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
- I2C2_SCL
- EN_SNK
- EN_SRC

Battery

battery.sch

- VBUS
- VBAT_REG
- I2C1_SDA
- I2C1_SCL
- TCPC_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

RTC

rtc.sch

- 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

uSD Card

sd.sch

- 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

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 — 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)

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!!!

Audio

audio.sch

- SAI2_RXD
- SAI2_TXD
- SAI2_TXFS
- SAI2_TXC
- SAI2_MCLK

WLAN+BT M.2

wifi_bt_m2.sch

USB_WLAN_DP	USB_WLAN_DP
USB_WLAN_DN	USB_WLAN_DM
BT_UART_TXD	UART4_TXD
BT_UART_RXD	UART4_RXD TODO!!!
BT_UART_RTS	UART4_RTS (translator?)
BT_UART_CTS	UART4_CTS
BT_HOST_WAKE	BT_HOST_WAKE
WIFI_DISABLE	WIFI_DISABLE
BT_DISABLE	BT_DISABLE
WIFI_CLK	WIFI_CLK
WIFI_CMD	WIFI_CMD
WIFI_DATA0	WIFI_DATA0
WIFI_DATA1	WIFI_DATA1
WIFI_DATA2	WIFI_DATA2
WIFI_DATA3	WIFI_DATA3
WIFI_RST	SD2_RST
WIFI_WAKE	WIFI_WAKE
I2C2_SDA	I2C2_SDA
I2C2_SCL	I2C2_SCL
M2_PCM_CLK	M2_PCM_CLK
M2_PCM_SYNC	M2_PCM_SYNC TODO!!!
M2_PCM_IN	M2_PCM_IN (translator?)
M2_PCM_OUT	M2_PCM_OUT

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

Ethernet

ethernet.sch

- 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

J101A

IMX8M-SOM

		ENET_TXC	
		ENET_TD0	
		ENET_TD1	
		ENET_TD2	
		ENET_TD3	
		ENET_TX_CTL	
		ENET_RD0	
		ENET_RD1	
		ENET_RD2	
		ENET_RD3	
		ENET_RX_CTL	
		ENET_RXC	
		ENET_MDIO	
ENET_RST		ENET_MDC	
		SD2_RST	
		SD2_DATA3	
		SD2_DATA2	
		SD2_DATA1	
		SD2_DATA0	
		WIFI_WAKE	
		SD2_CMD	
		uSD_CD_B	
TCPC_INT		SD2_CLK	
		WWAN_DISABLE	
		USB1_SS_SEL	
		BT_HOST_WAKE	
		CAPTOUCH_INT	

GND GND

J101B

IMX8M-SOM

	WIFI_DISABLE
	GPIO3_IO09
	GPIO3_IO08
	PWR_FLAG 3V3_OUT
	ENET_2V5 PWR_FLAG NVCC_SD2
DSI_DP2	
DSI_DN2	
DSI_DP0	
DSI_DN0	
DSI_CKN	
DSI_CKP	
DSI_DP1	
DSI_DN1	
DSI_DP3	
DSI_DN3	

+5V +5V

C101 22uF, C102 22uF, C103 0.1uF, C104 0.1uF, C105 22uF, C106 22uF

GND 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			ENET_WoL
			SAI1_RXD1(GPIO4_IO03)
			ENET_INT
SAI5_RXC(GPIO3_IO20)			
SAI1_RXD0(GPIO4_IO02)			CLKO_25MHz
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

3V3_OUT

R102 10k

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			
BT_DISABLE			
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
TODO!!! USB2_VBUS			
USB2_ID			USB1_DN
USB1_VBUS			USB1_DP
USB1_ID			

GND GND

3V3_OUT

R103 10k, R104 10k, R105 10k

USB2_VBUS=3.3V???

GND GND

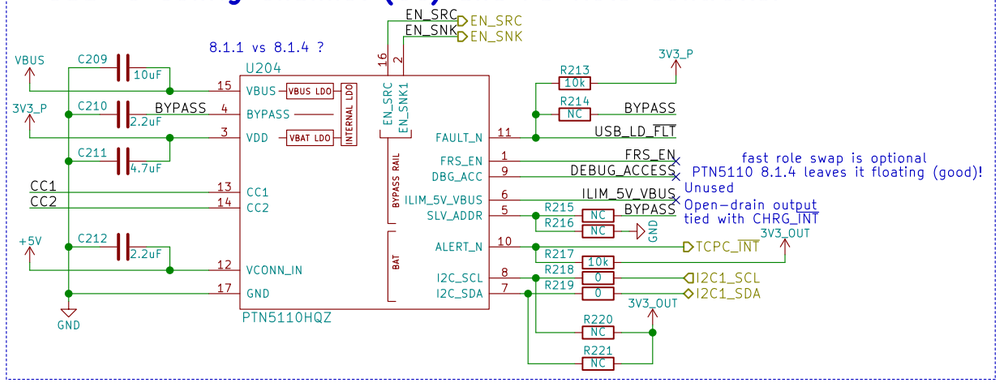
Sheet: /
File: dvk-mx8m-bsb.sch

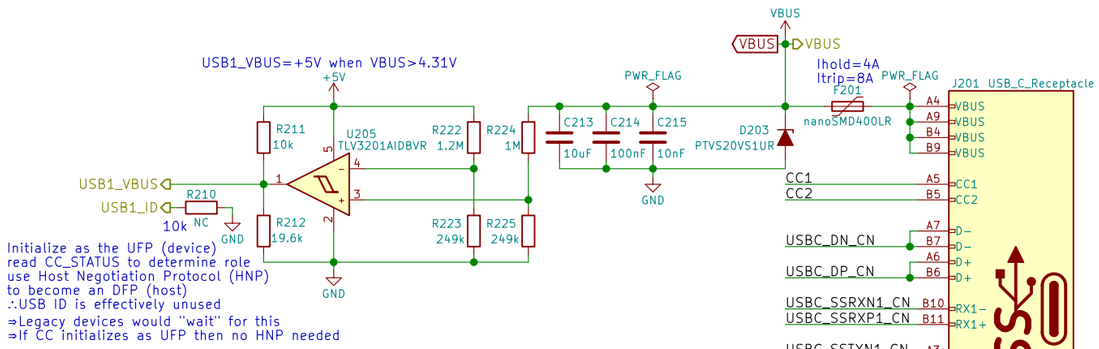
Title: DVK-MX8M-BSB

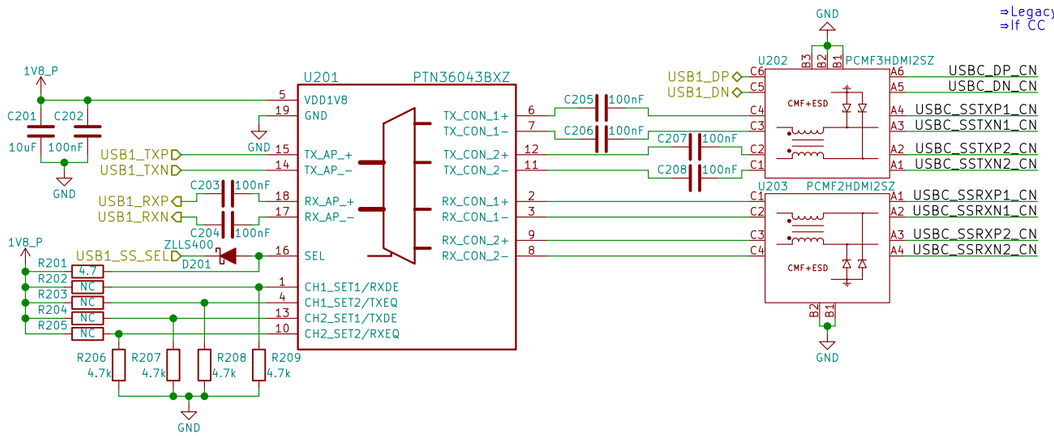
Size: A2	Date: 2018-05-02	Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7		Id: 1/17

"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

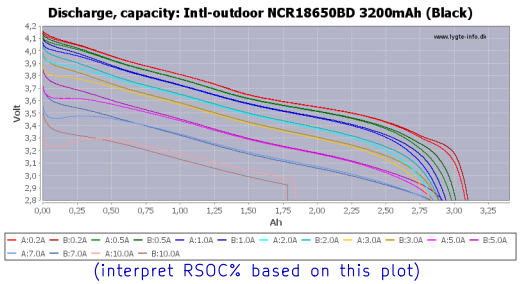






Sheet: /USB-C/		
File: usb-c.sch		
Title: USB Type C		
Size: A3	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 2/17

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

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

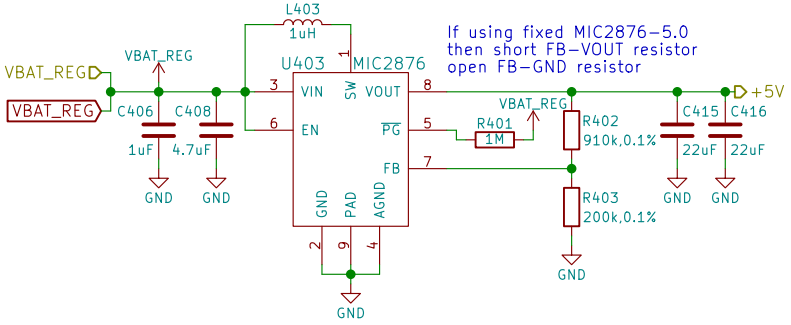
VBAT(nom)=REG06[7:2]
VBAT(default_max_ovp)=(REG06[7:2]×1.005)×1.04=4.3982016V
REG06[7:2]=010111⇒VBAT(max_ovp)=4.3814784
BQ29705 provides 4.425V as OVP!!!

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: 3/17

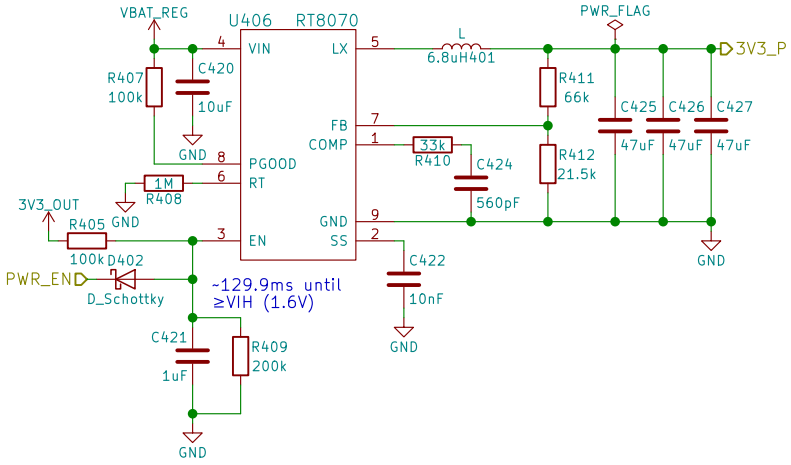
5.0V/3.8A



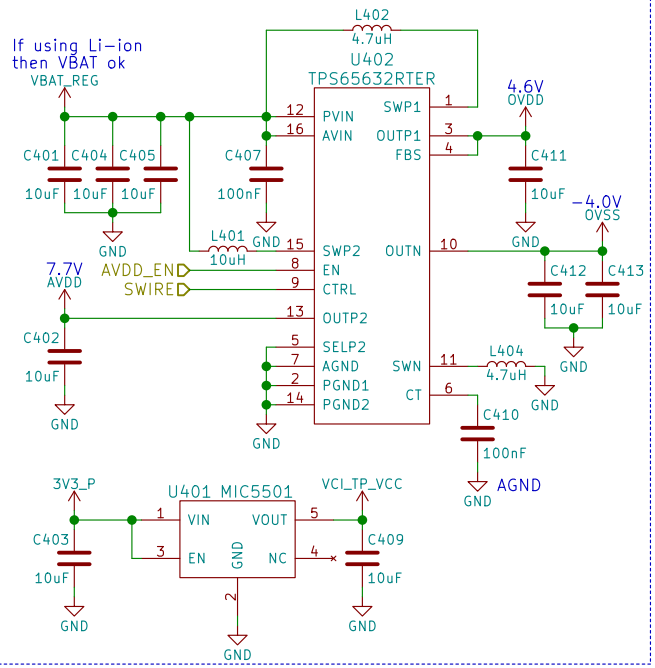
Cheaper, more efficient, smaller, and simpler than RT6150A
Explicitly mentions USB/smartphone application

3.3V/3A

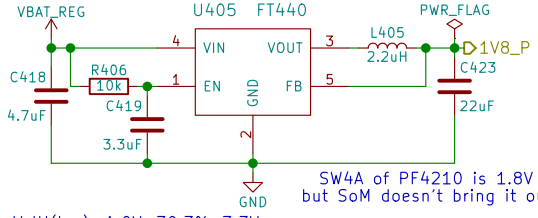
When VBAT can fall below
3.3V use TPS63020 instead!



AMOLED POWER



1.8V/600mA

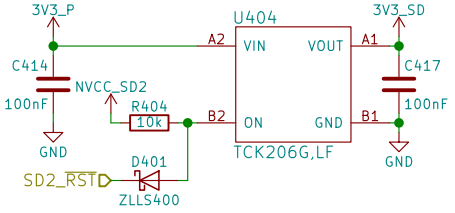


SW4A of PF4210 is 1.8V
but SoM doesn't bring it out

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

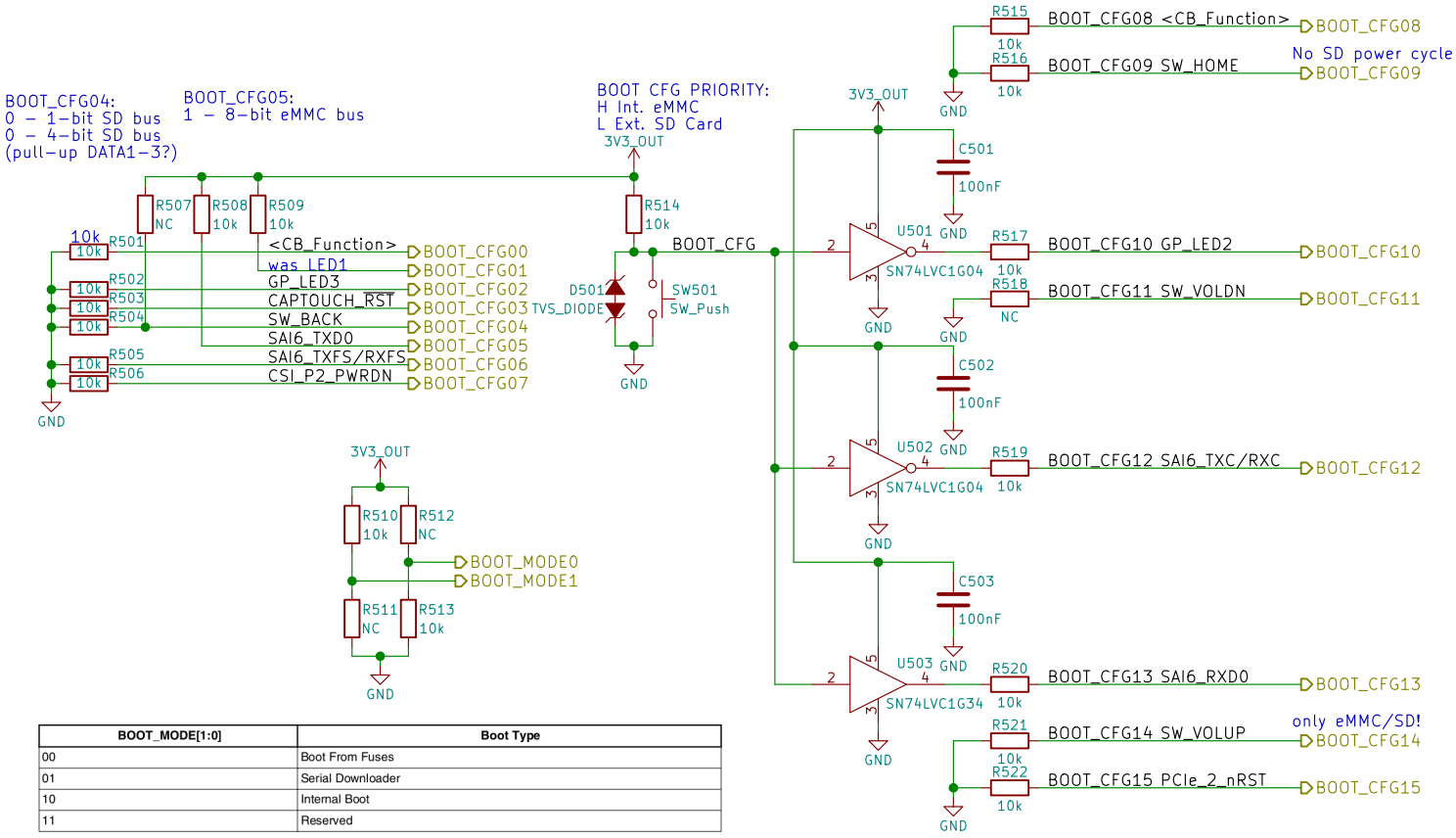
SD POWER



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: 4/17

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

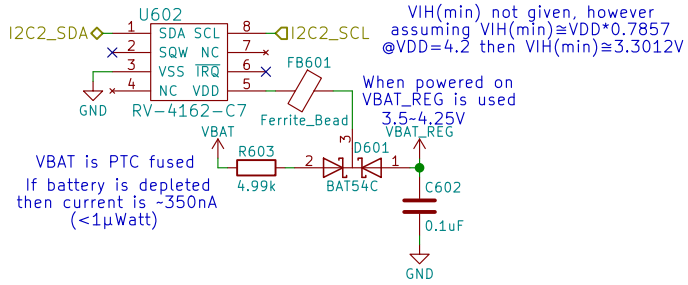


BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

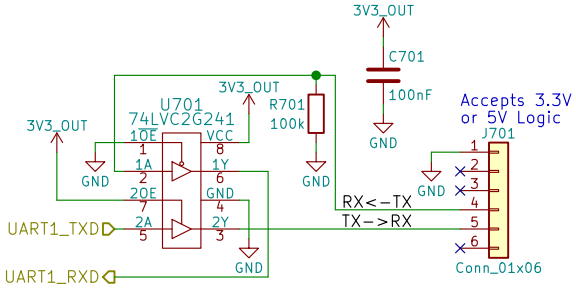
Size: A4	Date: 2018–05–02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/17



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: 6/17

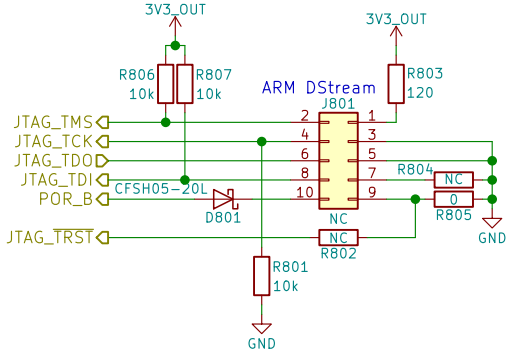


GNU GPLv3
Copyright 2018
Purism SPC

Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

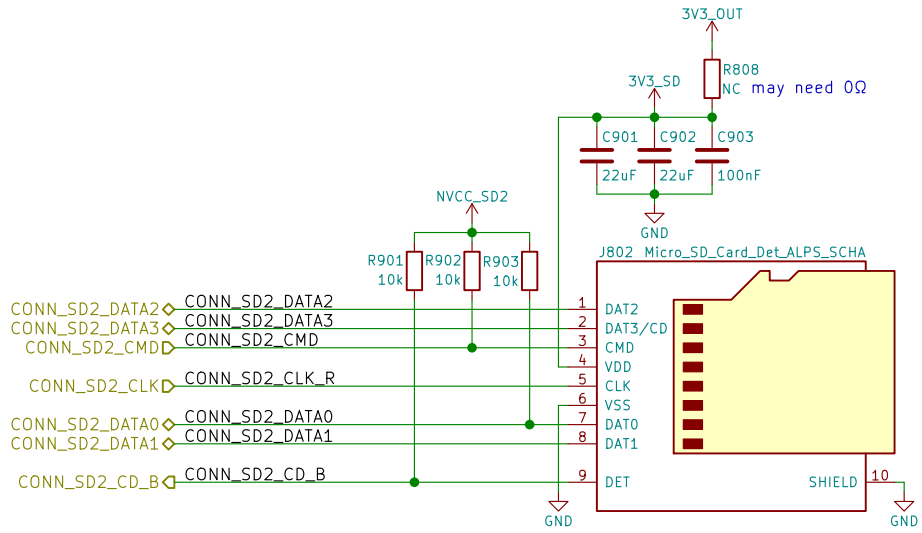
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/17

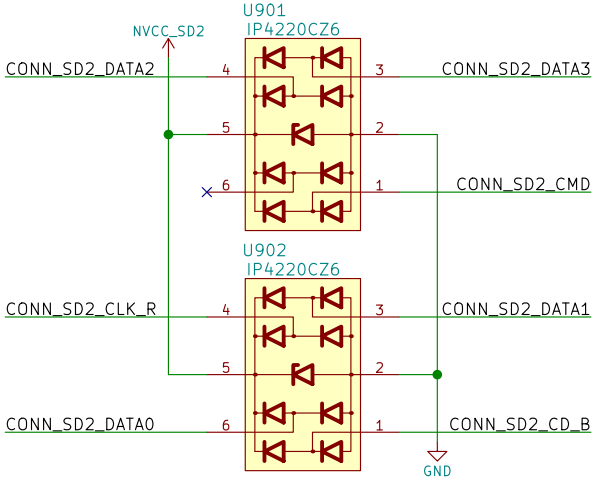


Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/17

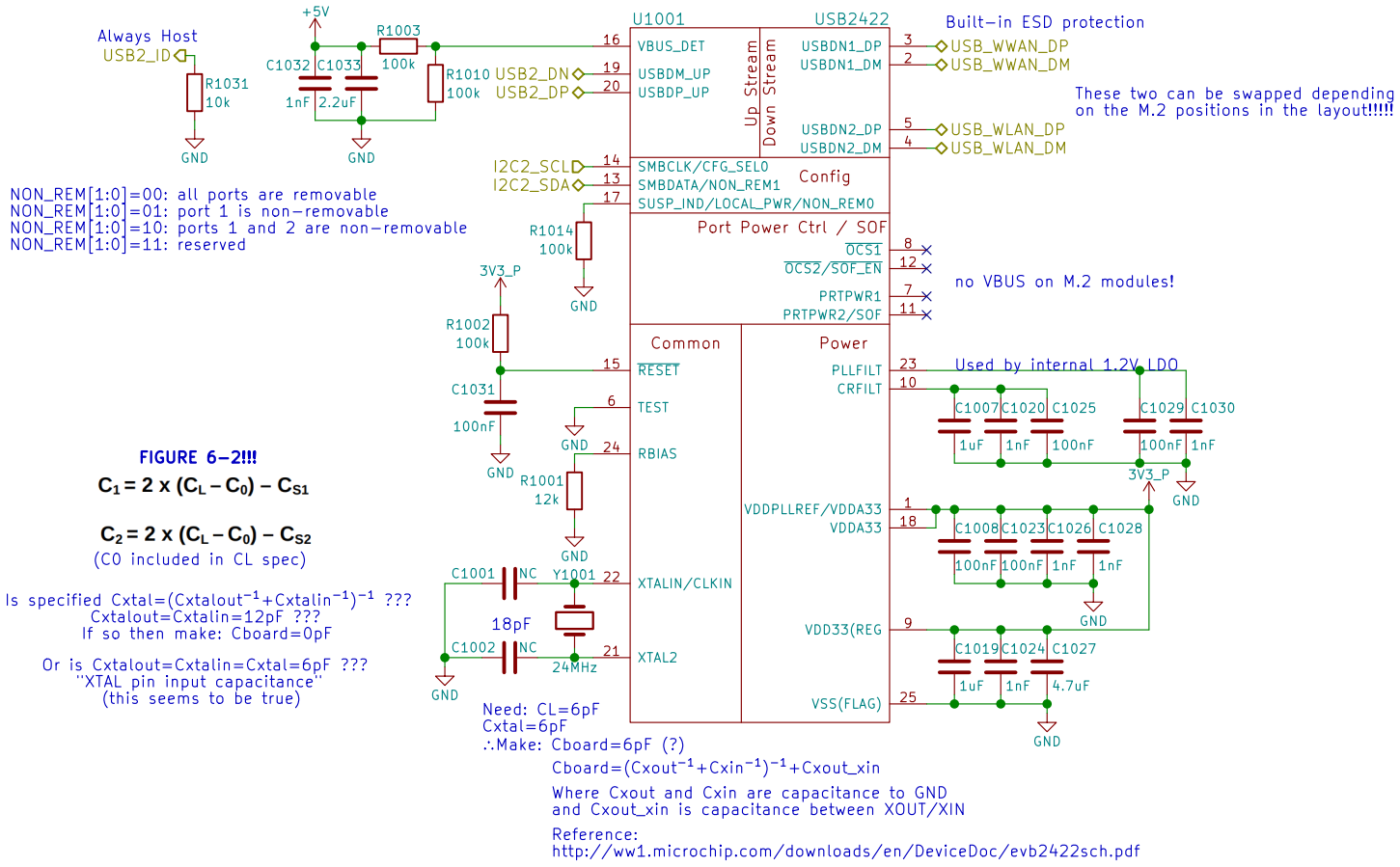




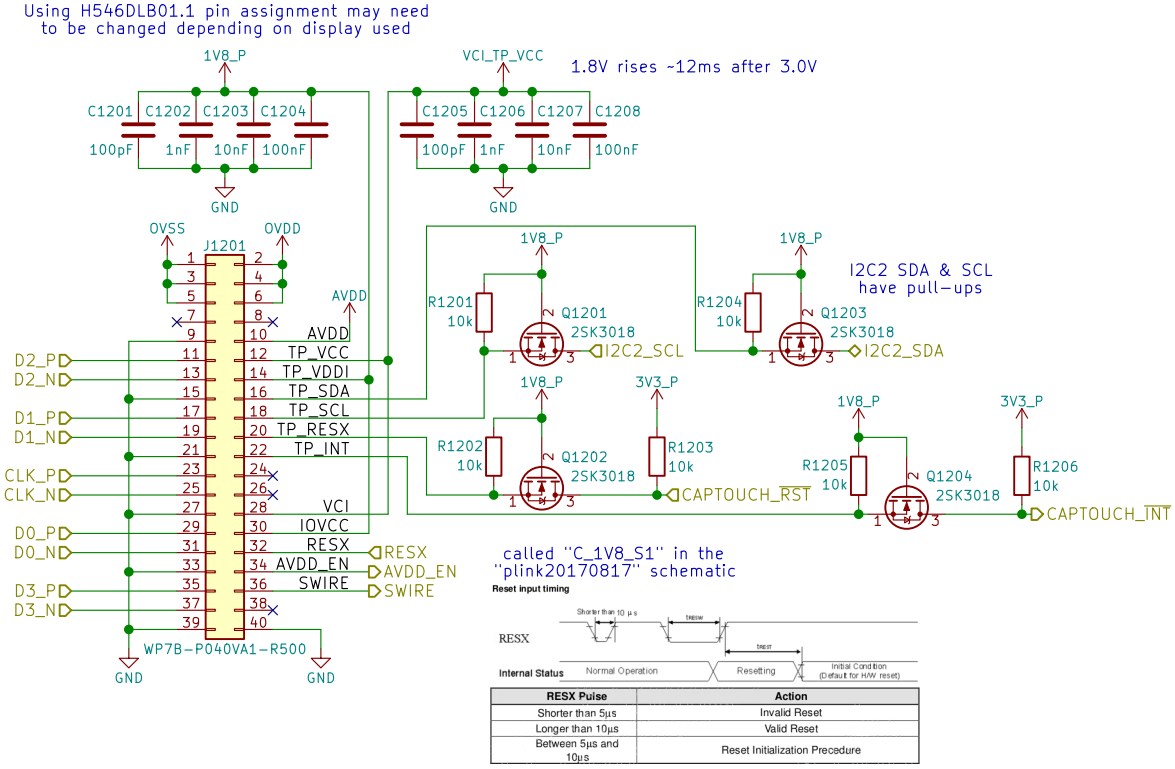
Sheet: /uSD Card/
File: sd.sch

Title: uSD Card

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/17



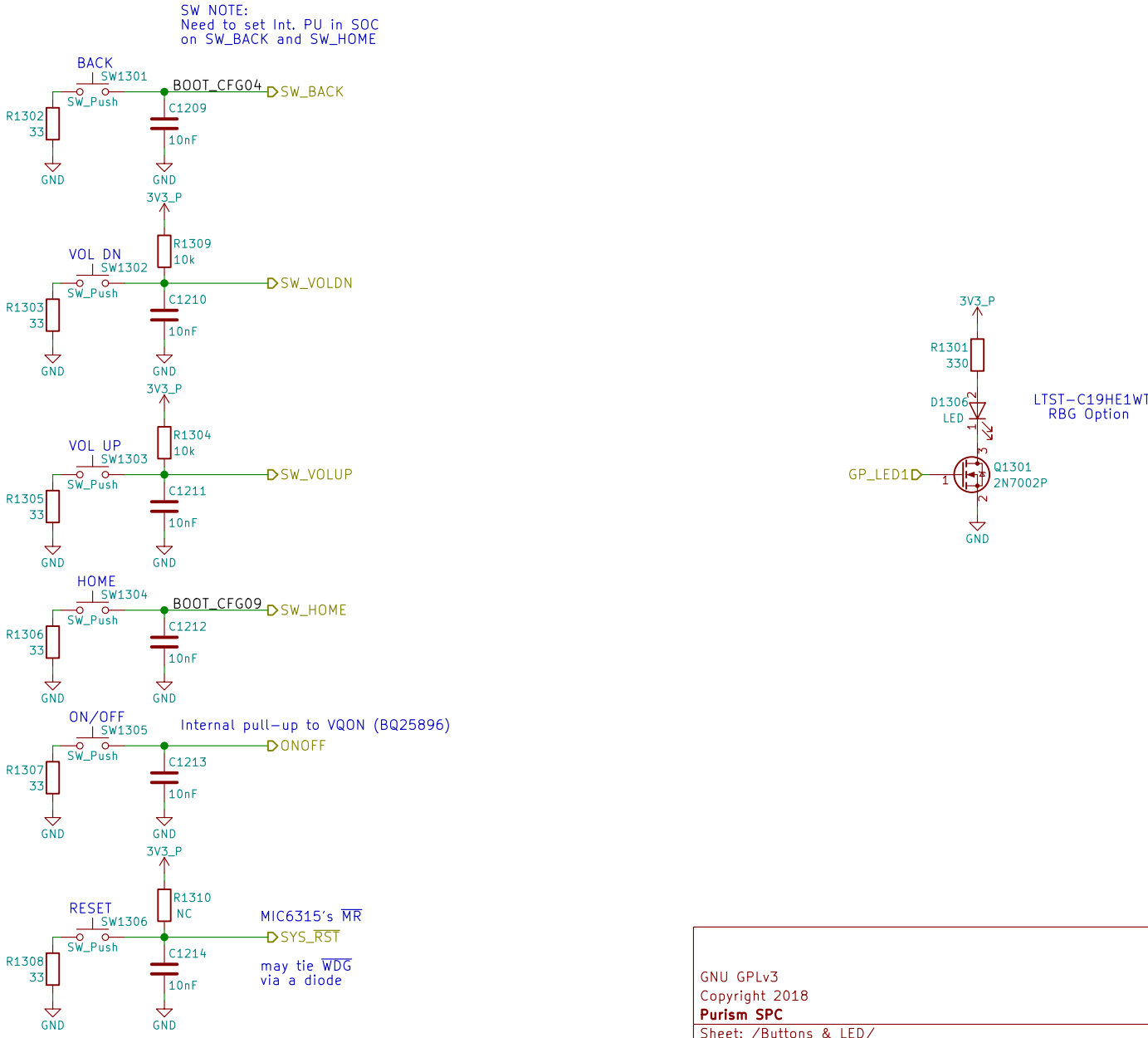
Sheet: /USB Hub/		
File: usb_hub.sch		
Title:		
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 10/17



Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

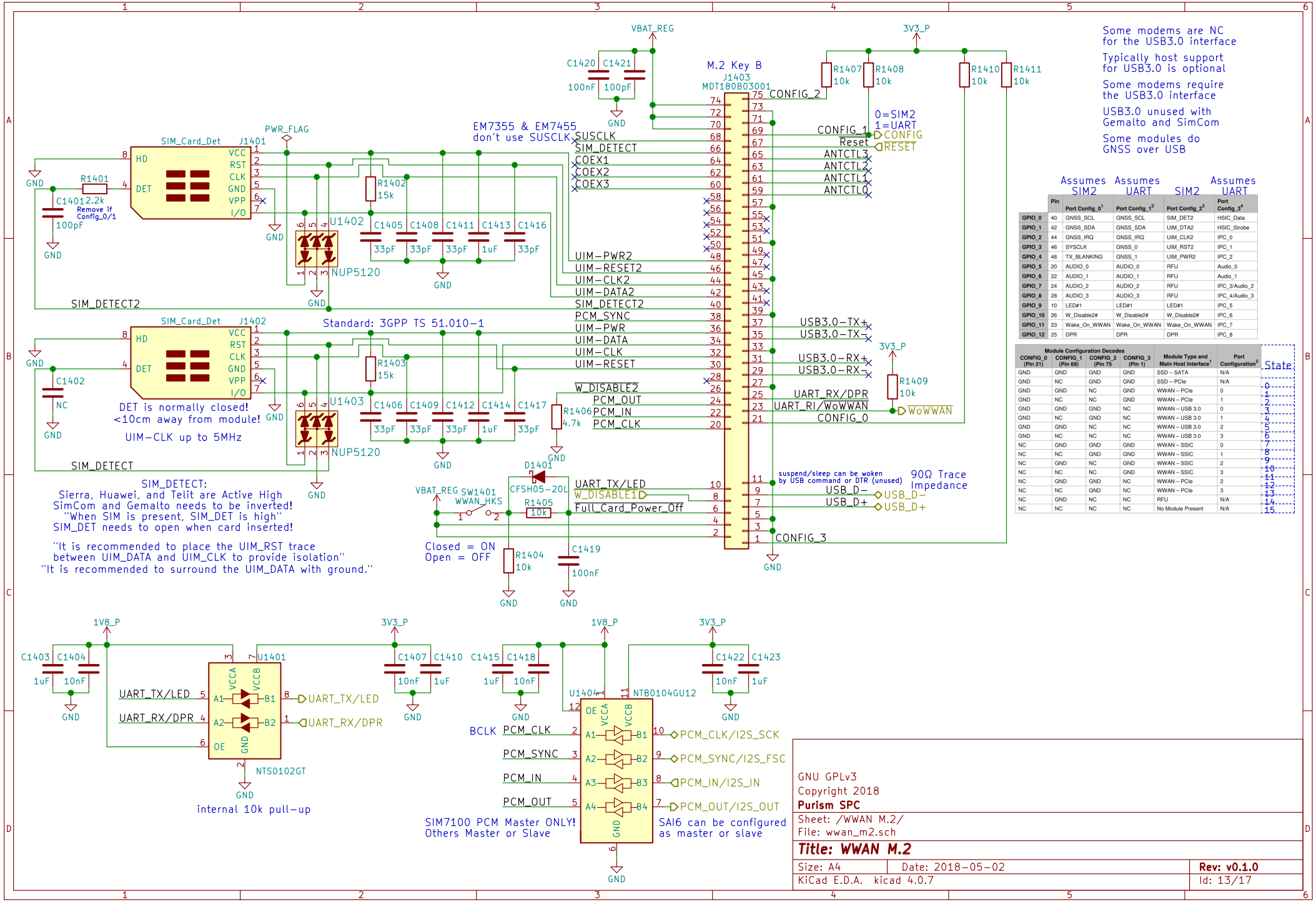
Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 11/17



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: 12/17



	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

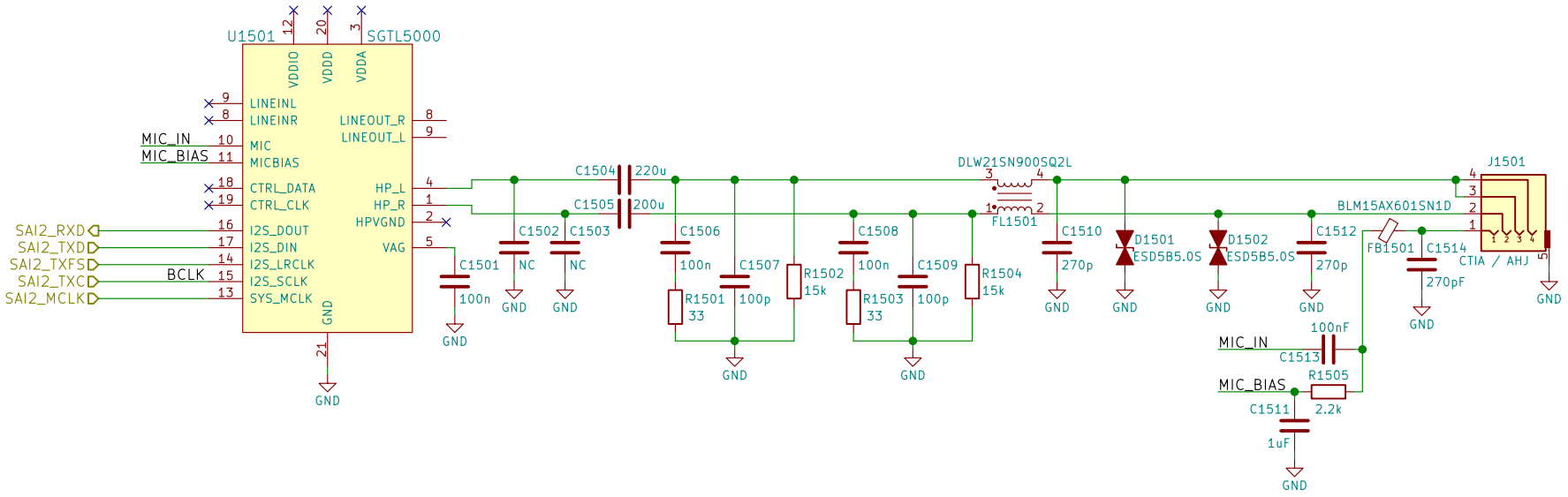
Module Configuration Decodes					
CONFIG_0 (Pin 21)	CONFIG_1 (Pin 69)	CONFIG_2 (Pin 75)	CONFIG_3 (Pin 1)	Module Type and Main Host Interface[1]	Port Configuration[2]
GND	GND	GND	GND	SSD – SATA	N/A
GND	NC	GND	GND	SSD – PCIe	N/A
GND	GND	NC	GND	WWAN – PCIe	0
GND	NC	NC	GND	WWAN – PCIe	1
GND	GND	GND	NC	WWAN – USB 3.0	0
GND	NC	GND	NC	WWAN – USB 3.0	1
GND	GND	NC	NC	WWAN – USB 3.0	2
GND	NC	NC	NC	WWAN – USB 3.0	3
NC	GND	GND	GND	WWAN – SSIC	0
NC	NC	GND	GND	WWAN – SSIC	1
NC	GND	NC	GND	WWAN – SSIC	2
NC	NC	NC	GND	WWAN – SSIC	3
NC	GND	GND	NC	WWAN – PCIe	2
NC	NC	GND	NC	WWAN – PCIe	3
NC	GND	NC	NC	RFU	N/A
NC	NC	NC	NC	No Module Present	N/A

State: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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

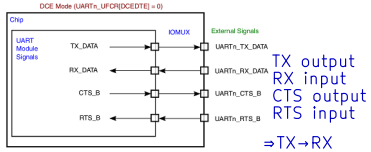
Title: WWAN M.2

Size: A4 | Date: 2018-05-02 | **Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7 | Id: 13/17



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: 14/17

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

3V3_P

USB_WLAN_DP
USB_WLAN_DN

WIFI_CLK
WIFI_CMD
WIFI_DATA0
WIFI_DATA1
WIFI_DATA2
WIFI_DATA3
WIFI_WAKE

M2_PCM_CLK
M2_PCM_SYNC
M2_PCM_IN
M2_PCM_OUT

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

1V8_P

R1506
10k

D1503
ZLLS400
WIFI_RST

D1504
ZLLS400
W_DISABLE1

RS9116 SUSCLK
is a GPIO (unused)
SUSCLK

W_DISABLE2
W_DISABLE1
M2_I2C_SDA
M2_I2C_SCL

M.2_Key_E

GND

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

R1507
10k

R1509
10k

M2_I2C_SDA
M2_I2C_SCL

I2C2_SDA
I2C2_SCL

Q1501
FDV301N

Q1502
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!!!

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

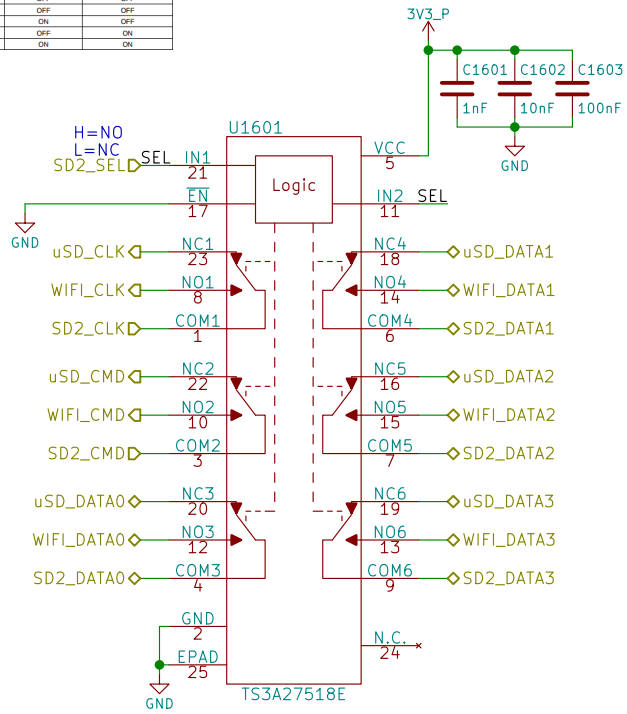
Sheet: /WLAN+BT M.2/
File: wifi_bt_m2.sch

Title: WLAN+BT M.2

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 15/17

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

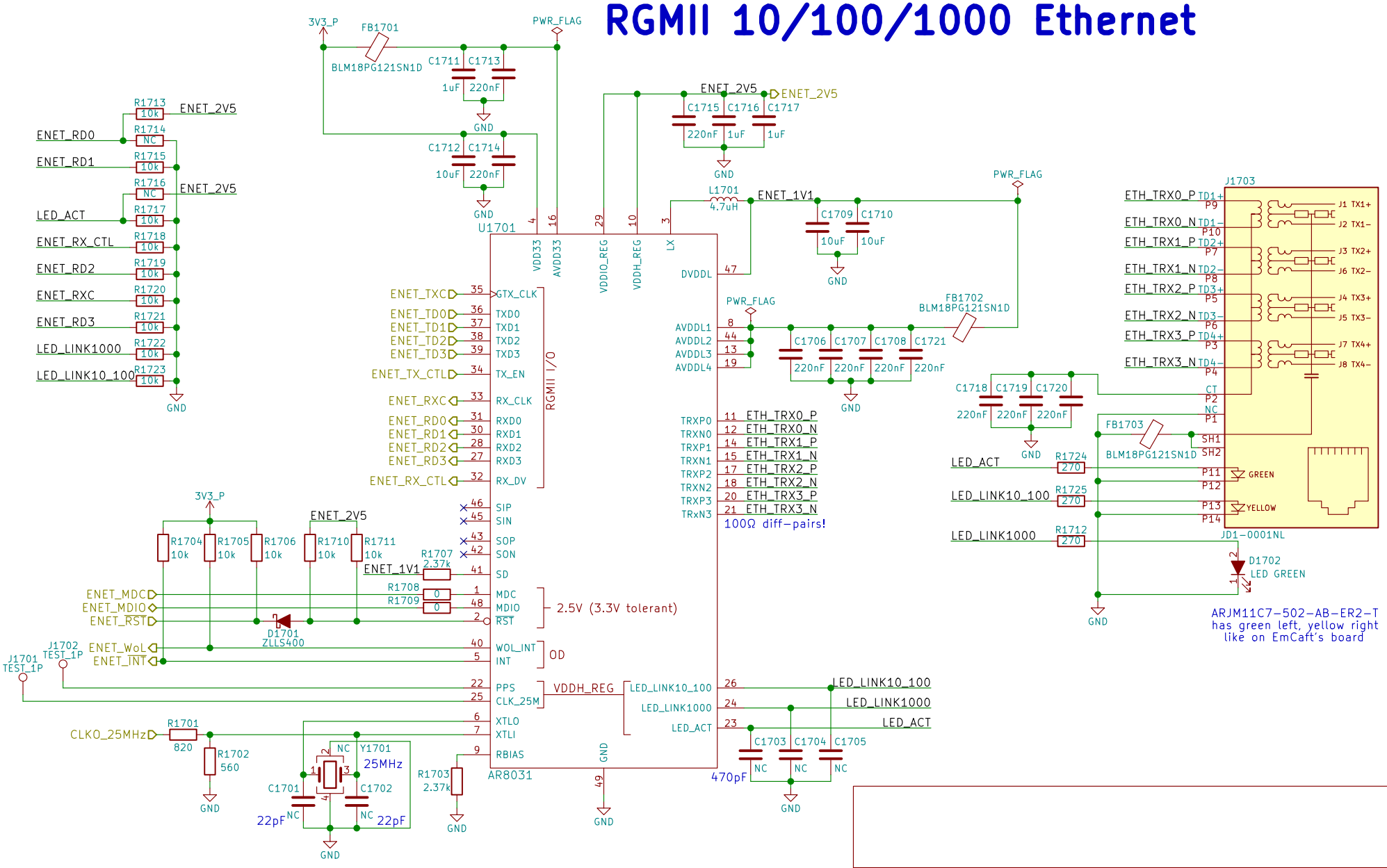


Sheet: /SDIO DEMUX/
File: sdio_demux.sch

Title: SDIO Demultiplexer

Size: A4	Date: 2018-05-02	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 16/17

RGMII 10/100/1000 Ethernet



Sheet: /Ethernet/		
File: ethernet.sch		
Title:		
Size: A4	Date:	**Rev:**
KiCad E.D.A. kicad 4.0.7		Id: 17/17