USB-C

usb-c.sch

- 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

Battery

battery.sch

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

Power

power.sch

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

Boot Config

boot.sch

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_MODE0
BOOT_MODE1	BOOT_MODE1

Audio

audio.sch

- SAI2_RXD
- SAI2_TXD
- SAI2_TXFS
- SAI2_TXC
- SAI2_MCLK

RTC

rtc.sch

- I2C2_SDA
- I2C2_SCL

WLAN+BT M.2

wifi_bt_m2.sch

- USB_WLAN_DP
- USB_WLAN_DN
- BT_UART_TXD — UART4_TXD
- BT_UART_RXD — UART4_RXD
- BT_UART_RTS — UART4_RTS
- BT_UART_CTS — UART4_CTS
- BT_HOST_WAKE
- WIFI_DISABLE
- BT_DISABLE
- WIFI_CLK
- WIFI_CMD
- WIFI_DATA0
- WIFI_DATA1
- WIFI_DATA2
- WIFI_DATA3
- WIFI_RST — SD2_RST
- WIFI_WAKE
- I2C2_SDA
- I2C2_SCL

UART Debug

uart.sch

- UART1_TXD
- UART1_RXD

JTAG

jtag.sch

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

SDIO DEMUX

sdio_demux.sch

- 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

uSD Card

sd.sch

- CONN_SD2_DATA1
- CONN_SD2_DATA0
- CONN_SD2_CMD
- CONN_SD2_DATA3
- CONN_SD2_DATA2
- CONN_SD2_CLK
- CONN_SD2_CD_B

USB Hub

usb_hub.sch

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

MIPI DSI

mipi_dsi.sch

- D0_P
- D0_N
- D1_P
- D1_N
- D2_P
- D2_N
- D3_P
- D3_N
- CLK_P
- CLK_N
- RESX
- AVDD_EN
- SWIRE
- I2C2_SDA
- I2C2_SCL
- CAPTOUCH_INT
- CAPTOUCH_RST — SAI1_RXD3(GPIO4_IO05)

Buttons & LED

buttons_led.sch

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

WWAN M.2

wwan_m2.sch

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

J101A

IMX8M-SOM

		SD2_RST	
		SD2_DATA3	
		SD2_DATA2	
		SD2_DATA1	
		SD2_DATA0	
		WIFI_WAKE	
		SD2_CMD	
		uSD_CD_B	
TCPC_INT		SD2_CLK	
		USB1_SS_SEL	
		BT_HOST_WAKE	
		CAPTOUCH_INT	
GND	GND		

J101B

IMX8M-SOM

		GPIO3_IO09	
		GPIO3_IO08	
		PWR_FLAG 3V3_OUT	
		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	+5V		
C101 22uF	C102 22uF	C103 0.1uF	
C104 0.1uF	C105 22uF	C106 22uF	
GND	GND		

J101C

IMX8M-SOM

BOOT_MODE0			
BOOT_MODE1			
JTAG_TDI			
JTAG_TMS			
JTAG_TRST			SAI1_TXC
JTAG_TDO			
JTAG_TCK			
J102 TEST_1P			
DSI_BL_PWM			
WDG			
PWR_EN			SAI1_RXD1(GPIO4_IO03)
SAI5_RXC(GPIO3_IO20)			
SAI1_RXD0(GPIO4_IO02)			
GPIO1_IO13			
SAI1_RXD4(GPIO4_IO06)			SAI2_TXC
SAI1_RXD3(GPIO4_IO05)			
BTN1			
SAI1_RXD2(GPIO4_IO04)			BTN2
SAI2_TXFS			
SAI2_RXD			SAI2_MCLK
SAI1_RXD6(GPIO4_IO08)			
GND	GND		

J101D

IMX8M-SOM

SAI2_TXD			SAI1_RXD7(GPIO4_IO09)
			I2C2_SCL
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			
SAI1_TXD5(GPIO4_IO17)			
POR_B			
UART1_RXD			
SAI1_TXD2(GPIO4_IO14)			
SAI1_TXD6(GPIO4_IO18)			
UART3_RXD			USB2_DN
			USB2_DP
			USB1_RXN
			USB1_RXP
			USB1_TXN
UART1_TXD			USB1_TXP
USB2_VBUS TODO!!!			
USB2_ID USB2_VBUS=3.3V???			USB1_DN
USB1_VBUS			USB1_DP
USB1_ID			
GND	GND		

3V3_OUT

R103	R104	R101
10k	10k	10k

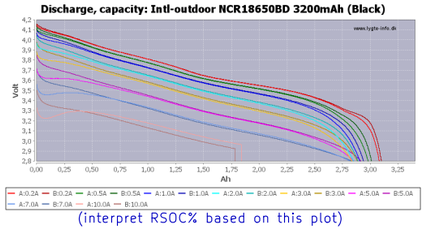
R102 10k

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: 1/16



(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

U201 BQ25896

I(Lsat)=7A

3.5-4.25V

Default LOW:
adapter source

Open-drain output
tied with TCPC_INT

If enough I/O is available then
separate CHRG_INT & TCPC_INT

This disables charging
but maybe not VBUS->VOUT
if PTN5110HQ's FAULT_STATUS[6]==1
(Force Off VBUS bit) then set EN_HiZ=1
EN_HiZ may be auto-set when in hiccup

Reading PTN5110HQ's CC_STATUS and POWER_STATUS
registers will tell TCPM (i.MX8M) when to set EN_HiZ

Also, reading PTN5110HQ's CC_STATUS and POWER_STATUS
registers will tell TCPM (i.MX8M) when to set OTG_CONFIG=1
(this will also happen when PTN5110HQ sets EN_SRC HIGH)

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

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

VBAT(DPL)=2.15-2.5V

NCR18650BD is recommended

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

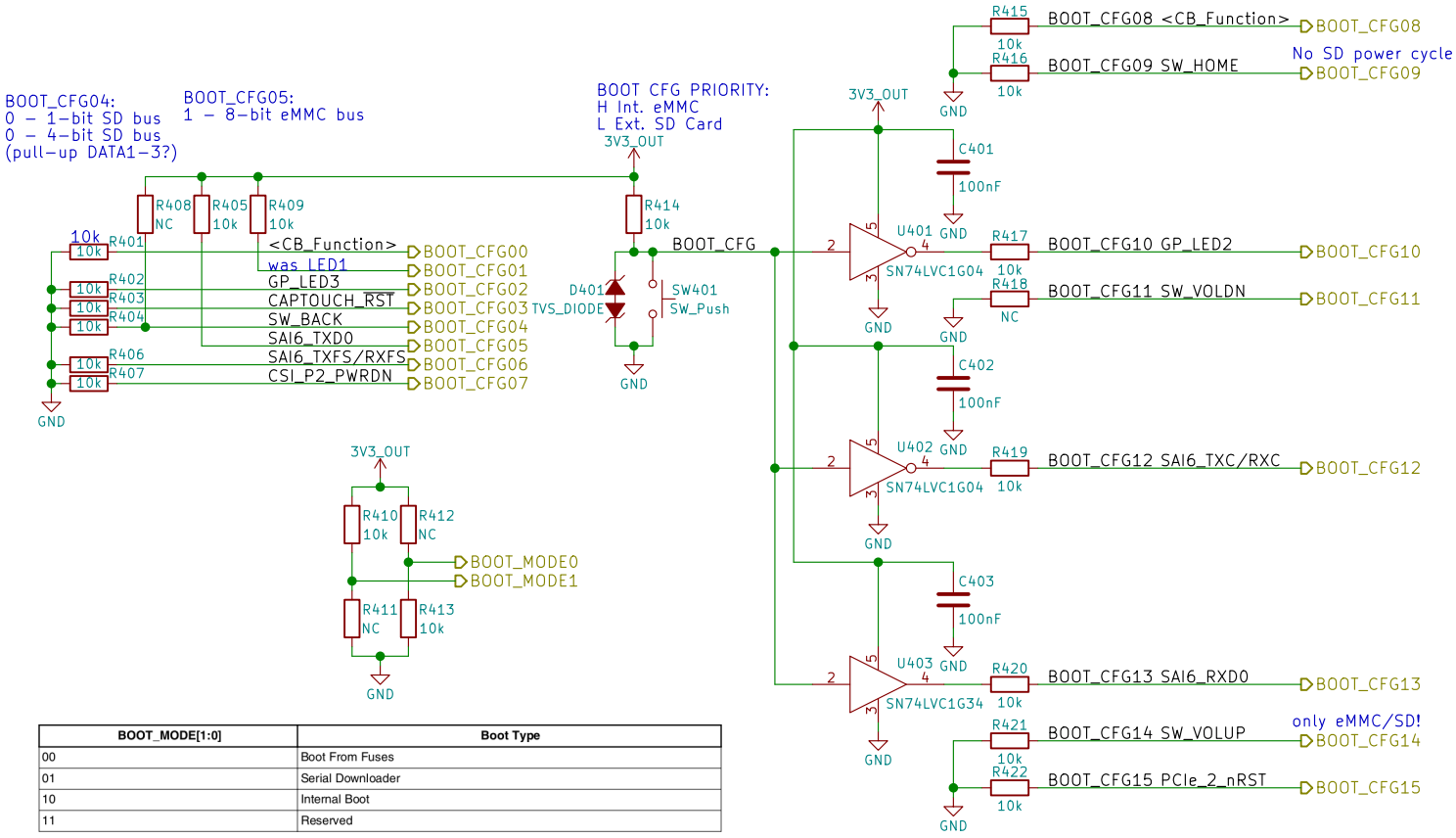
reference design: http://www.ti.com/lit/ug/sluuba2b/sluuba2b.pdf

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

Sheet: /Battery/		
File: battery.sch		
Title: Battery		
Size: A3	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 2/16

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

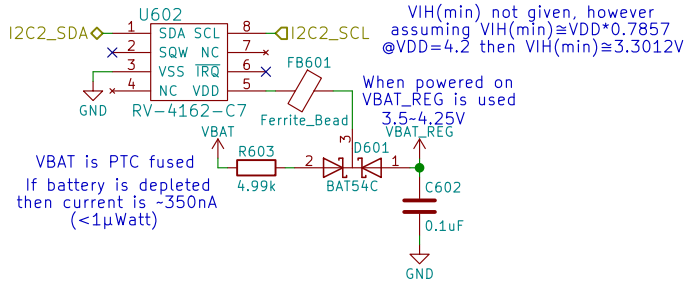


BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

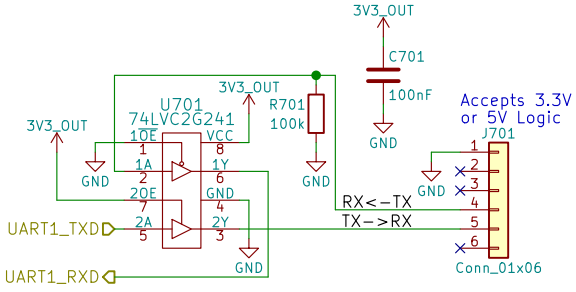
Size: A4	Date: 2018–05–02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 3/16



Sheet: /RTC/
File: rtc.sch

Title: RTC

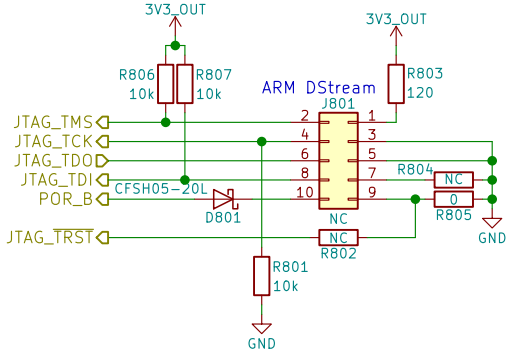
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 4/16



Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

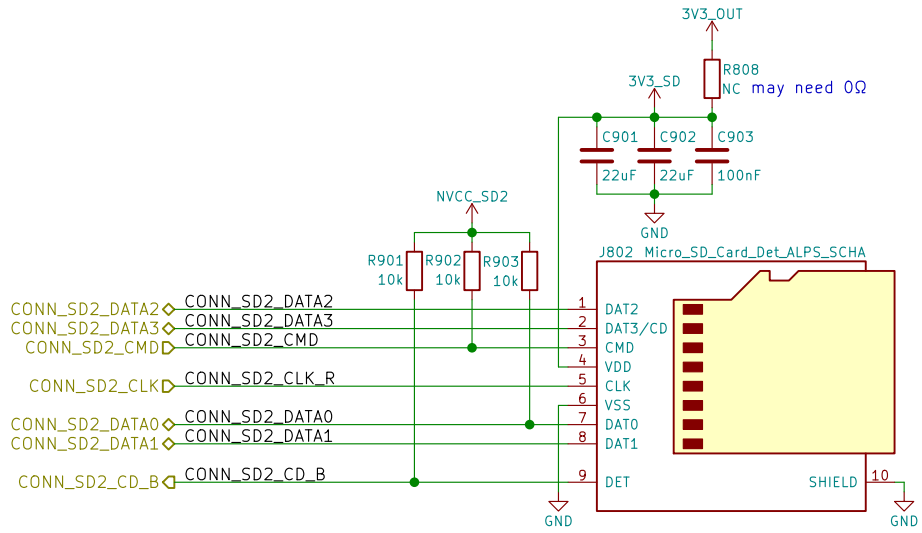
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/16

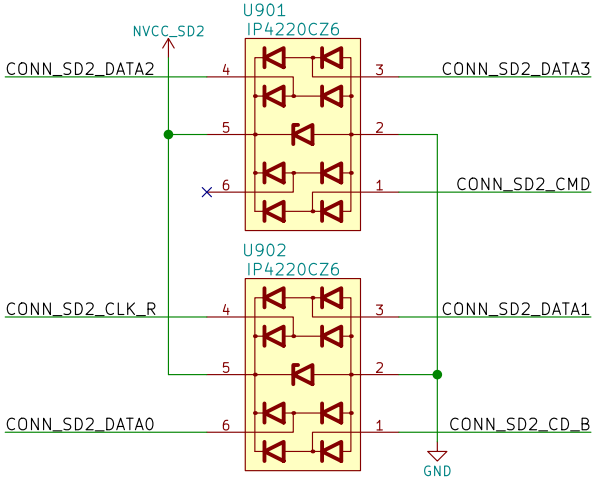


Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 6/16





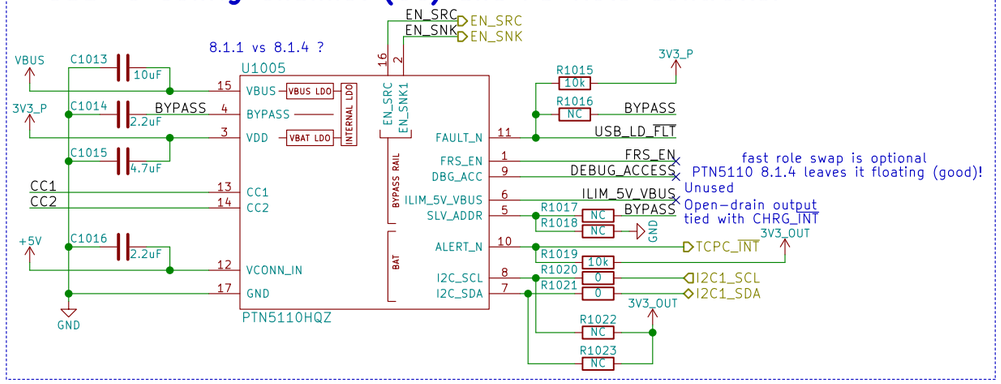
Sheet: /uSD Card/
File: sd.sch

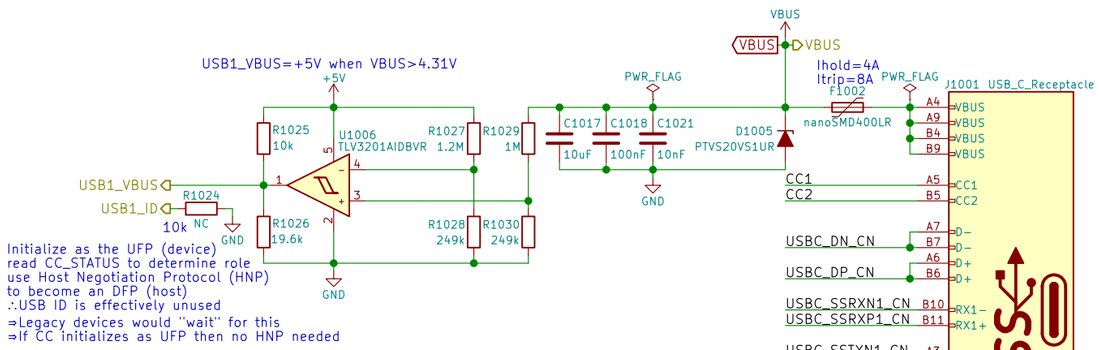
Title: uSD Card

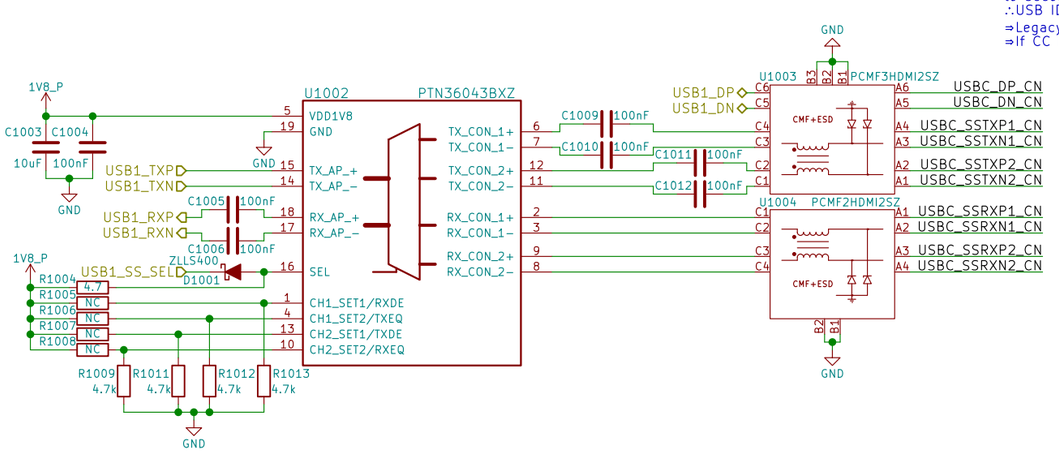
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/16

"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)."

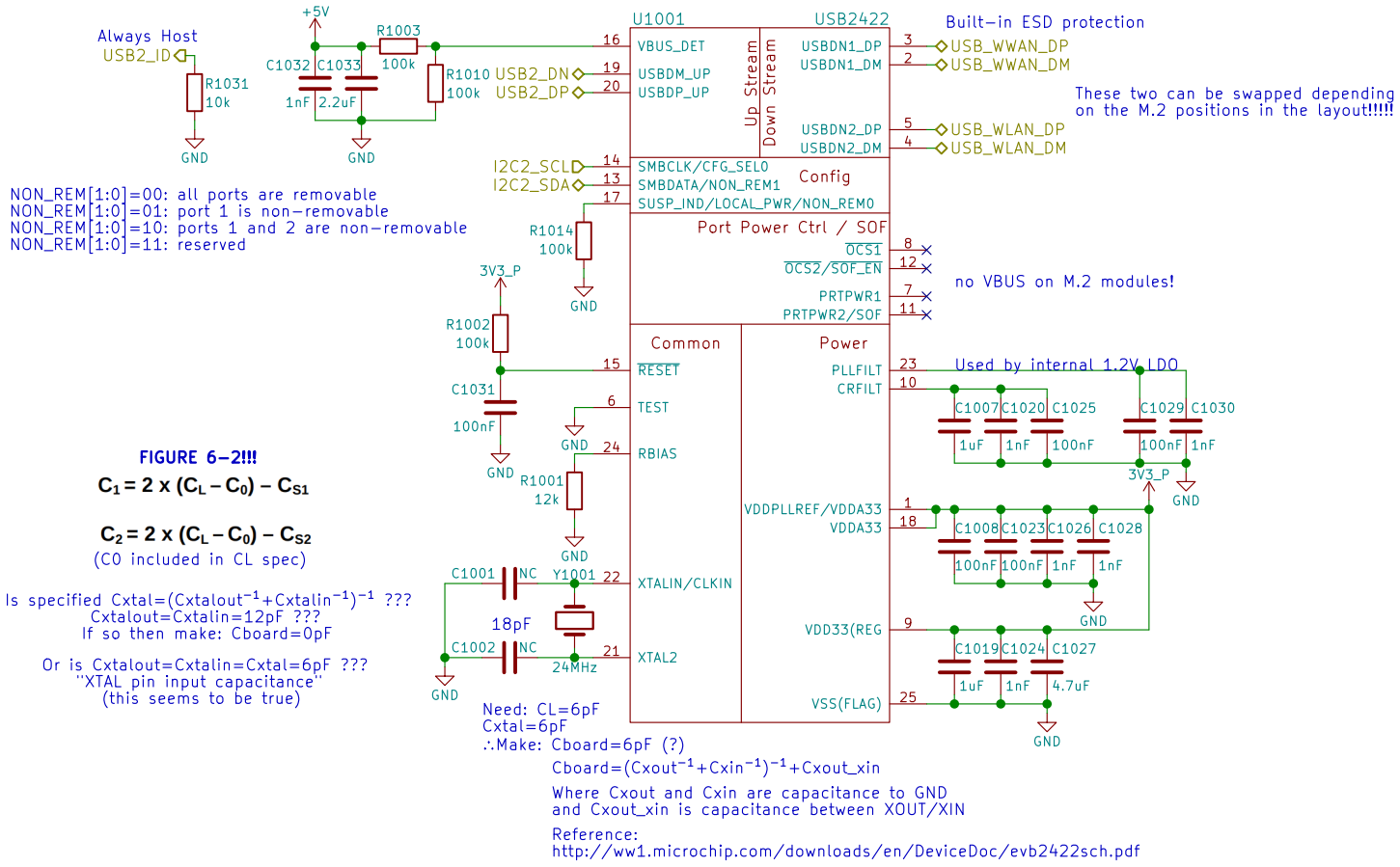
USB-C Config Channel (CC) and PD Role Controller



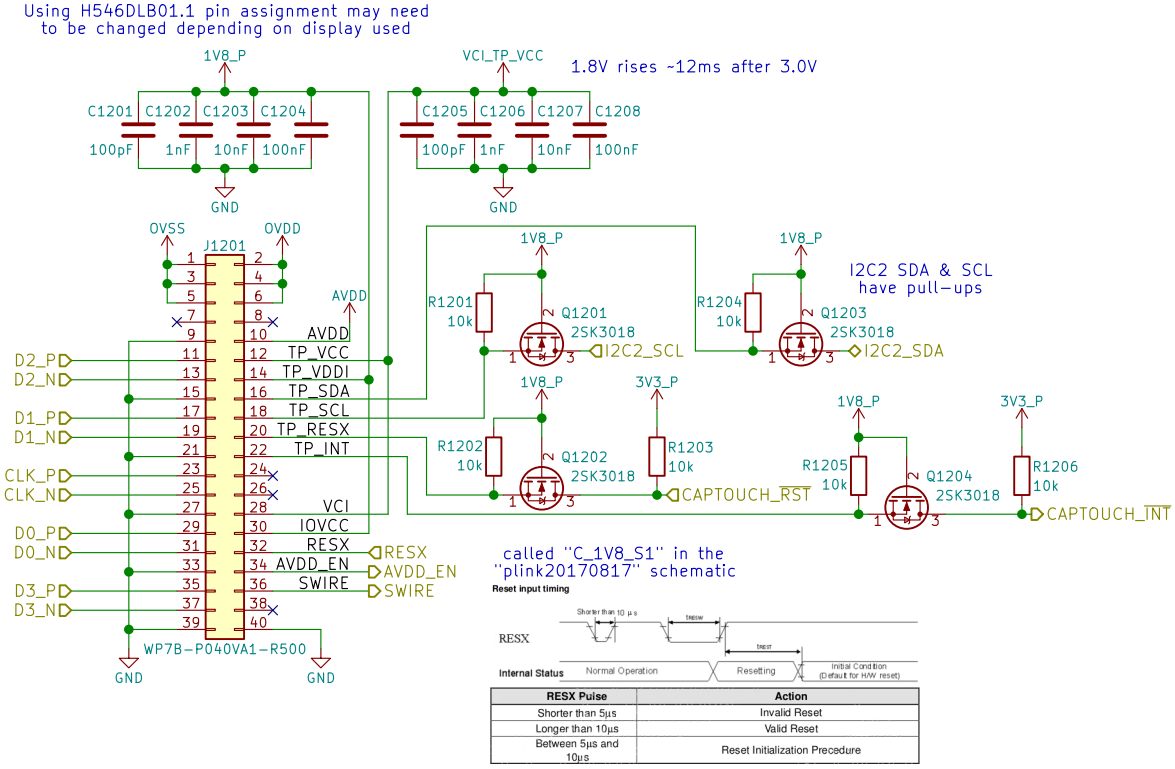




Sheet: /USB-C/		
File: usb-c.sch		
Title: USB Type C		
Size: A3	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/16



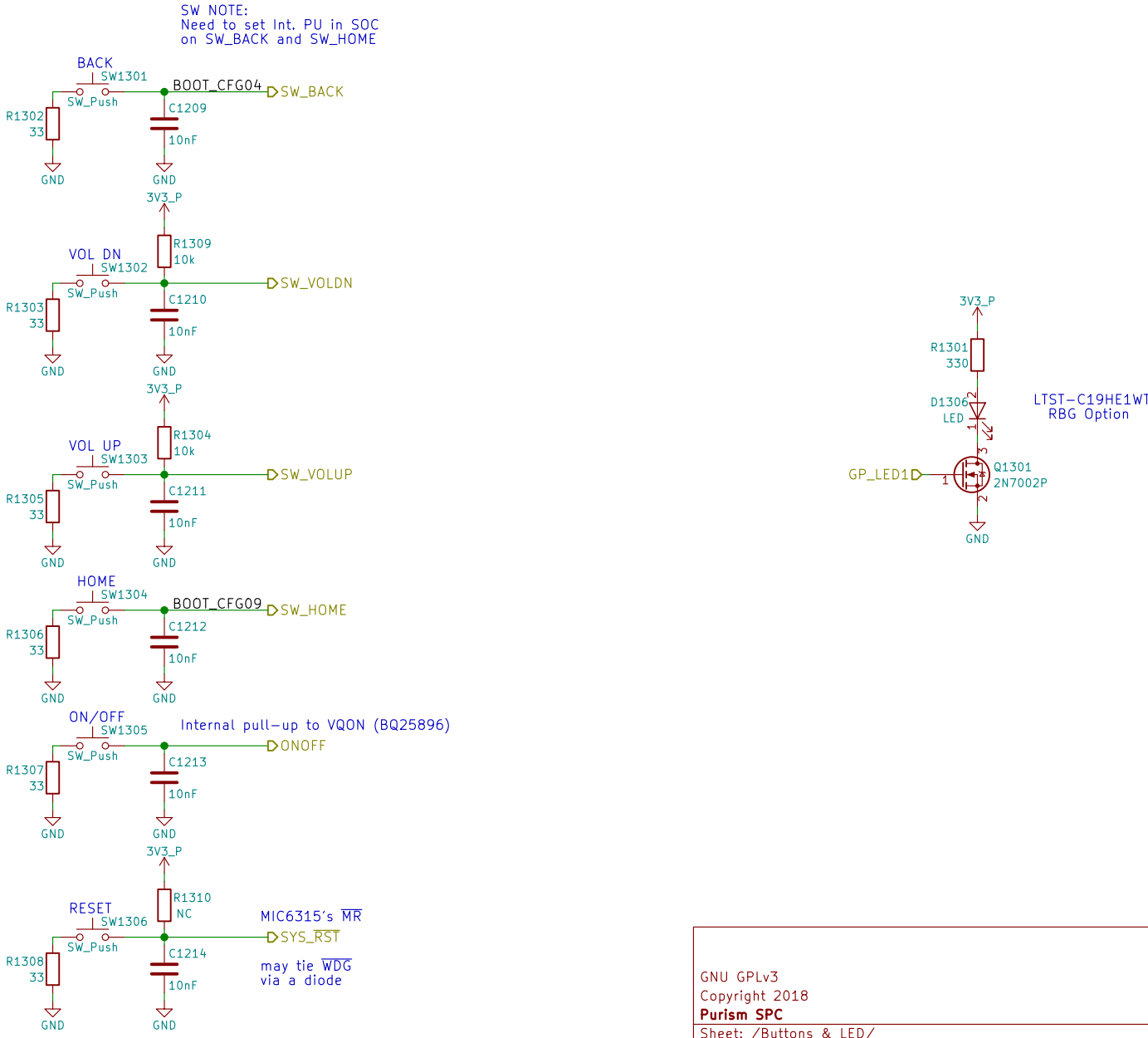
Sheet: /USB Hub/ File: usb_hub.sch		
Title:		
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/16



Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

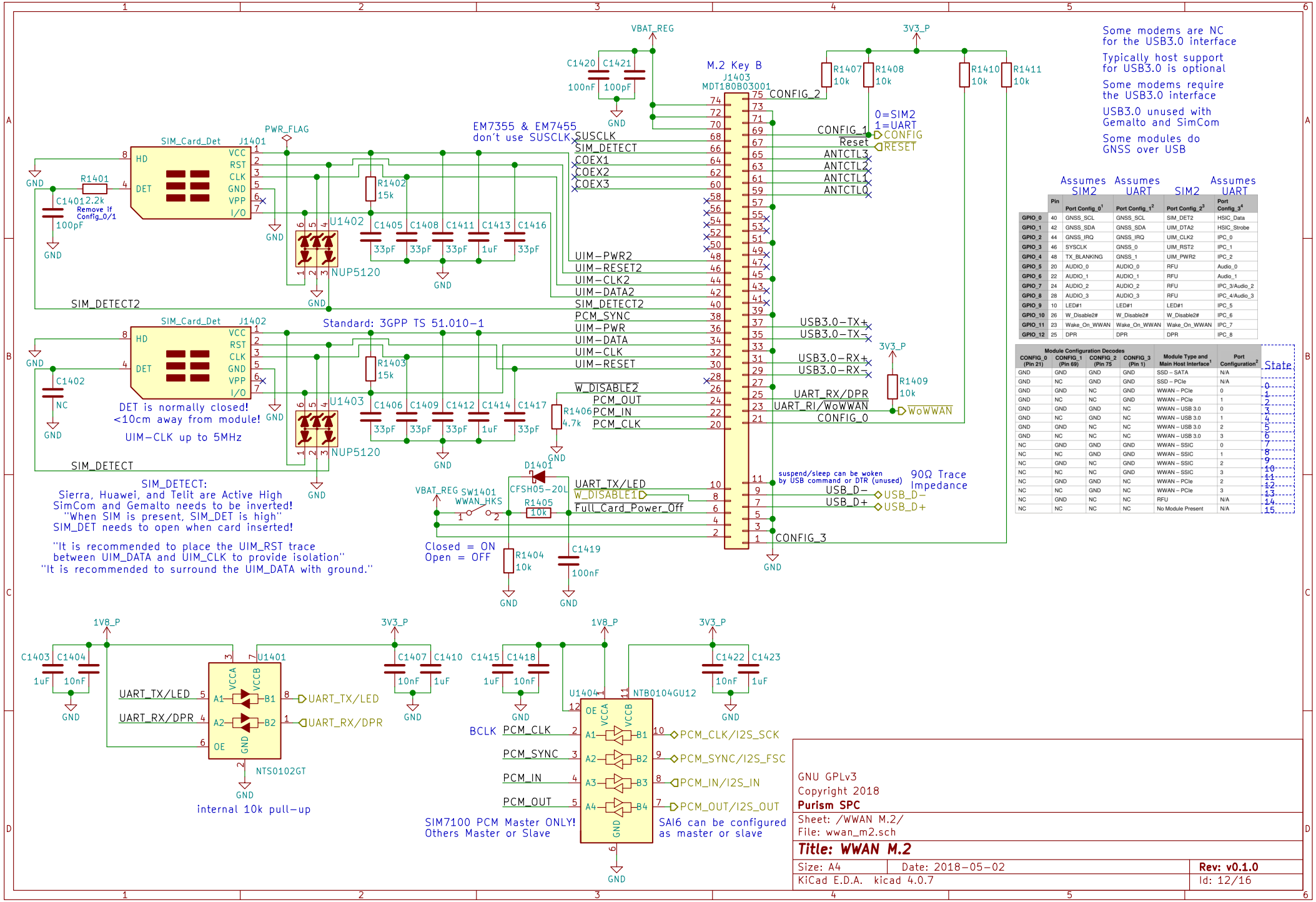
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 10/16



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: 11/16



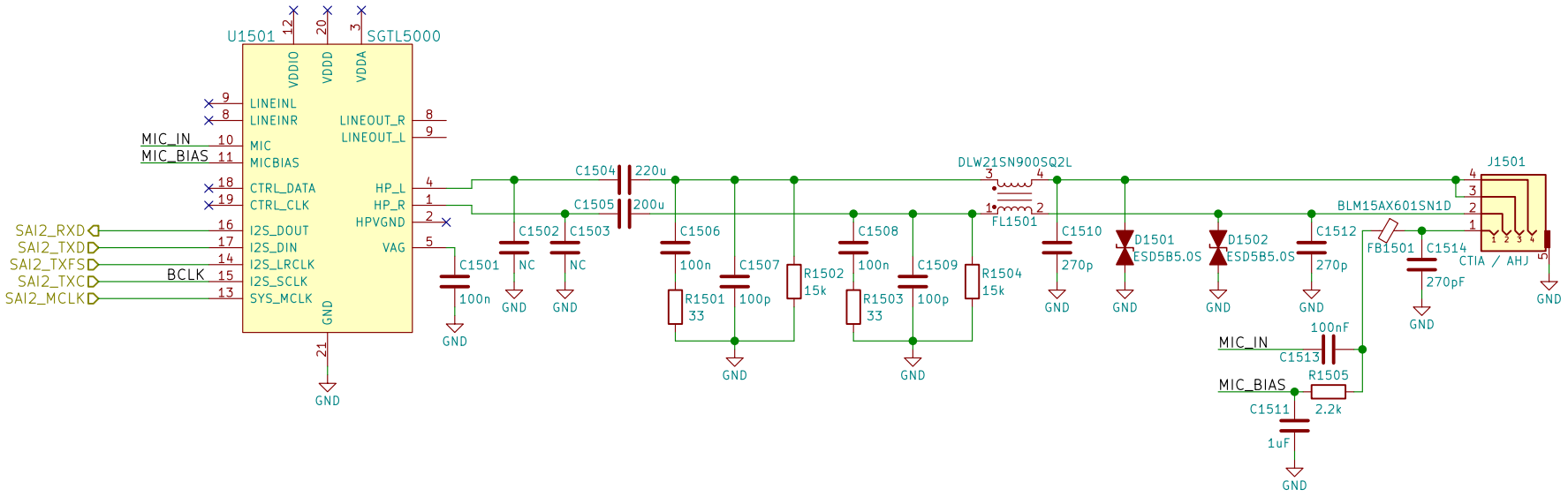
	Pin	Port Config_0[1]	Port Config_1[2]	Port Config_2[3]	Port Config_3[4]
GPIO_0	40	GNSS_SCL	GNSS_SCL	SIM_DET2	HSIC_Data
GPIO_1	42	GNSS_SDA	GNSS_SDA	UIM_DTA2	HSIC_Strobe
GPIO_2	44	GNSS_IRQ	GNSS_IRQ	UIM_CLK2	IPC_0
GPIO_3	46	SYSCLK	GNSS_0	UIM_RST2	IPC_1
GPIO_4	48	TX_BLANKING	GNSS_1	UIM_PWR2	IPC_2
GPIO_5	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: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 12/16

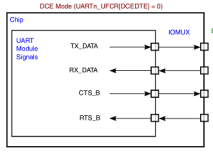


Sheet: /Audio/
File: audio.sch

Title: Audio

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 13/16

UARTn_UFCR[DCEDTE]=0 on POR



TX output
RX input
CTS output
RTS input

⇒TX→RX
RX←TX
CTS→CTS
RTS←RTS

RS9116 NC:
RTS, CTS, BT_HOST_WAKE, WIFI_WAKE

6.2 M.2 Signal Directions

Module: Table 23
Socket: Table 46

RedPine RS9116 MB0
Requires +5V for USB!

J1502
M.2_Key_E

3V3_P
1V8_P
GND

USB_WLAN_DP
USB_WLAN_DN
WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE
WIFI_RST
W_DISABLE1

R1506 10k
D1503 ZLLS400
D1504 ZLLS400

BT_HOST_WAKE
BT_UART_RXD
SoC's RX
Module's TX
SoC's TX
Module's RX
BT_UART_TXD
BT_UART_RTS
BT_UART_CTS

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

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK
W_DISABLE2
W_DISABLE1
M2_I2C_SDA
M2_I2C_SCL

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!!!
verify if translators
with PWR_EN is needed!

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

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

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

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**
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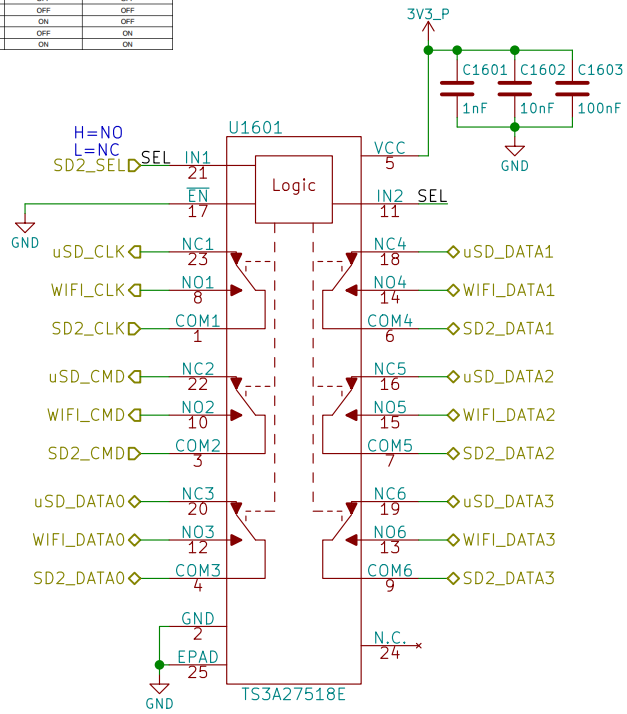
Can swap around signals in the layout:

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**
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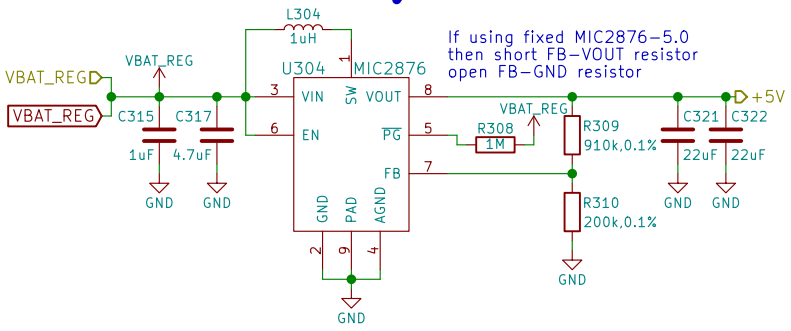
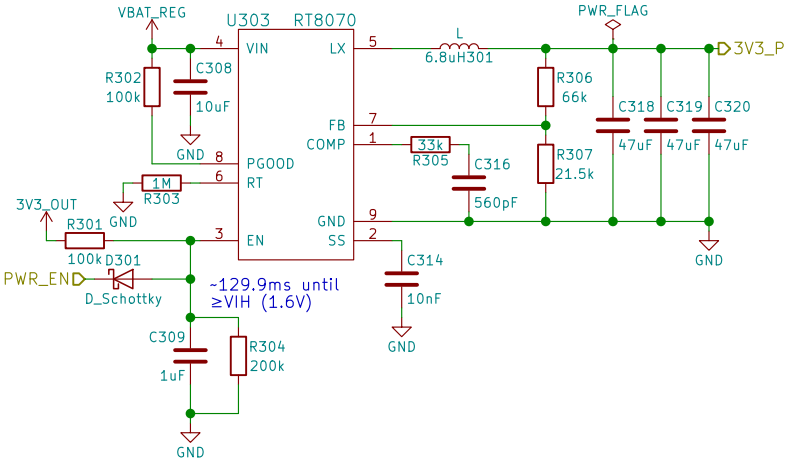
5.0V/3.8A



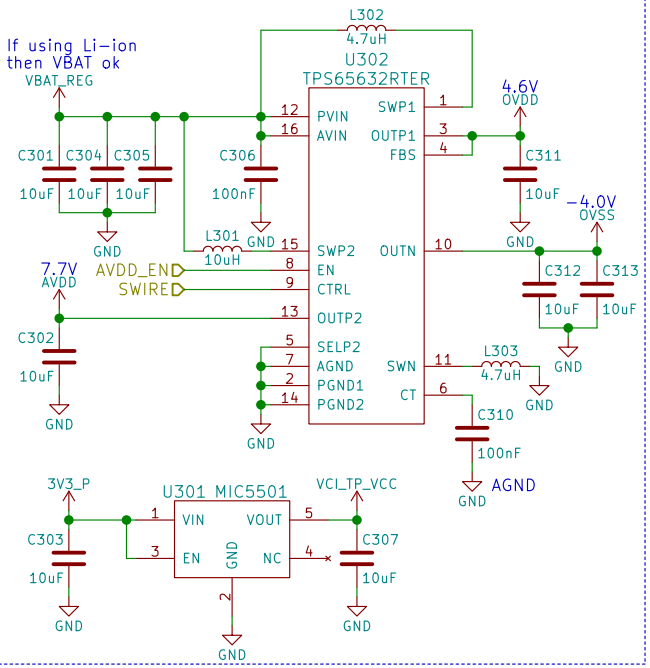
Cheaper, more efficient, smaller, and simpler than RT6150A
Explicitly mentions USB/smartphone application

3.3V/3A

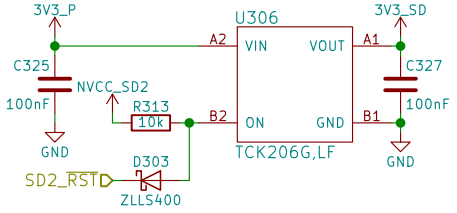
When VBAT can fall below
3.3V use TPS63020 instead!



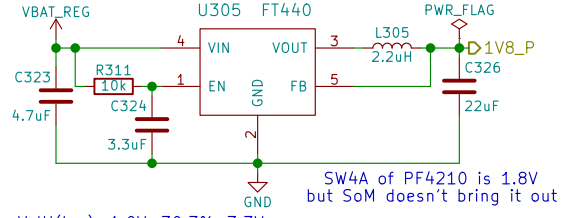
AMOLED POWER



SD 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

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: 16/16