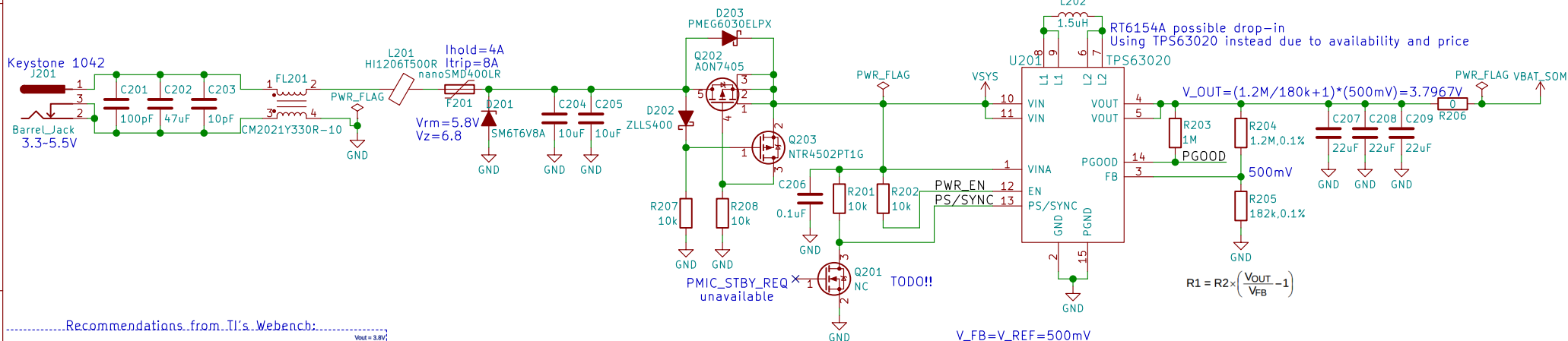


Estimated remaining capacity					
Voltage	AW 18650 2600mAh (black)	Sanyo 18650 2600mAh (Red)	Panasonic CGR18650CH 2250mAh	Panasonic NCR18650A 3100mAh	Panasonic NCR18650B 3400mAh
4.2	100%	100%	100%	100%	100%
4.1	92%	92%	94%	94%	94%
4.0	78%	79%	85%	83%	84%
3.9	61%	61%	76%	73%	74%
3.8	43%	44%	66%	60%	62%
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%	3%	3%
3.2	0%	0%	0%	0%	0%

Measured 1 hour after discharge at 1A

⇒ 18650 batteries don't reach 3.3V until depleted



$$I_{PEAK} = \frac{I_{out}}{\eta \times (1 - D)} + \frac{V_{in} \times D}{2 \times f \times L} = \frac{2A}{0.9 \times \left(1 - \left(\frac{3.7967V - 3.0V}{3.7967V}\right)\right)} + \frac{3.0V \times \left(\frac{3.7967V - 3.0V}{3.7967V}\right)}{2 \times 2.4MHz \times 1.5\mu H} = 2.899803756A$$

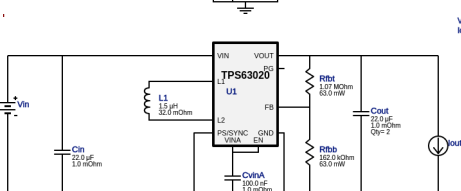
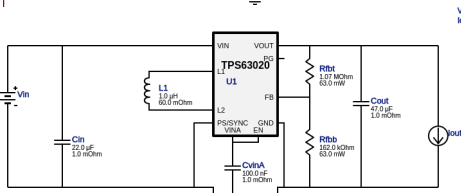
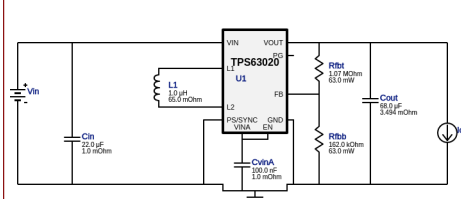
Calculated $I_{peak} \approx 2.9A$
 $I_L(sat) = 4.4A @ 20\% \text{ drop}$
 $\Delta I_L \approx 0.17A$

RT6154A possible drop-in
 Using TPS63020 instead due to availability and price

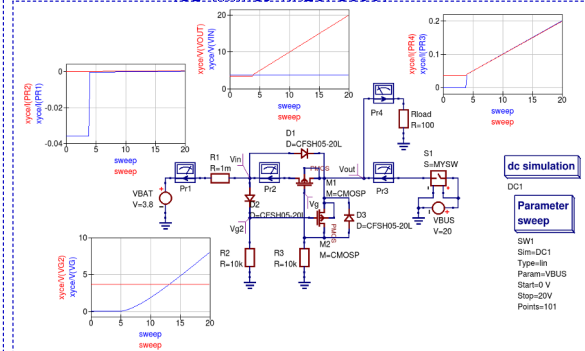
$$V_{OUT} = (1.2M / 180k + 1) \times (500mV) = 3.7967V$$

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

Recommendations from TI's Webench:



Reverse Current Simulation in XYCE
 (S1 mimics NX2QP5090)



$V_{FB} = V_{REF} = 500mV$
 "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:
 $R2 \approx 200k \pm 20k (\pm 10\%)$ or 180k-220k
 Given this, $V_{OUT} \approx 3.8V$, $1.1188M \leq R1 \leq 1.452M$
 The most common value in this range is 1.2M
 Making $R2 \approx 181.818k$ or roughly 182k

GNU GPLv3
 Copyright 2018
Purism SPC

Sheet: /Battery/
 File: battery.sch

Title: Battery

Size: A4
 Date: 2018-04-18
 KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0
 Id: 2/14

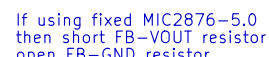
When VBAT can fall below 3.3V use TPS63020 instead!



AMOLED POWER

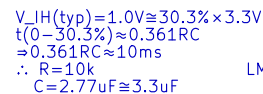


5.0V/3.8A



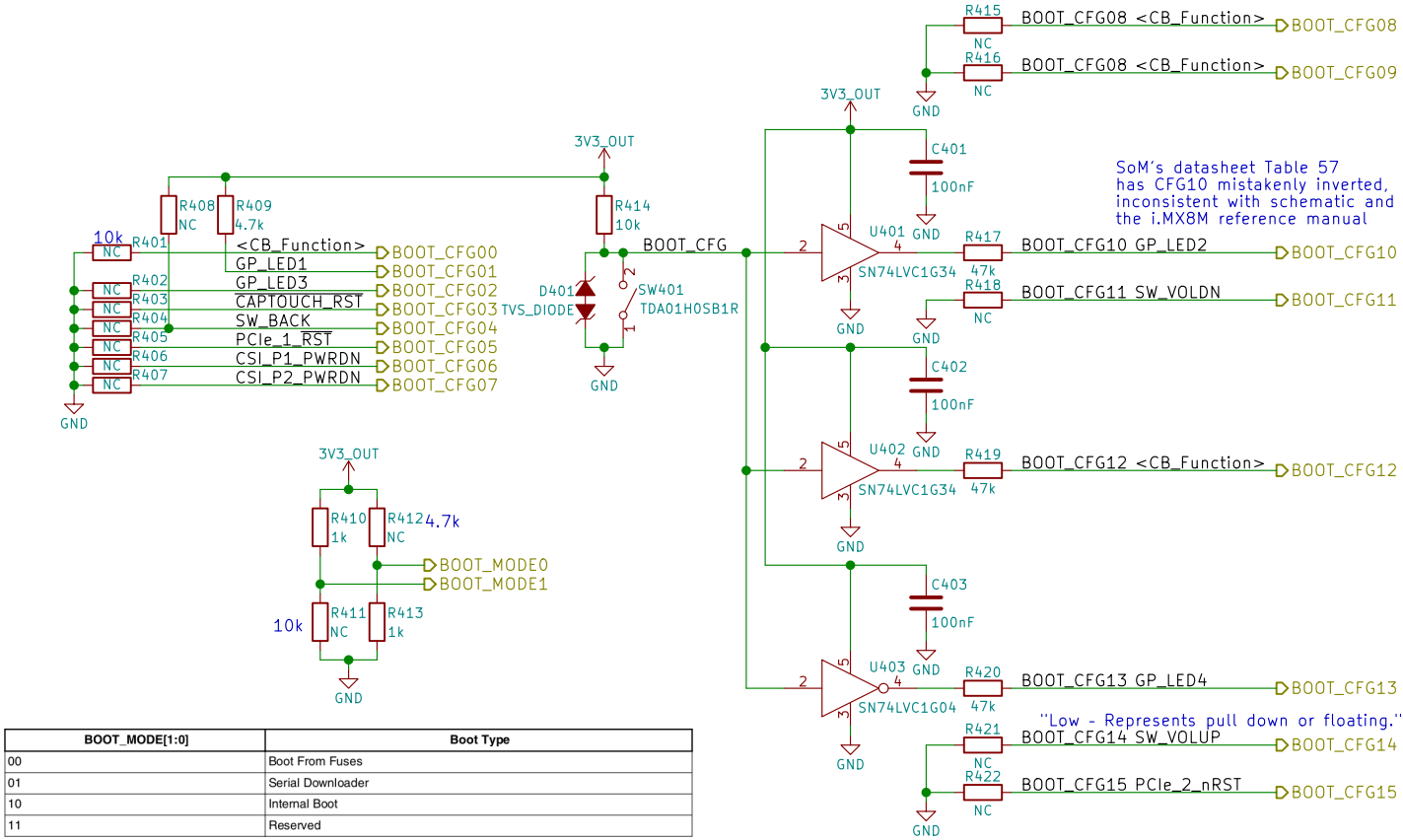
Cheaper, more efficient, smaller, and simpler than RT6150A
Explicitly mentions USB/smartphone application

1.8V/600mA



Buck instead of TLV70218 LDO
saving up to ~100mW loss
3670MF-1.8 is much more expensive
ST1S12G18R is a drop-in

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

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Purism SPC

Sheet: /Boot Config/
File: boot.sch

Title: Boot Configuration

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 4/14

Id: 5/14

Id: 6/14



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Purism SPC

Sheet: /UART Debug/
File: uart.sch

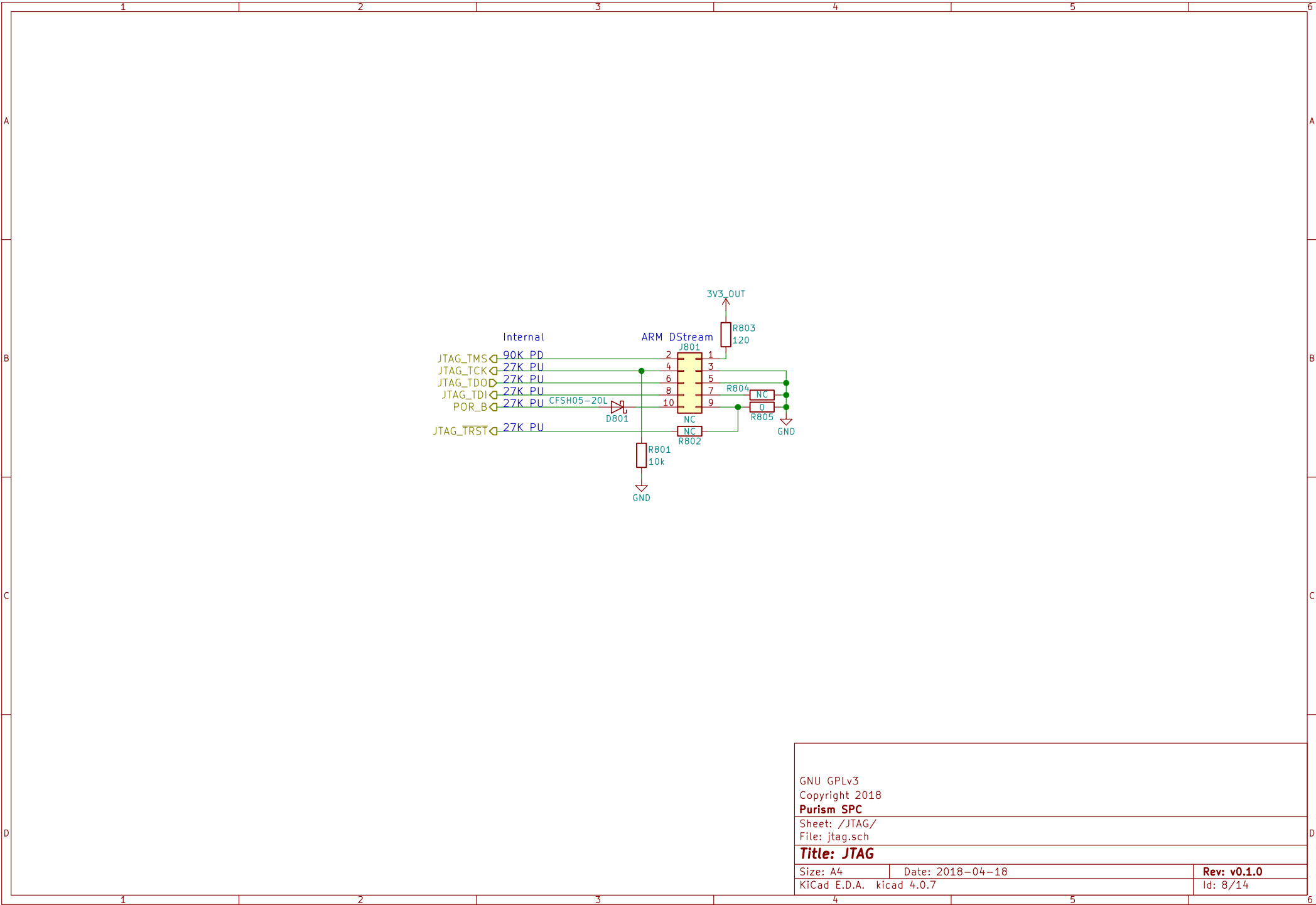
Title: UART Debug

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 7/14



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Purism SPC

Sheet: /JTAG/
File: jtag.sch

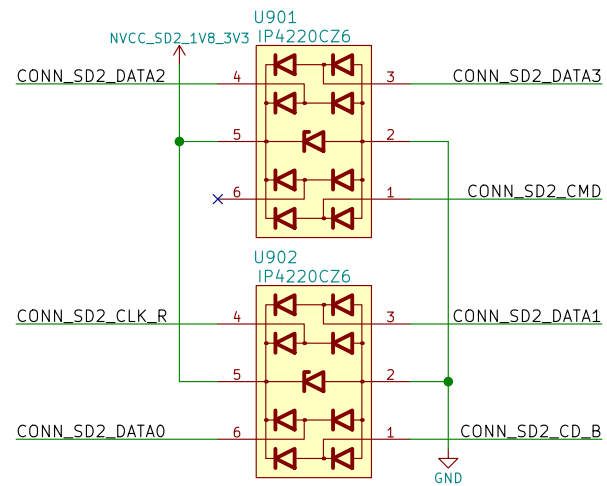
Title: JTAG

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

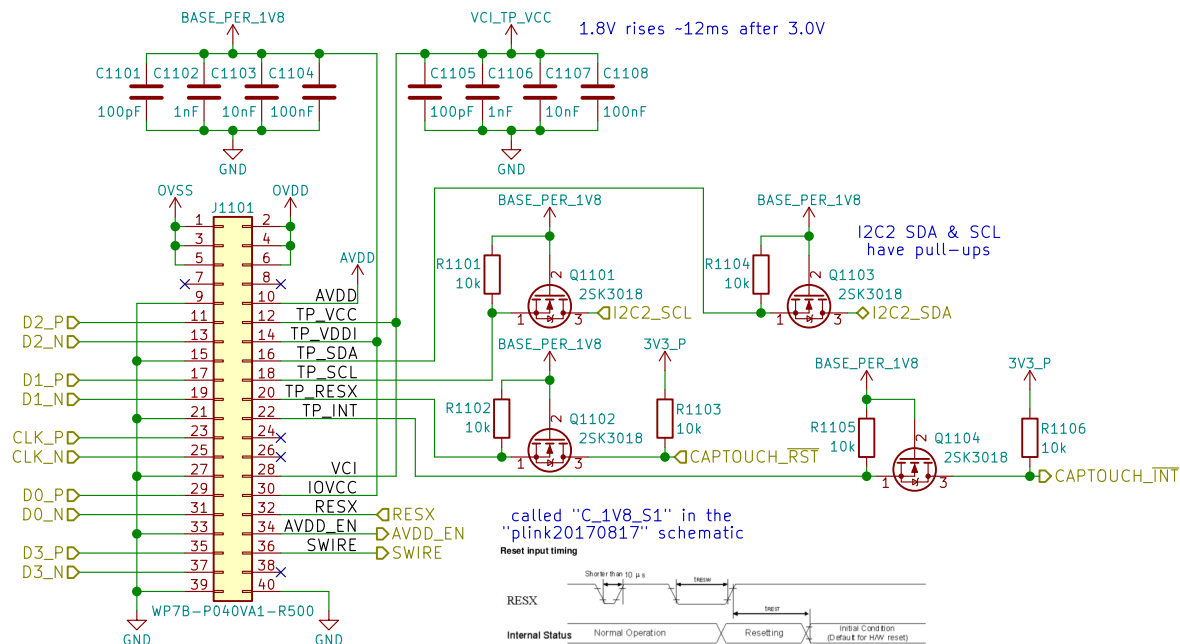
Id: 8/14



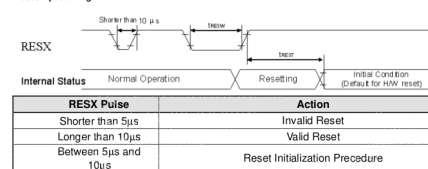
Id: 9/14

Id: 10/14

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



Reset input timing



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Purism SPC

Sheet: /MIPI DSI/
File: mipi_dsi.sch

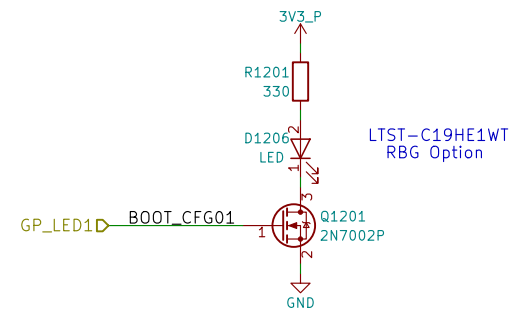
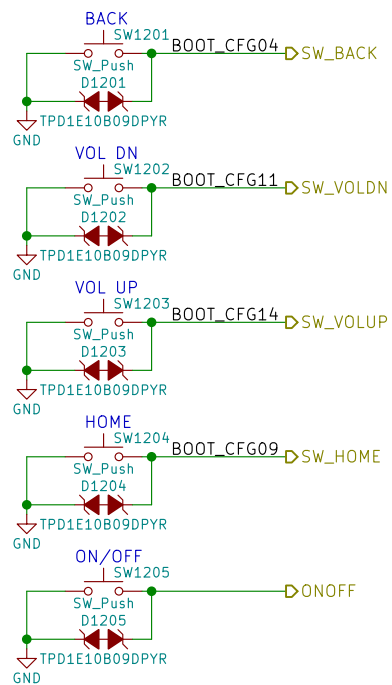
Title: MIPI DSI

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 11/14



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Purism SPC

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

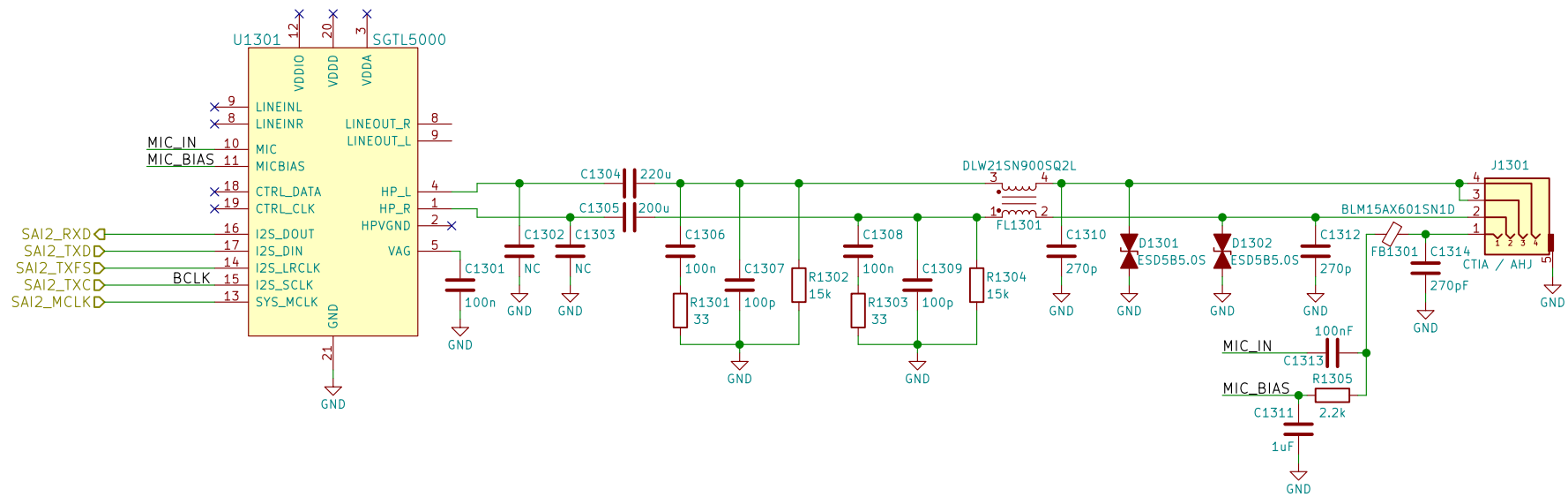
Title: Buttons & LED

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 12/14



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Purism SPC

Sheet: /Audio/
File: audio.sch

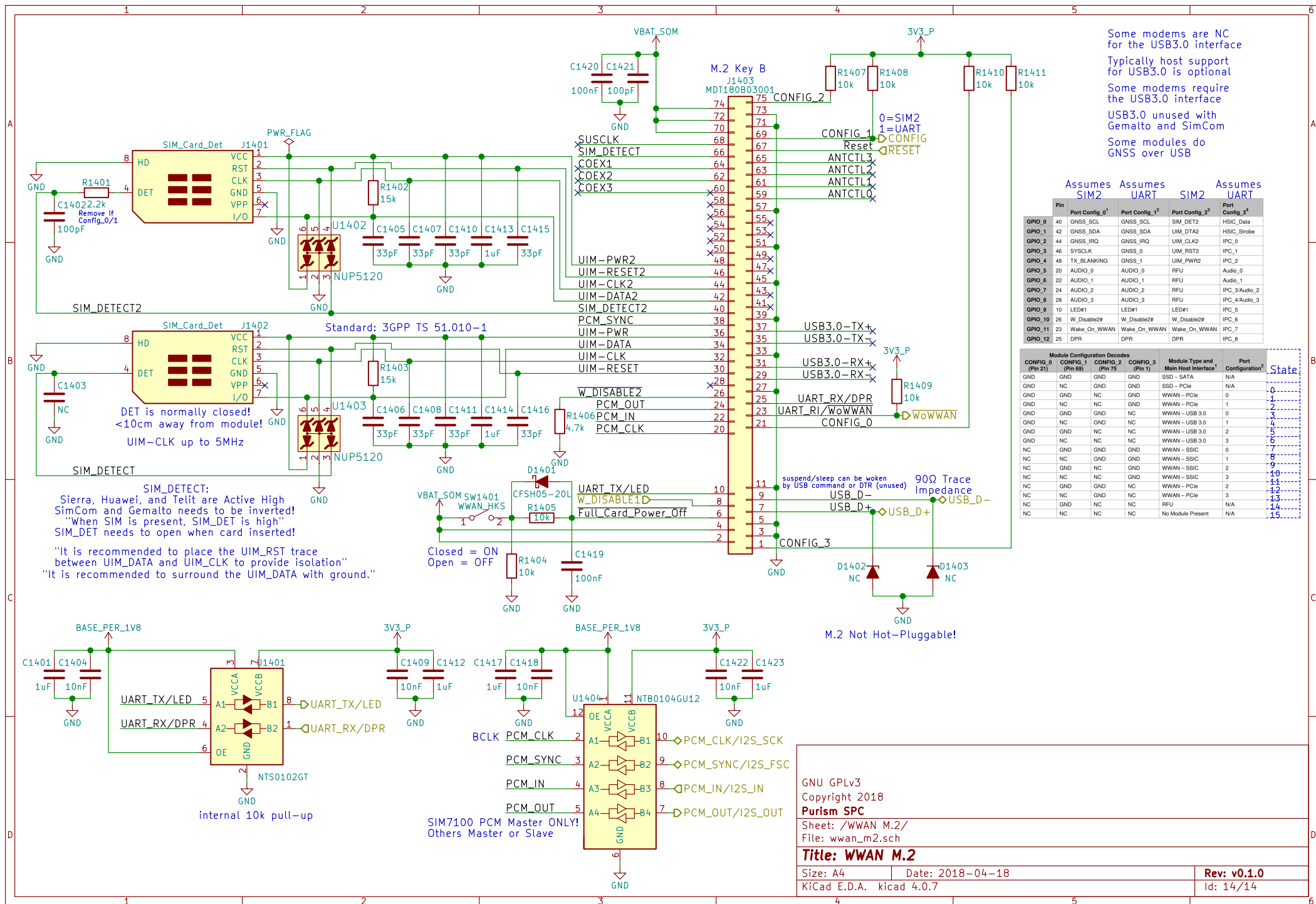
Title: Audio

Size: A4 Date: 2018-04-18

KiCad E.D.A. kicad 4.0.7

Rev: v0.1.0

Id: 13/14



Some modems are NC for the USB3.0 interface
Typically host support for USB3.0 is optional
Some modems require the USB3.0 interface
USB3.0 unused with Gemalto and SimCom
Some modules do GNSS over USB

		Assumes SIM2	Assumes UART	Assumes SIM2	Assumes UART
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				Module Type and Main Host Interface ¹	Port Configuration ²	State
CONFIG_0 (Pin 21)	CONFIG_1 (Pin 69)	CONFIG_2 (Pin 75)	CONFIG_3 (Pin 1)					
GND	GND	GND	GND	SSD - SATA	N/A			0
GND	NC	GND	GND	SSD - PCIe	N/A			1
GND	GND	NC	GND	WWAN - PCIe	0			2
GND	NC	NC	GND	WWAN - PCIe	1			3
GND	GND	GND	NC	WWAN - USB 3.0	0			4
GND	NC	GND	NC	WWAN - USB 3.0	1			5
GND	GND	NC	NC	WWAN - USB 3.0	2			6
GND	NC	NC	NC	WWAN - USB 3.0	3			7
NC	GND	GND	GND	WWAN - SSIC	0			8
NC	NC	GND	GND	WWAN - SSIC	1			9
NC	GND	NC	GND	WWAN - SSIC	2			10
NC	NC	NC	GND	WWAN - SSIC	3			11
NC	GND	NC	NC	WWAN - PCIe	2			12
NC	NC	GND	NC	WWAN - PCIe	3			13
NC	GND	NC	NC	RFU	N/A			14
NC	NC	NC	NC	No Module Present	N/A			15