Battery
battery.sch

Power
PMIC_ON_REQ
CONN_SD2_RST
SWIRE
AVDD_EN
power.sch

Comes from POR/Supervisory IC
but not the SoC
(PMIC_STBY_REQ is unavailable)

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_MODE0
BOOT_MODE1 BOOT_MODE1
boot.sch

Reset & Watchdog
GPIO1_IO02(WDOG) GPIO1_IO02(WDOG)
POR_B POR_B
PMIC_ON_REQ PMIC_ON_REQ
watchdog.sch

RTC Battery
I2C2_SDA I2C2_SDA
I2C2_SCL I2C2_SCL
rtc.sch

UART Debug
UART1_TXD UART1_TXD
UART1_RXD UART1_RXD
uart.sch

JTAG
JTAG_TMS JTAG_TMS
JTAG_TCK JTAG_TCK
JTAG_TDO JTAG_TDO
JTAG_TDI JTAG_TDI
POR_B POR_B
JTAG_TRST JTAG_TRST
jtag.sch

uSD Card
CONN_SD2_DATA1 SD2_DATA1
CONN_SD2_DATA0 SD2_DATA0
CONN_SD2_CMD SD2_CMD
CONN_SD2_DATA3 SD2_DATA3
CONN_SD2_DATA2 SD2_DATA2
CONN_SD2_CLK SD2_CLK
CONN_SD2_CD_B SD2_CD_B
sd.sch

USB
FLT_PORT1 GPIO1_IO13(USB1_OTG_OC)
EN_PORT1
usb.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

Buttons & LED
SW_BACK SAI1_RXD4(GPIO4_IO06)
SW_VOLDN SAI1_TXD3(GPIO4_IO15)
SW_VOLUP SAI1_TXD6(GPIO4_IO18)
SW_HOME SAI1_TXD1(GPIO4_IO13)
ONOFF ONOFF
GP_LED1 SAI1_RXD1(GPIO4_IO03)
buttons_led.sch

WWAN M.2
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+ WWAN_USB_D+
USB_D- WWAN_USB_D-
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

Audio
SAI2_RXD SAI2_RXD
SAI2_TXD SAI2_TXD
SAI2_TXFS SAI2_TXFS
SAI2_TXC SAI2_TXC
SAI2_MCLK SAI2_MCLK
audio.sch

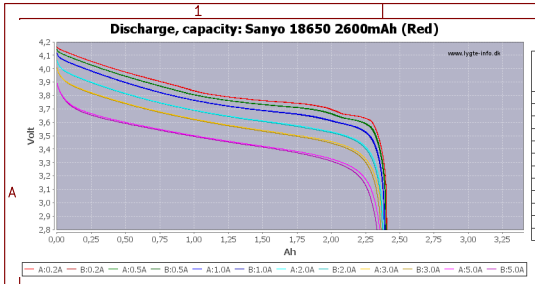
J101A
SAI2_TXFS
SD2_RST
SD2_DATA3
SD2_DATA2
SD2_DATA1
SD2_DATA0
SD2_CMD
SD2_CD_B
SD2_CLK
CAPTOUCH_INT
IMX8M-SOM
GND GND

J101C
BOOT_MODE0
BOOT_MODE1
JTAG_TDI
JTAG_TMS
JTAG_TRST
JTAG_TDO
JTAG_TCK
DSI_BL_PWM
GPIO1_IO02(WDOG)
SAI5_RXC(GPIO3_IO20)
SAI1_RXD0(GPIO4_IO02)
SAI1_RXD4(GPIO4_IO06)
SAI1_RXD3(GPIO4_IO05)
SAI1_RXD2(GPIO4_IO04)
SAI2_RXD
SAI1_RXD6(GPIO4_IO08)
SAI1_TXC
SAI1_RXD1(GPIO4_IO03)
SAI2_TXC
SAI2_MCLK
IMX8M-SOM
GND GND

J101B
GPIO3_IO09
GPIO3_IO08
PWR_FLAG
3V3_OUT
NVCC_SD2_1V8_3V3
PWR_FLAG
DSI_DP2
DSI_DN2
DSI_DP0
DSI_DN0
DSI_CKN
DSI_CKP
DSI_DP1
DSI_DN1
DSI_DP3
DSI_DN3
3.8V okay?
VBAT_SOM
C101 22uF
C102 22uF
C103 0.1uF
C104 0.1uF
C105 22uF
C106 22uF
IMX8M-SOM
GND GND

J101D
SAI2_TXD
SAI1_RXD5(GPIO4_IO07)
SAI1_TXD0(GPIO4_IO12)
ONOFF
I2C2_SDA
SAI1_TXD1(GPIO4_IO13)
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
UART1_TXD
SAI1_RXD7(GPIO4_IO09)
I2C2_SCL
3V3_P
R101 10k
3V3_P
R102 10k
IMX8M-SOM
GND GND

Sheet: /
File: dvk-mx8m-bsb.sch
Title: DVK-MX8M-BSB
Size: A2 | Date: 2018-04-18 | Rev: v0.1.0
KiCad E.D.A. kicad 4.0.7 | Id: 1/14



Estimated remaining capacity

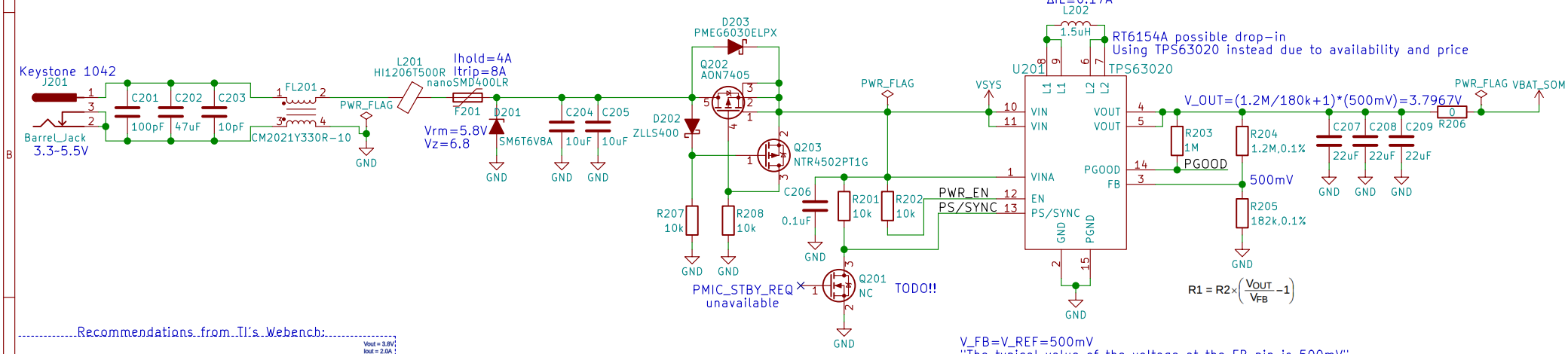
Voltage	AW 18650 2600mAh (Black)	Sanyo 18650 2600mAh (Red)	Panasonic CGR18650CH 2250mAh	Panasonic NCR18650A 3100mAh	Panasonic NCR18650B 3400mAh
4.2	100%	100%	100%	100%	100%
4.1	92%	92%	94%	94%	94%
4.0	78%	79%	85%	83%	84%
3.9	61%	63%	76%	73%	74%
3.8	43%	44%	66%	60%	62%
3.7	14%	15%	54%	52%	53%
3.6	3%	5%	26%	38%	39%
3.5	1%	2%	12%	20%	22%
3.4	0%	1%	5%	11%	13%
3.3	0%	0%	2%	1%	3%
3.2	0%	0%	0%	0%	0%

Measured 1 hour after discharge at 1A

⇒18650 batteries don't reach 3.3V until depleted

$$I_{PEAK} = \frac{Iout}{\eta \times (1 - D)} + \frac{Vin \times D}{2 \times f \times L} = \frac{2\,A}{0.9\times\left(1-\left(\frac{3.7967\,V-3.0\,V}{3.7967\,V}\right)\right)} + \frac{3.0\,V\times\left(\frac{3.7967\,V-3.0\,V}{3.7967\,V}\right)}{2\times 2.4\,MHz\times 1.5\,uH} = 2.899803756\,A$$

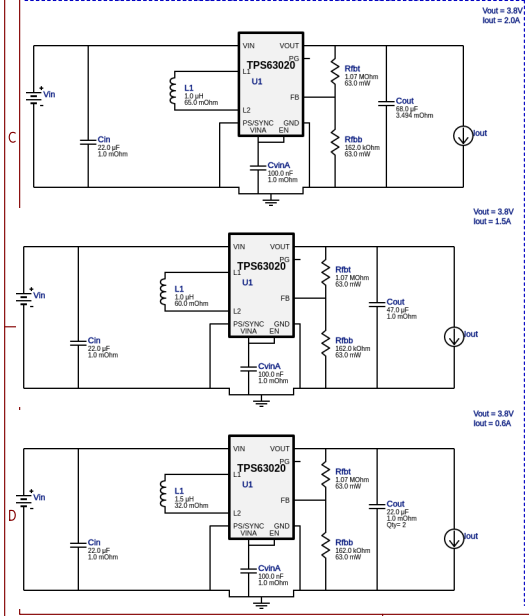
Calculated Ipeak≅2.9A
IL(sat)=4.4A @ 20% drop
ΔIL≅0.17A



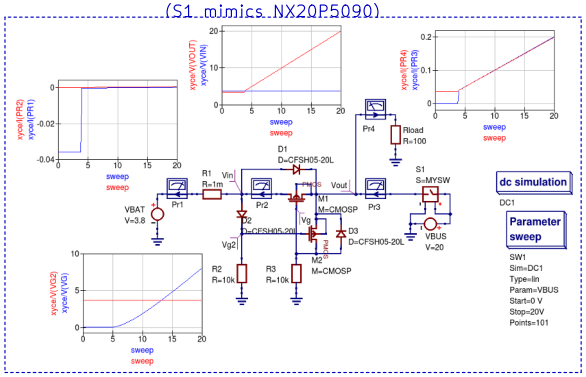
$$R1 = R2\times\left(\frac{V_{OUT}}{V_{FB}} - 1\right)$$

V_FB=V_REF=500mV
"The typical value of the voltage at the FB pin is 500mV"
"It is recommended to keep the value for [R2] in the range of 200kΩ; lower than 500kΩ"
Their example application circuit uses 180k for R2, therefore:
R2≅200k±20k (±10%) or 180k-220k
Given this, V_OUT≅3.8V, 1.1188M≤R1≤1.452M
The most common value in this range is 1.2M
Making R2≅181.818k or roughly 182k

Recommendations from TI's Webench:



Reverse Current Simulation in XYCE
(S1 mimics NX20P5090)



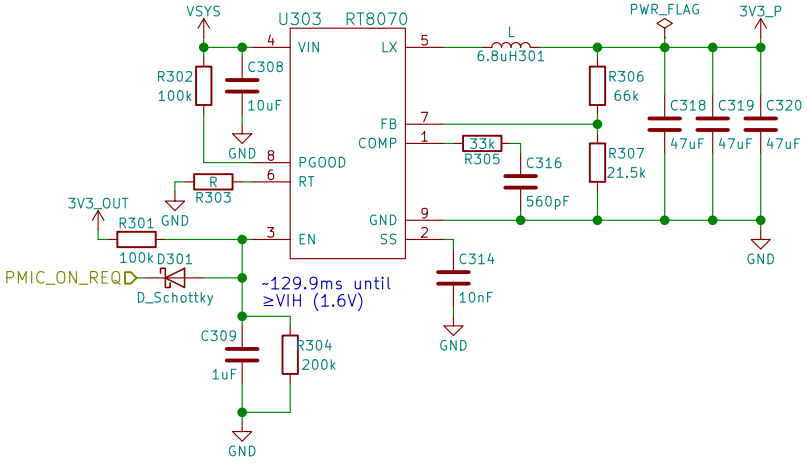
Sheet: /Battery/
File: battery.sch

Title: Battery

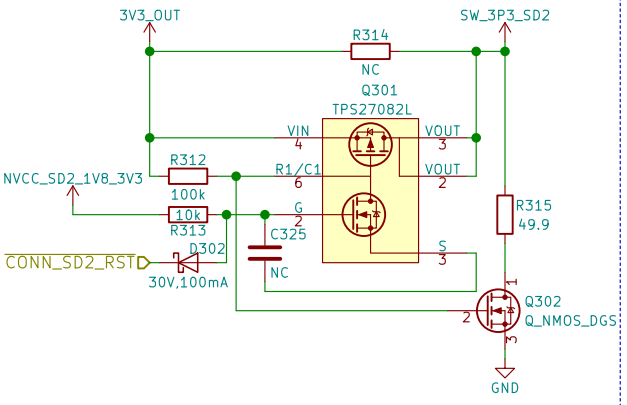
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 2/14

3.3V/3A

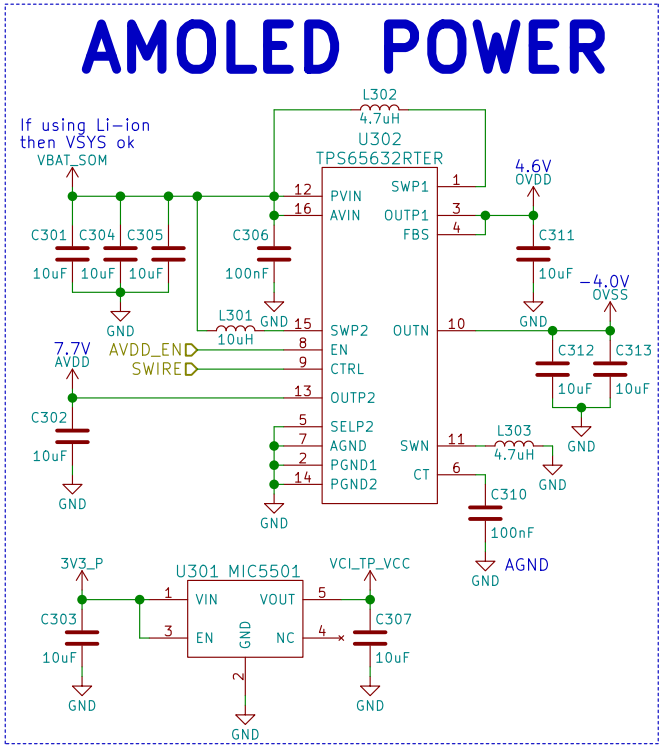
When VBAT can fall below 3.3V use TPS63020 instead!



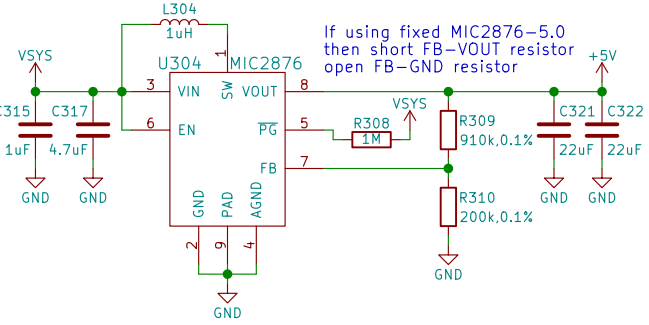
SD POWER



AMOLED POWER

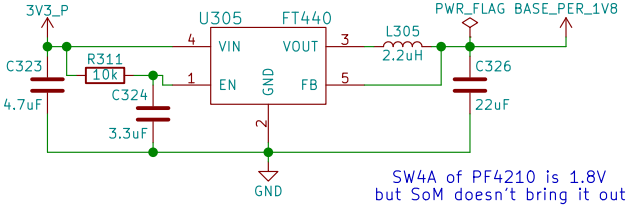


5.0V/3.8A



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

1.8V/600mA



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

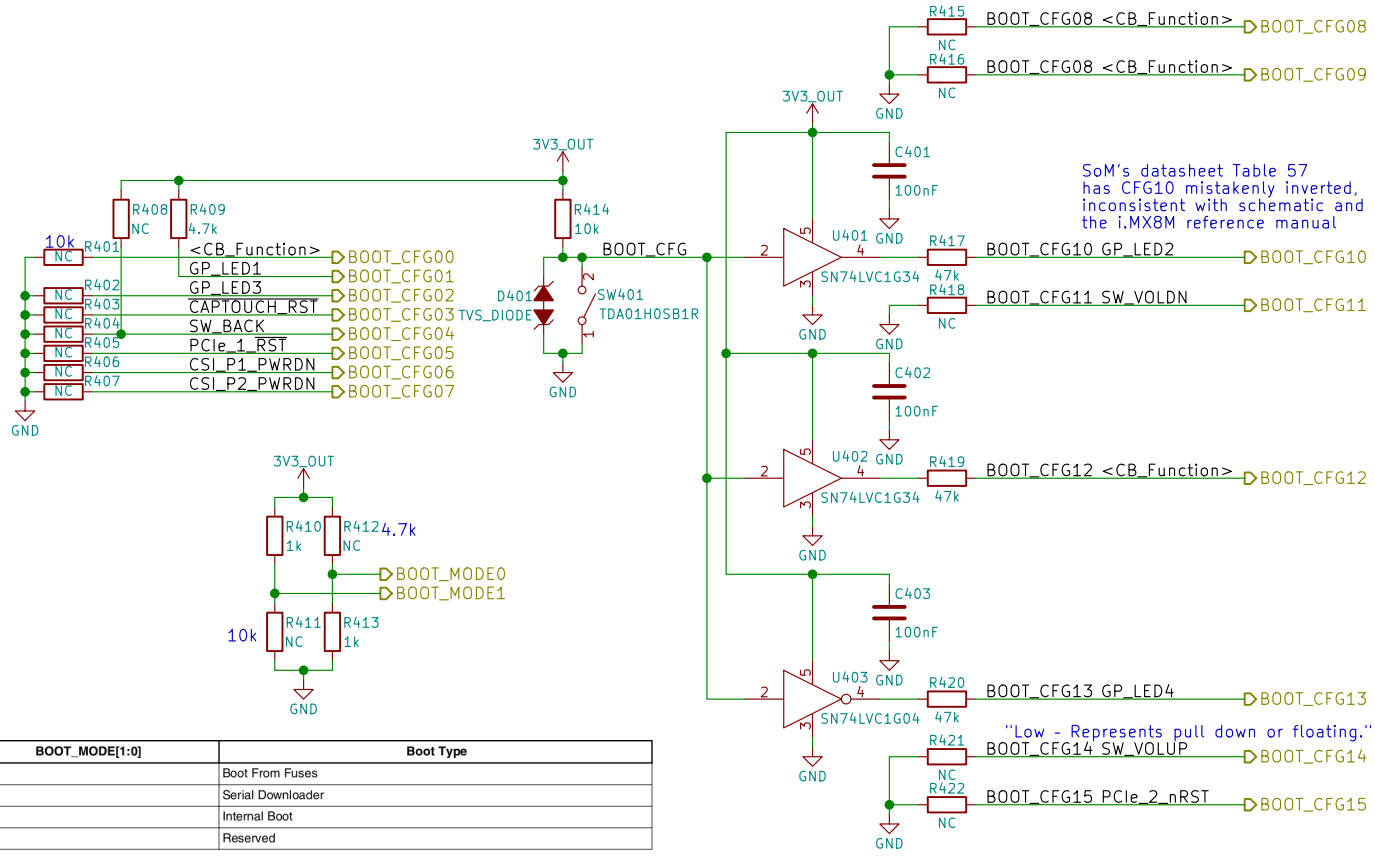
$V_{IH(typ)}=1.0V\cong30.3\%\times3.3V$
$t(0-30.3\%)\approx0.361RC$
$\Rightarrow0.361RC\approx10ms$
$\therefore R=10k$
$C=2.77uF\cong3.3uF$

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: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 3/14

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

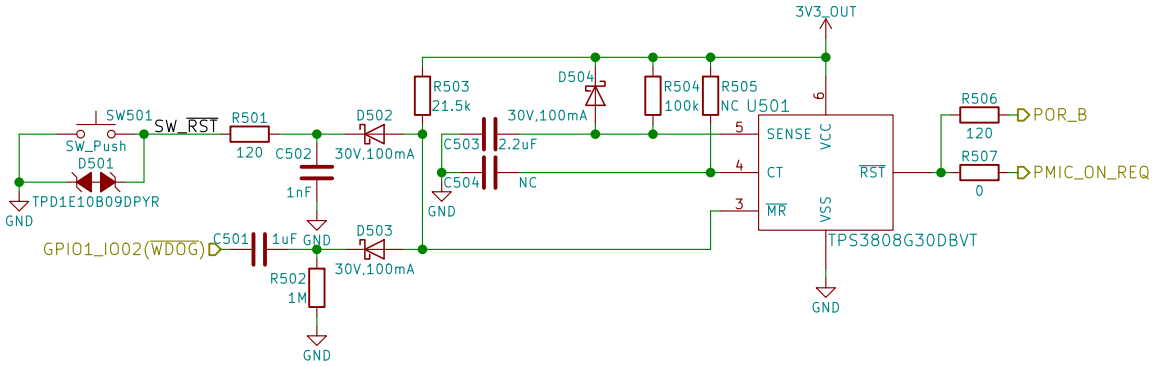


BOOT_MODE[1:0]	Boot Type
00	Boot From Fuses
01	Serial Downloader
10	Internal Boot
11	Reserved

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

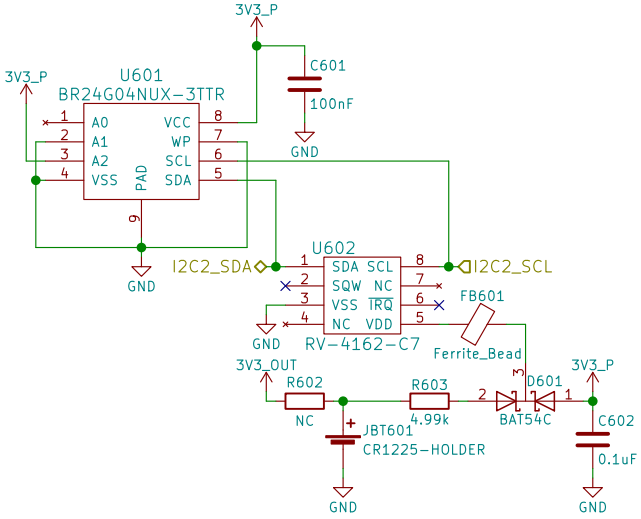
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 4/14



Sheet: /Reset & Watchdog/
File: watchdog.sch

Title: Reset & Watchdog

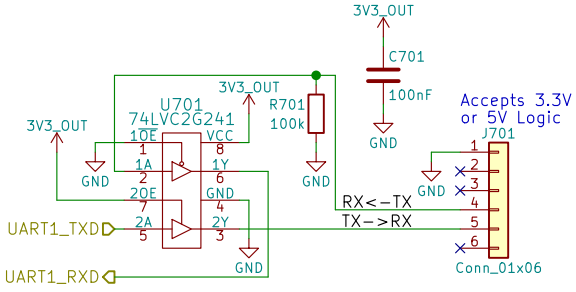
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 5/14



Sheet: /RTC Battery/
File: rtc.sch

Title: RTC Battery

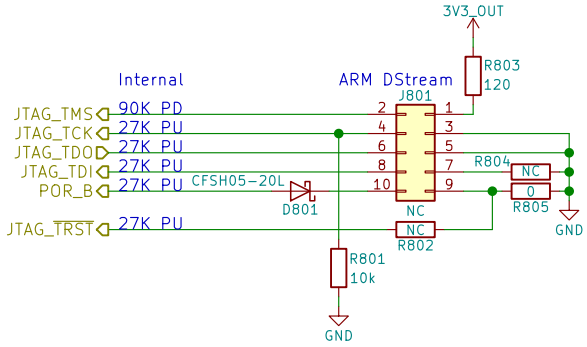
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 6/14



Sheet: /UART Debug/
File: uart.sch

Title: UART Debug

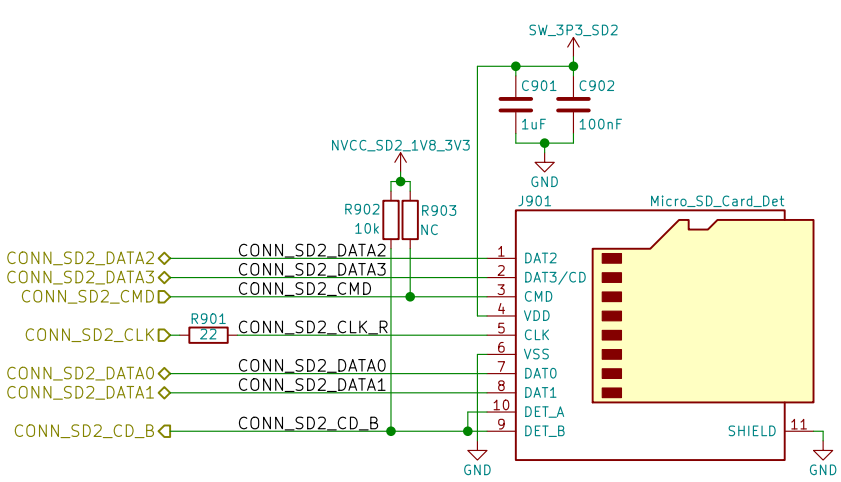
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 7/14

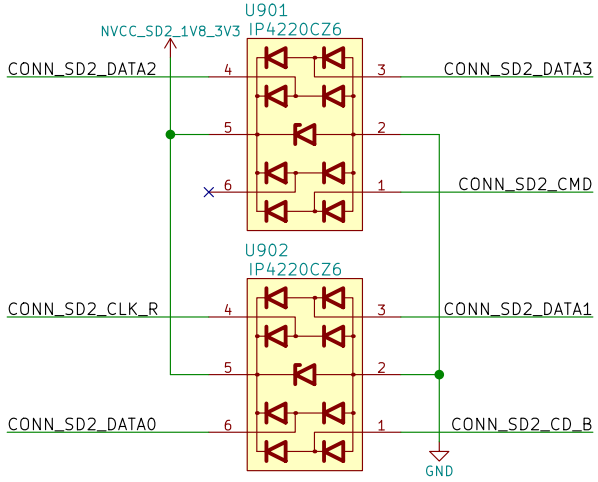


Sheet: /JTAG/
File: jtag.sch

Title: JTAG

Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 8/14

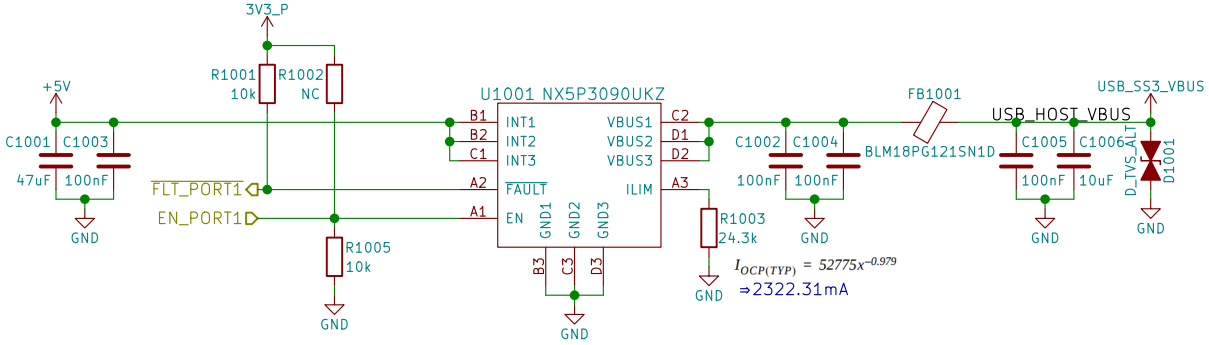




Sheet: /uSD Card/
File: sd.sch

Title: uSD Card

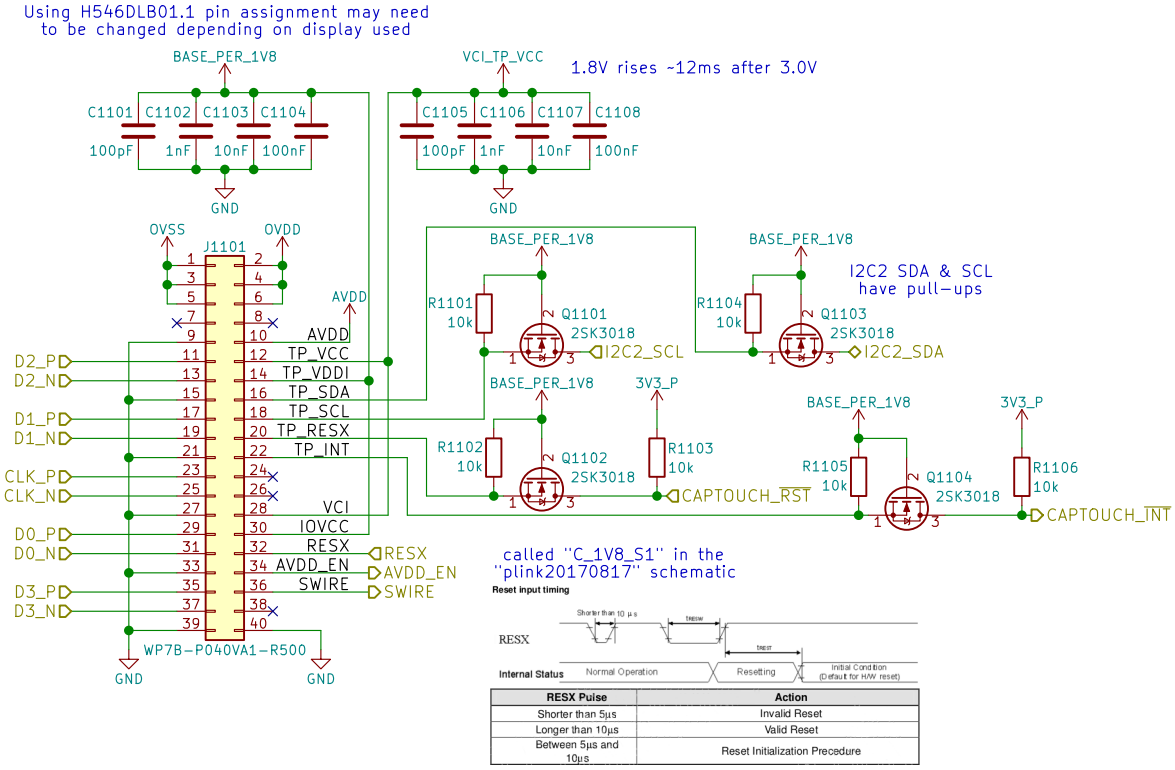
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 9/14



Sheet: /USB/
File: usb.sch

Title: USB

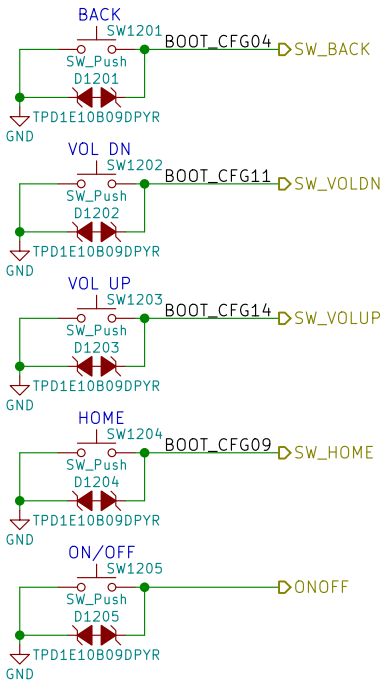
Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 10/14

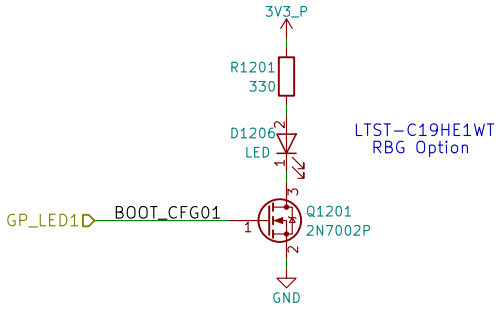


Sheet: /MIPI DSI/
File: mipi_dsi.sch

Title: MIPI DSI

Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 11/14

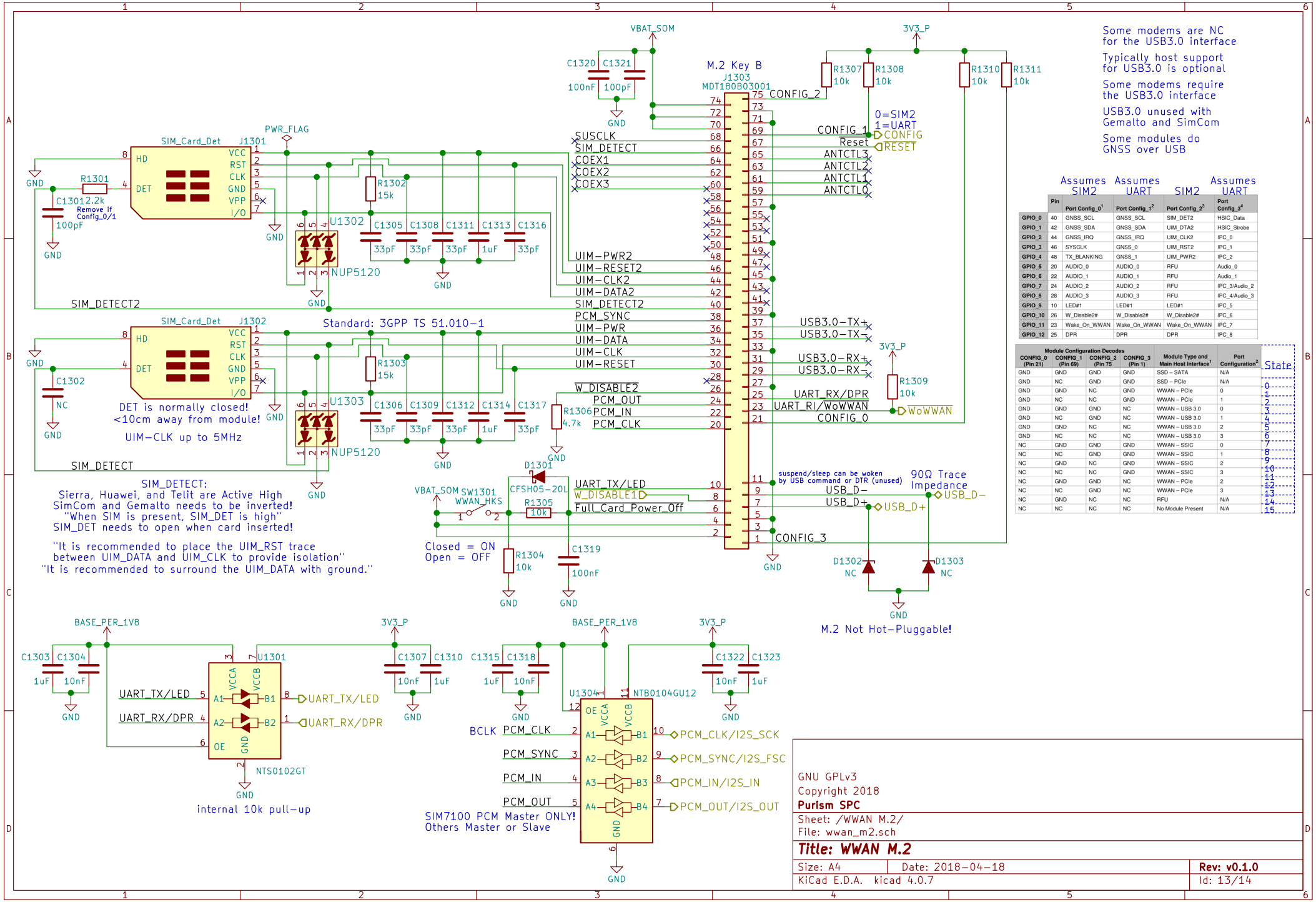




Sheet: /Buttons & LED/
File: buttons_led.sch

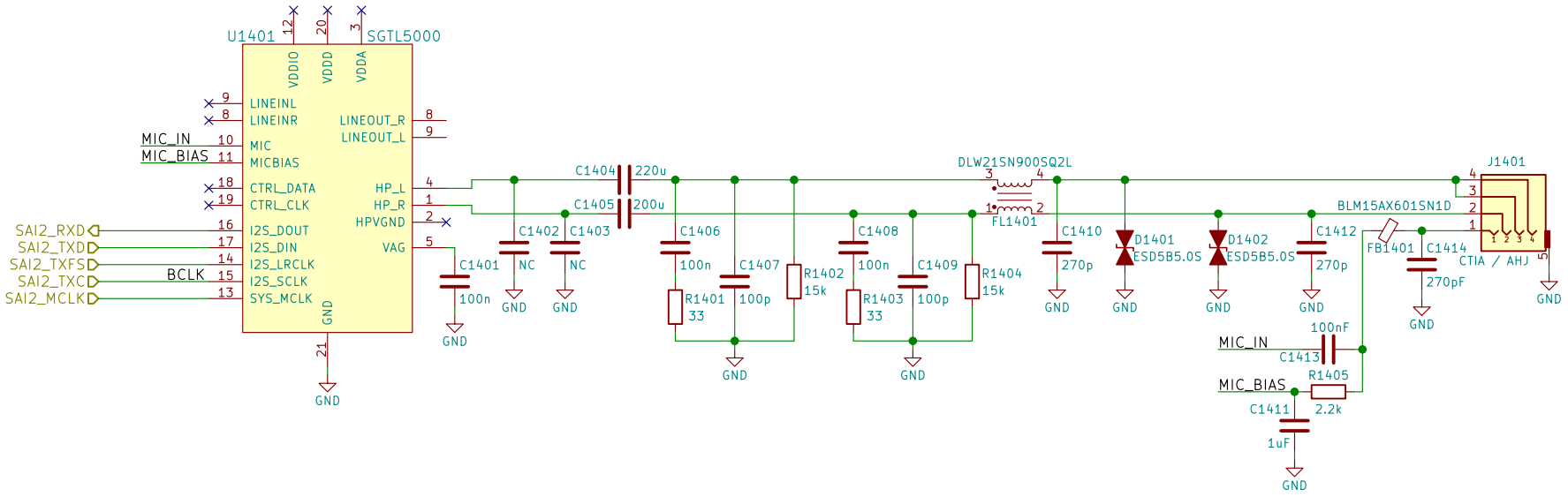
Title: Buttons & LED

Size: A4	Date: 2018-04-18	**Rev: v0.1.0**
KiCad E.D.A. kicad 4.0.7		Id: 12/14



	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



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