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Charger/OTG

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Battery

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Modem Power

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3G/4G Modem

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SIM cards and switch

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Modem Antennas

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WLAN, Bluetooth, FM

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Misc

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RFID/NFC

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Infrared

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B2B LOWER-UPPER

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Hackerbus

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uSD Breakout Board

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Keypad and buttons

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Cameras

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LEDs

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Sheet: Adaptation (v2 only)



Adaptation (v2 only)

File: v2.sch

Sheet: BB-xM Adapter (CPU)



BB-xM Adapter (CPU)

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Sheet: BB-xM Adapter (DISP)



BB-xM Adapter (DISP)

File: bbdisp.sch

Sheet: BB-xM Adapter (CAM)



BB-xM Adapter (CAM)

File: bbcam.sch

Circuits that exist in the v2 prototype only  
and that will not be part of the final design.

Unless indicated otherwise, resistors have a tolerance of 1%, or better. If the nominal value specified in the schematics is only available with lower tolerance, use that.

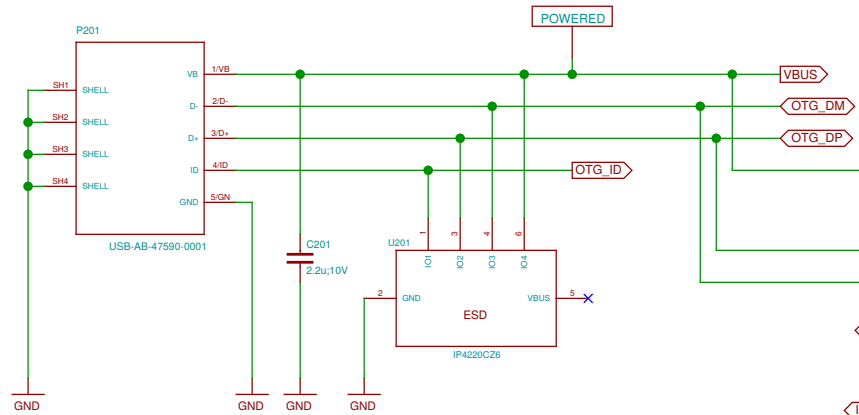
Unless indicated otherwise, all capacitors should be X5R or X6S, or better (X7R, NP0, etc.)  
If no voltage is specified, use  $\geq 6.3$  V.

Note regarding I2C addresses:  
Addresses in the schematics are provided for convenience.  
The authoritative source is  
<https://neo900.org/git/misc/tree/i2c>

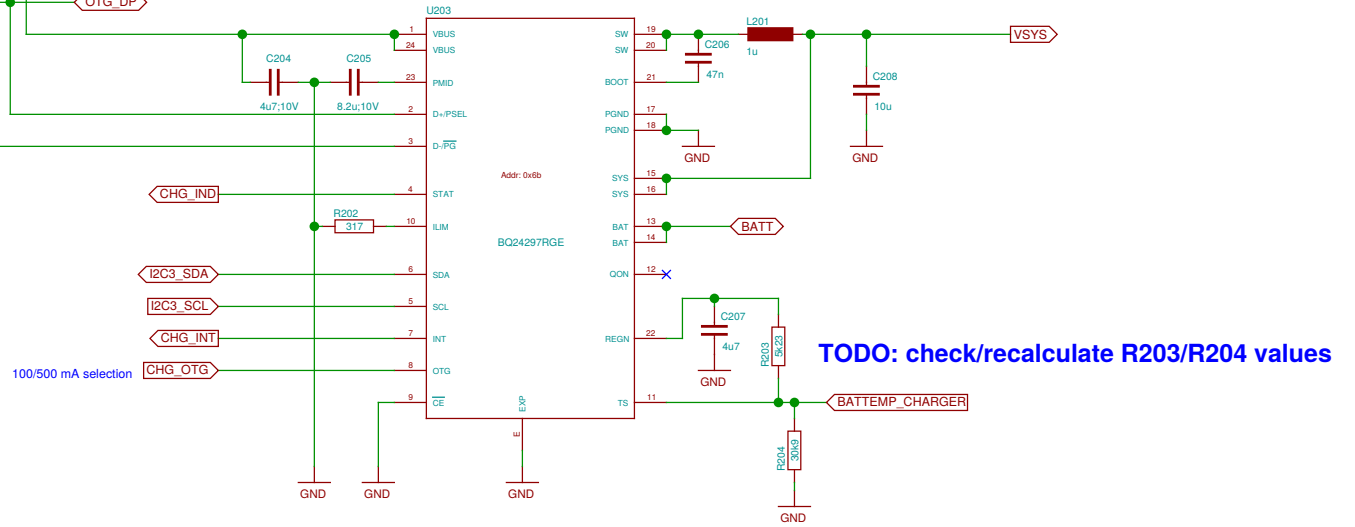
Signals that exist on both LOWER and UPPER (and maybe also BOB) have a \_U suffix on UPPER. No suffix is needed to distinguish between LOWER and BOB because all BOB components are on the same sheet and wires connecting them use sheet-local labels.

Sheet: /	
File: neo900.sch	
Title: Neo900	
Size: A3	Date: 2016-12-21 02:12:34
Plotted by: eeshow 221aa28 20161208-00:03Z	Rev: Id: 1/25

### USB OTG connector

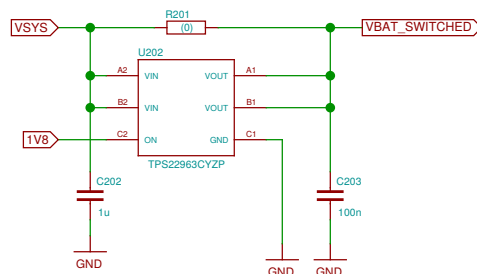


### Battery charger with USB OTG

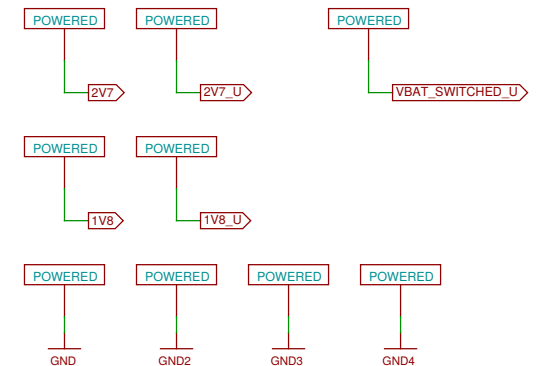


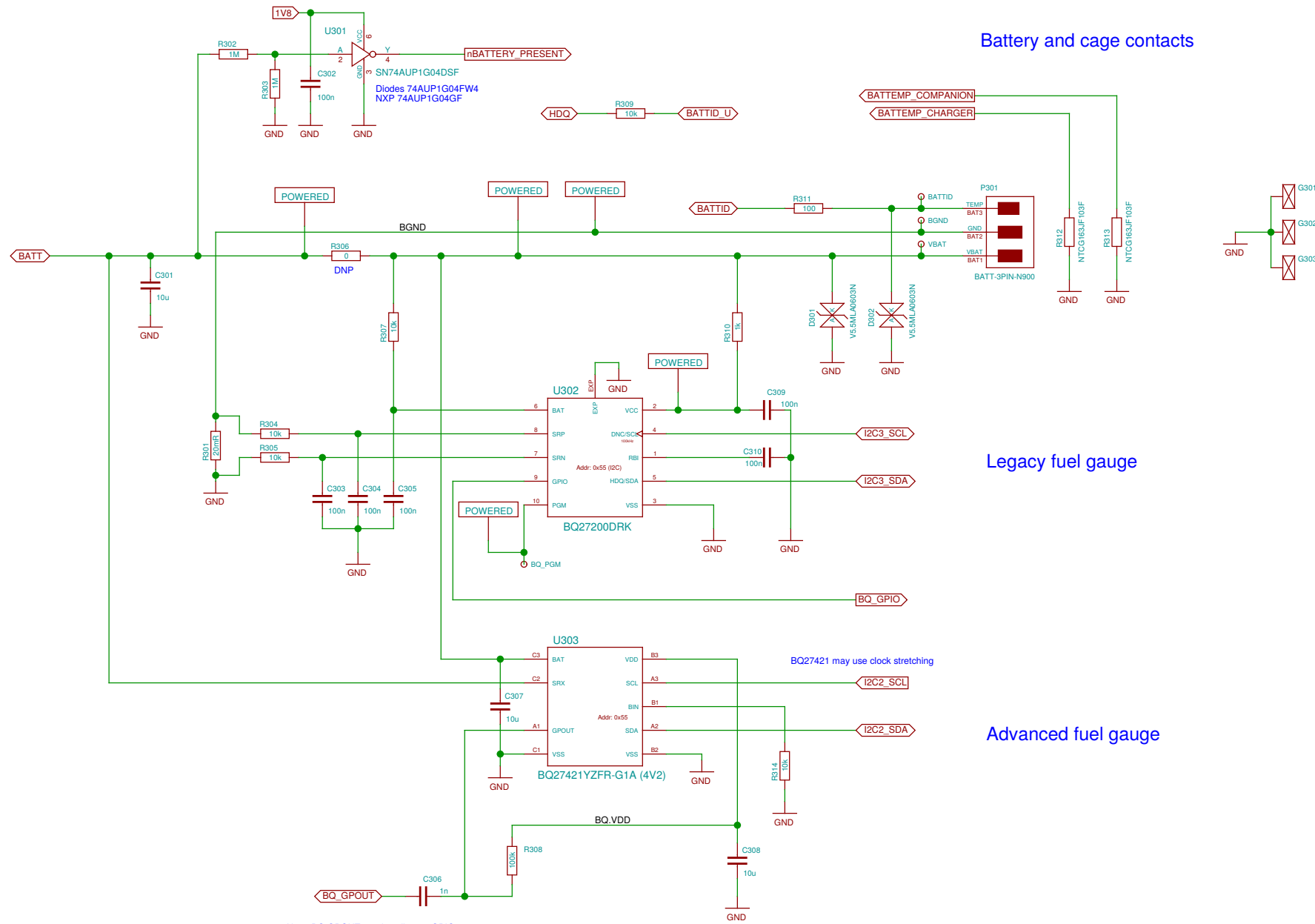
### Power distribution and sequencing

Most high-current consumers are on VBAT\_SWITCHED. 1V8 signals that the regulators on UPPER are operational.



### KiCad bureaucracy





Battery and cage contacts

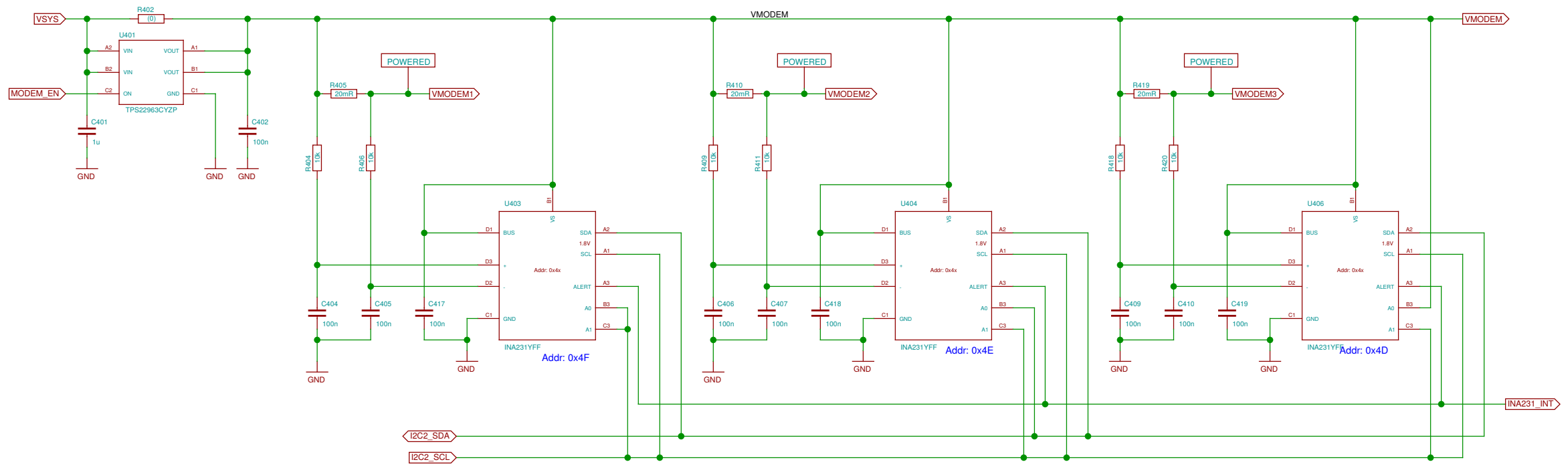
Legacy fuel gauge

Advanced fuel gauge

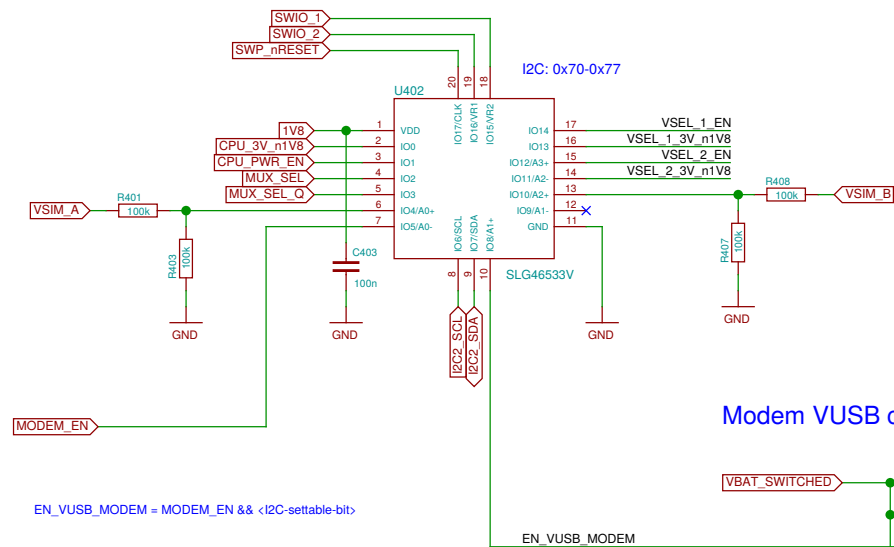
Note: BQ.GPOUT needs pull-up at GPIO.

Sheet: /Battery/ File: battery.sch	
Title: Battery	
Size: A3	Date: 2016-12-21 02:12:34
Plotted by: eeshow 221aa28 20161208-00:03Z	Rev: 3/25

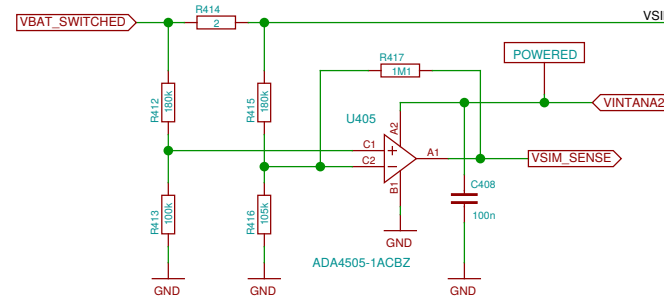
### Modem current monitor



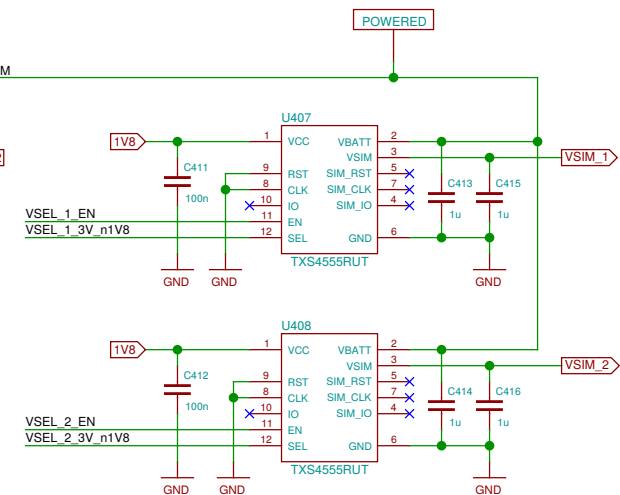
### SIM power selection



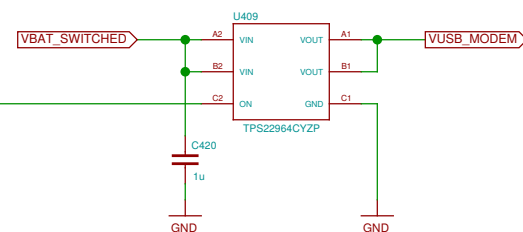
### SIM current sensing



### SIM power supply



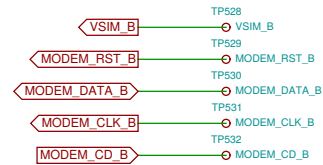
### Modem VUSB control (experimental)



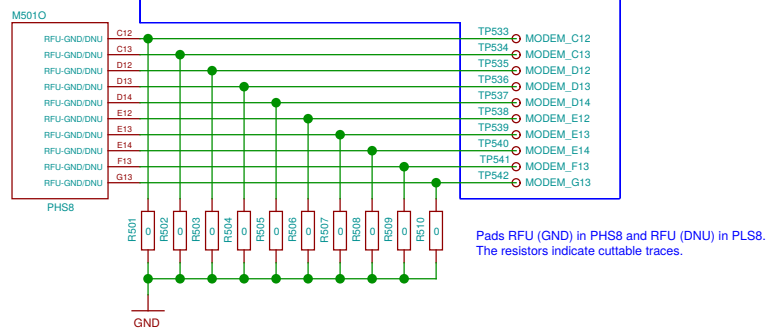
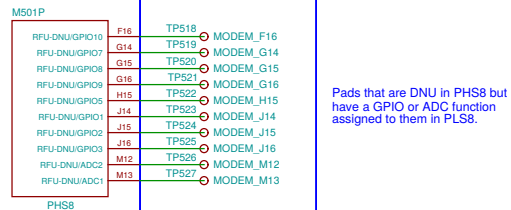
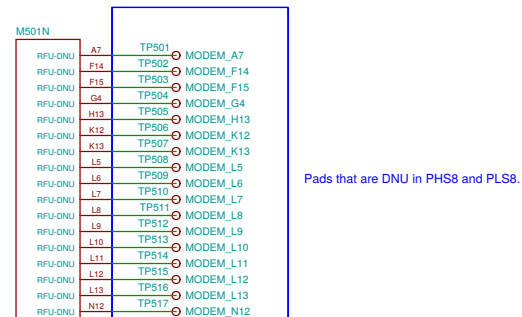
EN\_VUSB\_MODEM = MODEM\_EN && <I2C-settable-bit>

EN\_VUSB\_MODEM

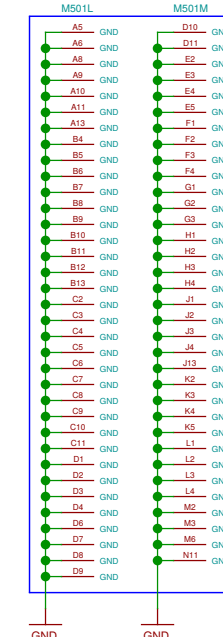
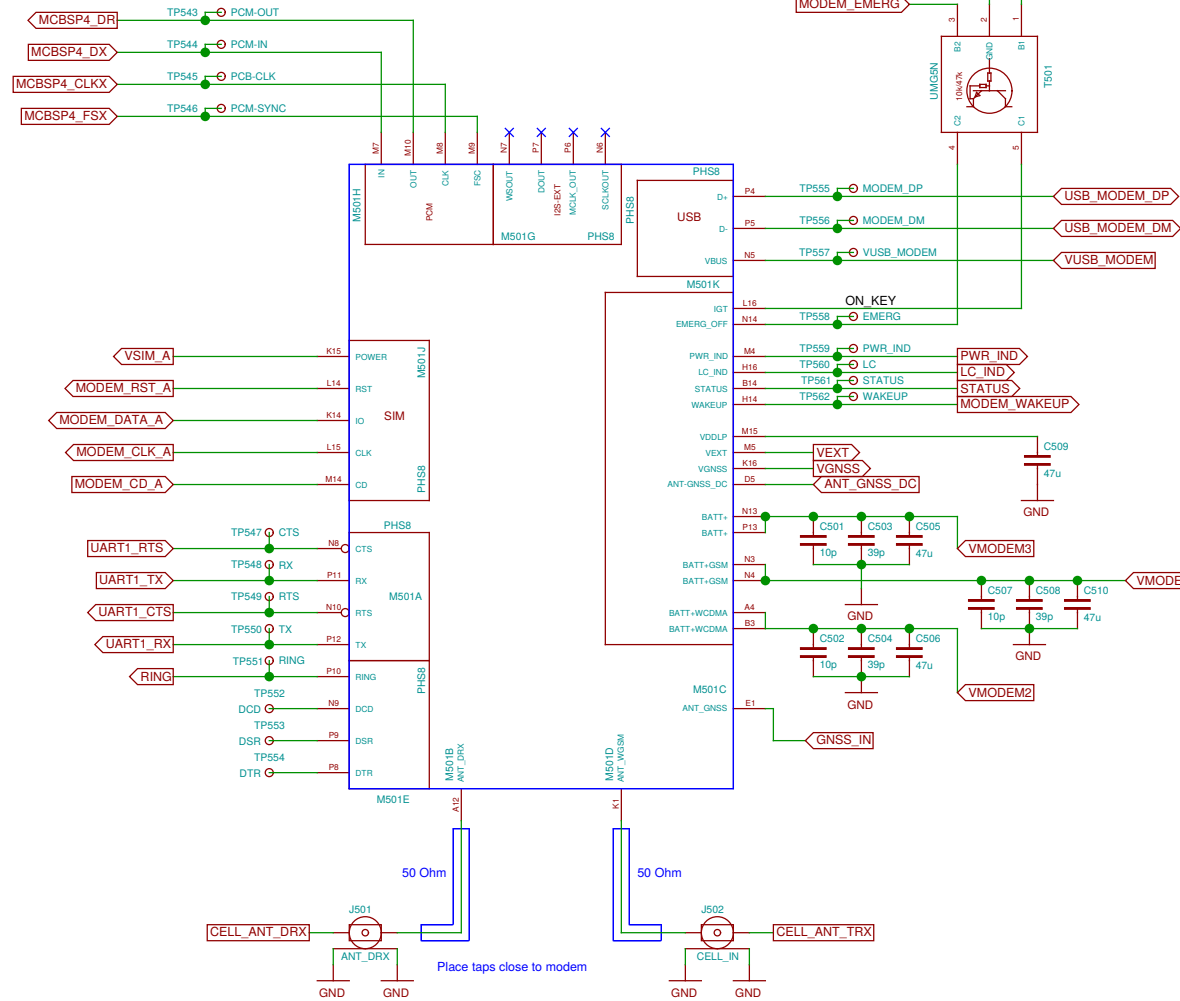
### SIM B bus



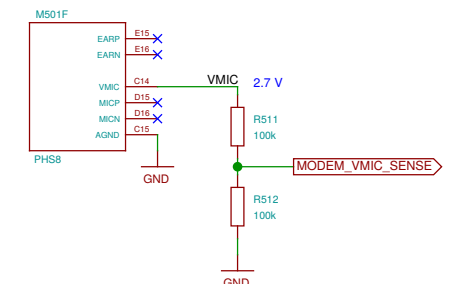
17+10+10 = 37 test points. PCB space permitting, to be arranged in a 6 x 6 + 1 grid with 1.0 mm pitch. This patch field is to be placed adjacent to the SIM B bus test points.

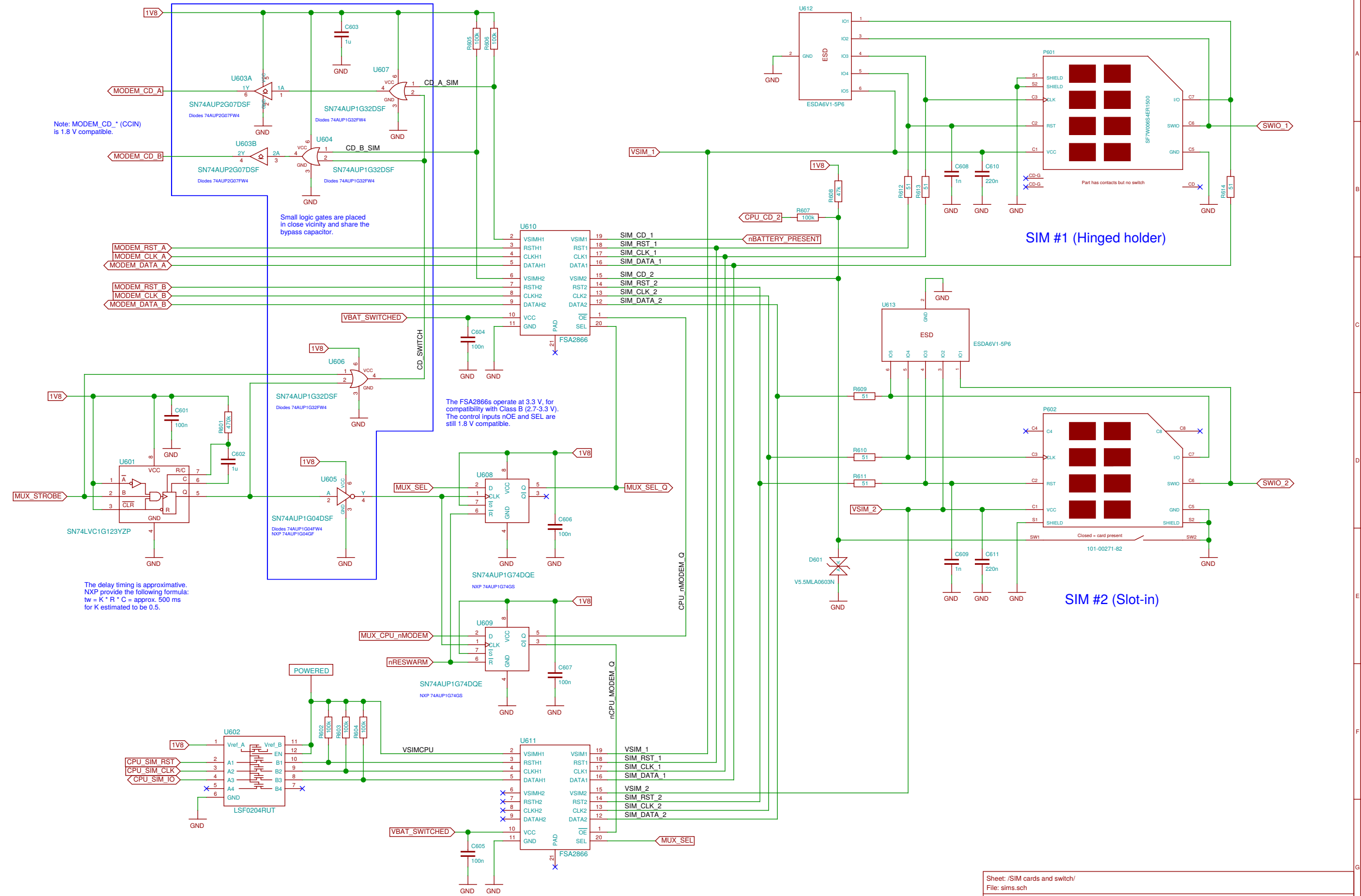


### Modem (module)



### Anti-eavesdropping





Note: MODEM\_CD\_\* (CCIN) is 1.8 V compatible.

Small logic gates are placed in close vicinity and share the bypass capacitor.

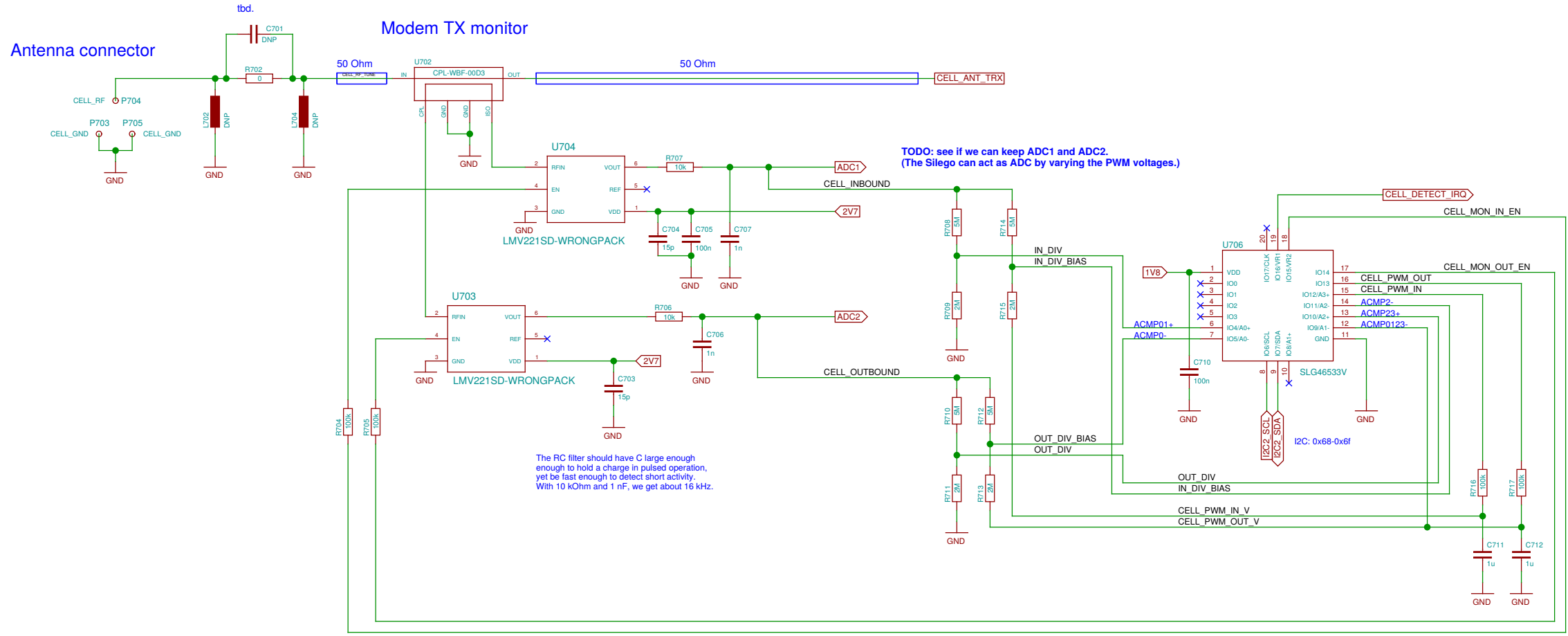
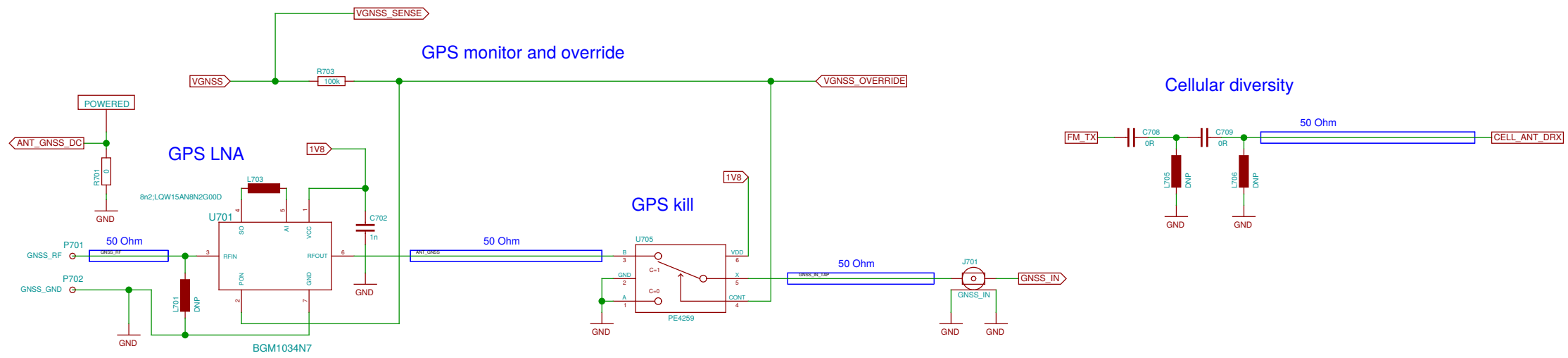
The FSA2866s operate at 3.3 V, for compatibility with Class B (2.7-3.3 V). The control inputs nOE and SEL are still 1.8 V compatible.

The delay timing is approximative. NXP provide the following formula:  $t_w = K * R * C = \text{approx. } 500 \text{ ms}$  for K estimated to be 0.5.

SIM #1 (Hinged holder)

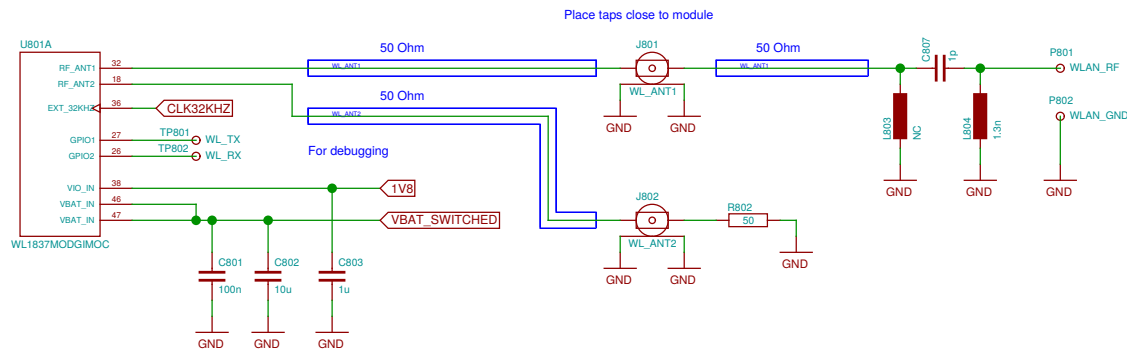
SIM #2 (Slot-in)

Sheet: /SIM cards and switch/		
File: sims.sch		
Title: SIM cards and switch		
Size: A3	Date: 2016-12-21 02:12:34	Rev:
Plotted by eeshow 22/12/2016 12:08:00:03Z		Id: 6/25

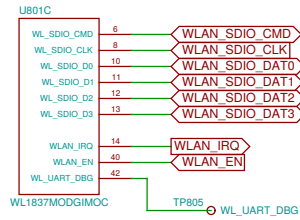


TODO: assign footprints for c-spring contacts

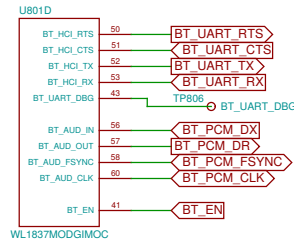
WLAN/BT antenna



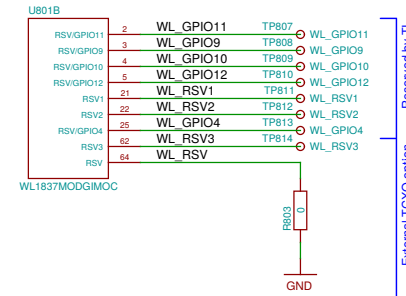
WLAN



Bluetooth

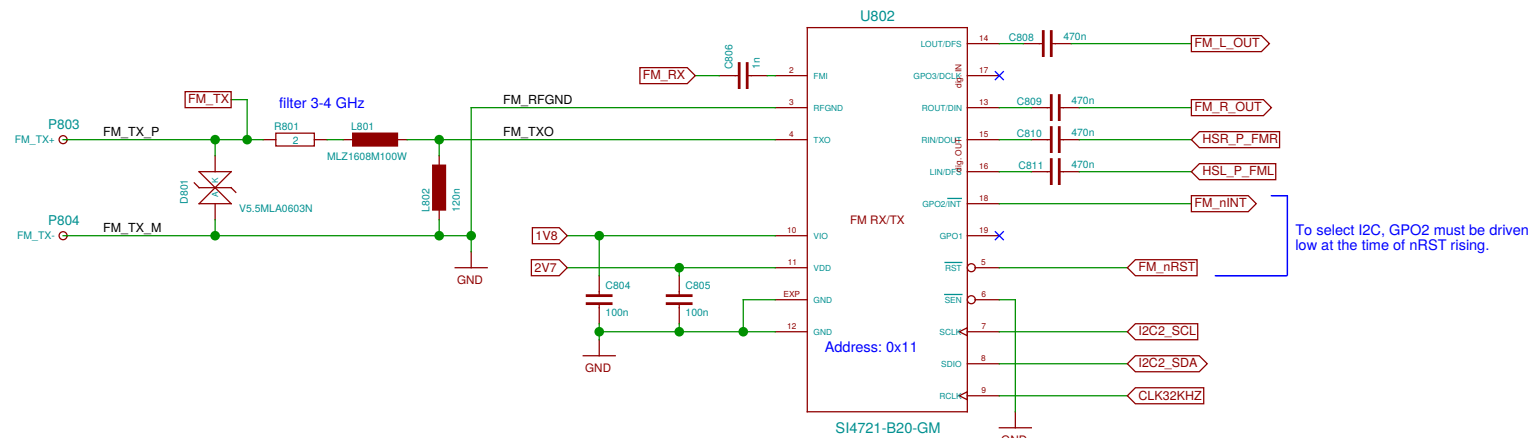


Reserved / Debugging



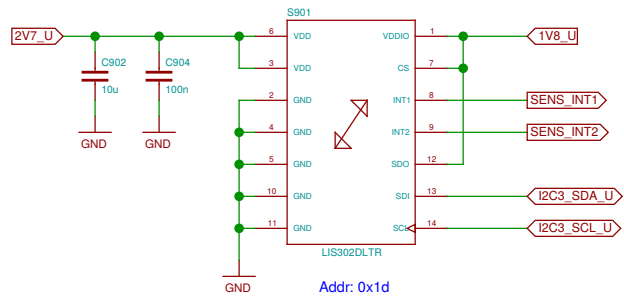
FM Radio (TX/RX)

FM TX antenna

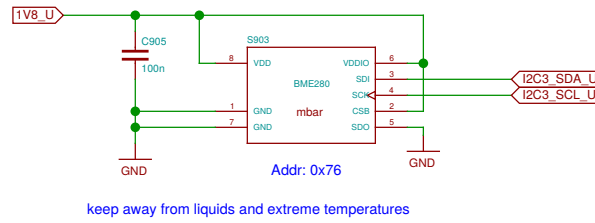




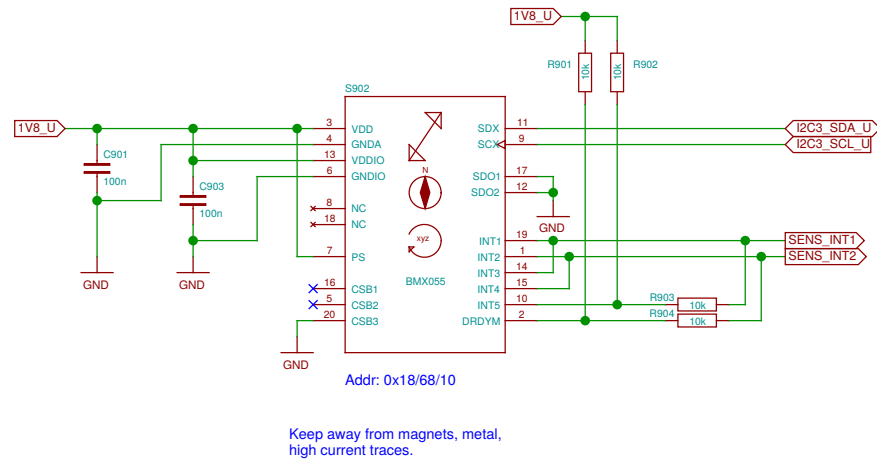
### Acceleration (legacy)



### Pressure, humidity

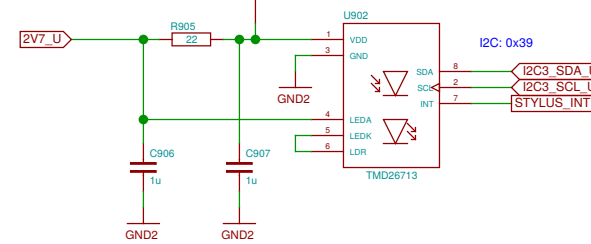


### 9-axis (acceleration, gyroscope, magnetometer)

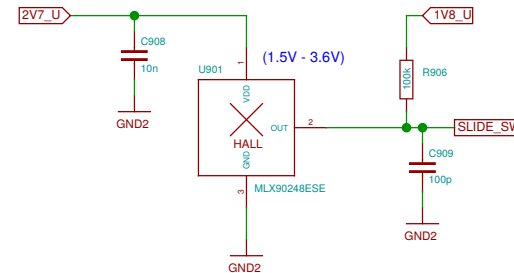


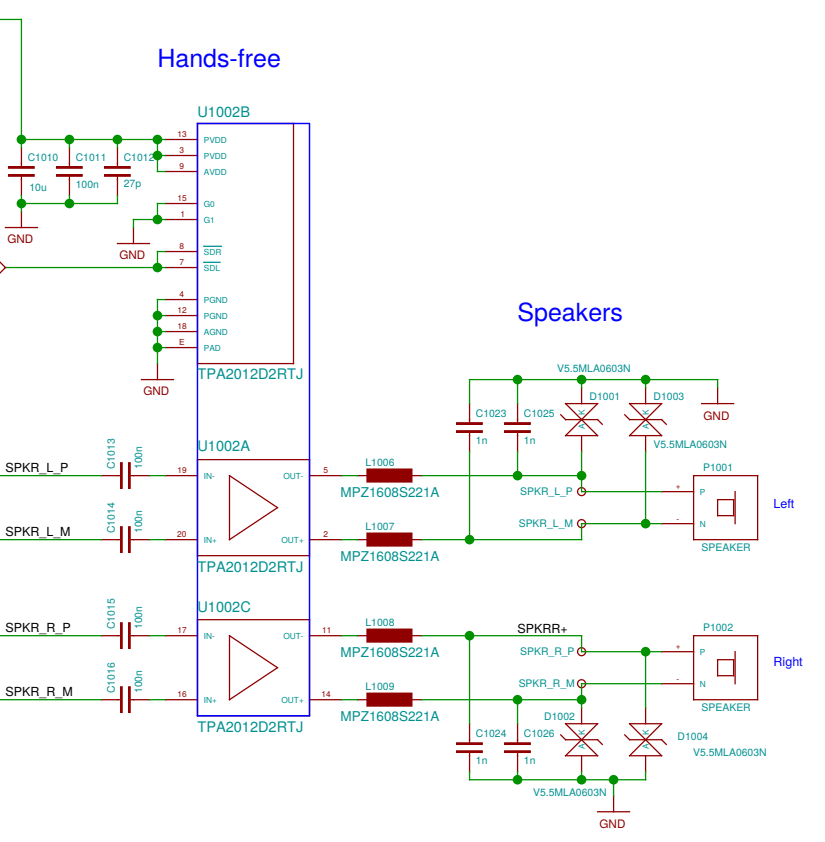
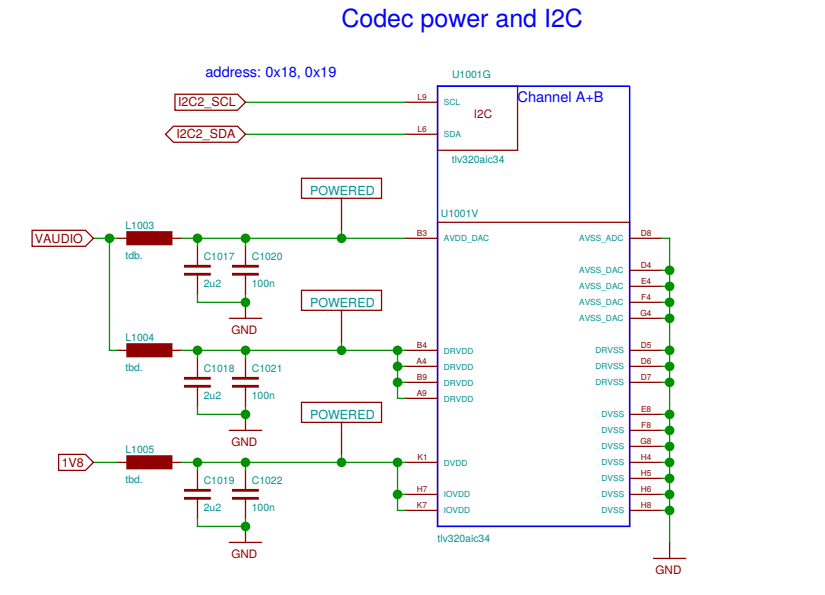
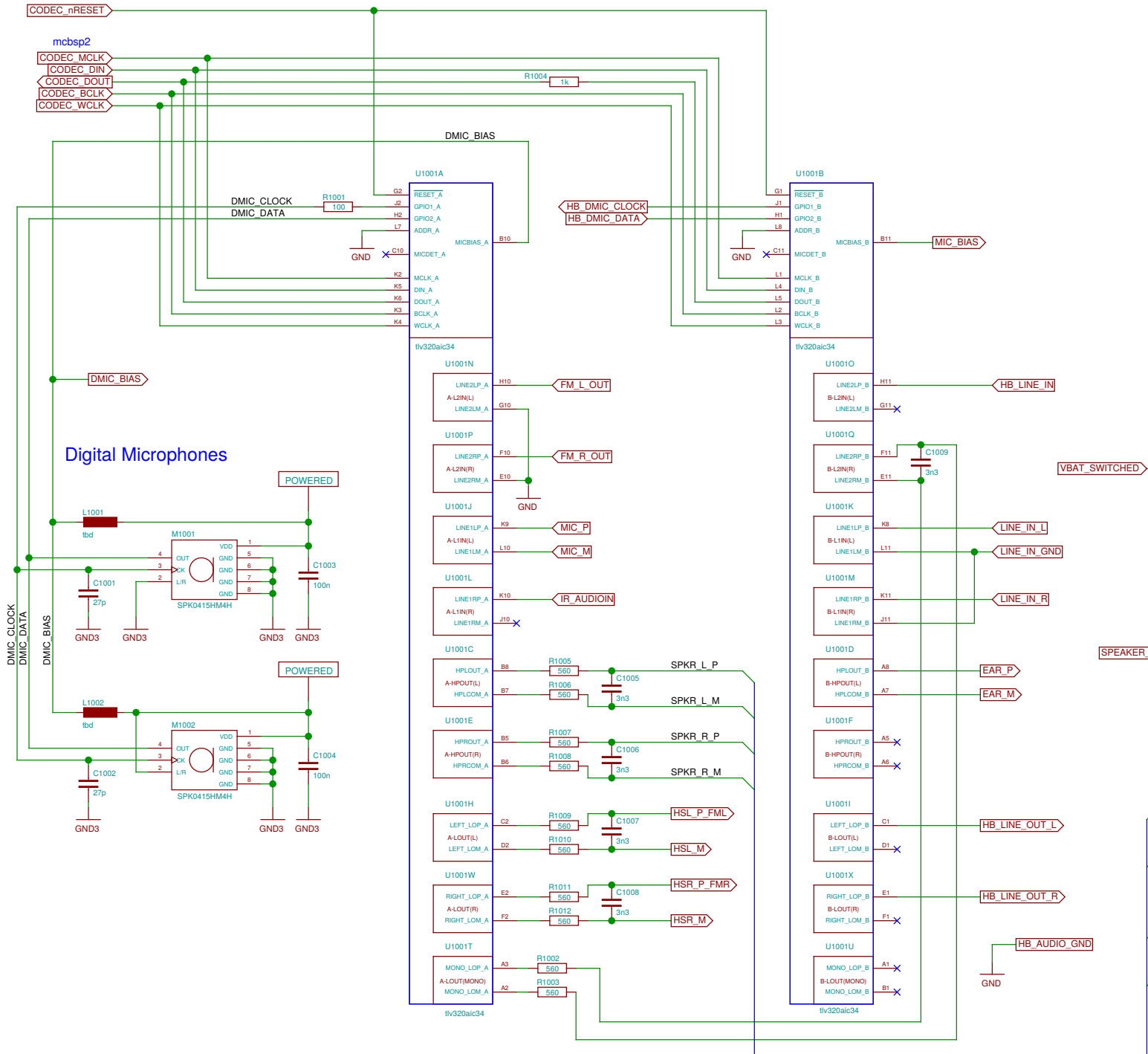
### UPPER LOWER

### Stylus detect

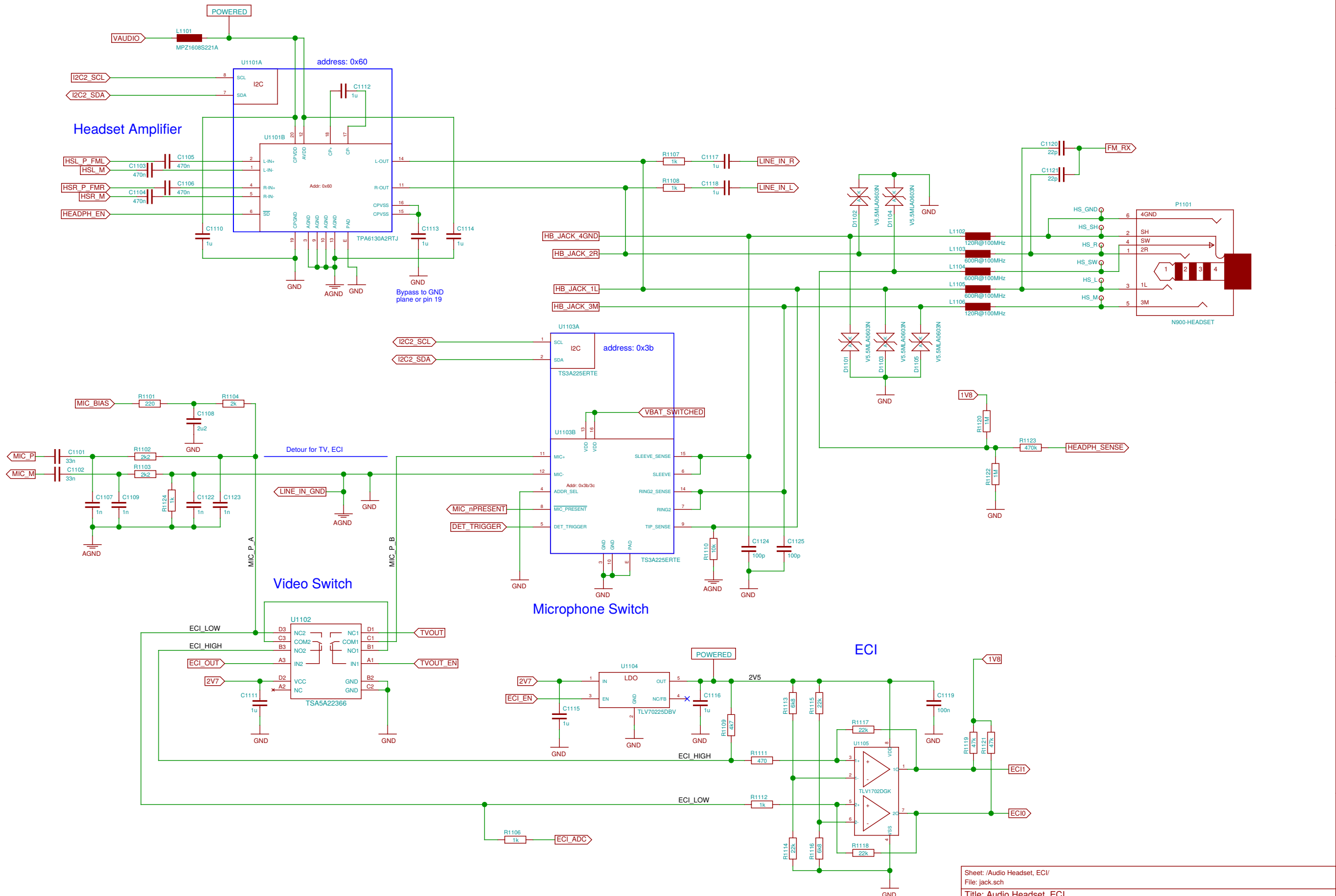


### Slide sensor



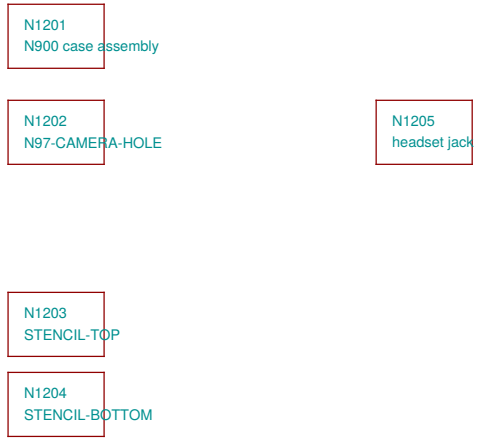


Sheet: /Audio Codec/		Date: 2016-12-21 02:17:16	
File: codec.sch		Rev:	
Title: Audio Codec		Id: 10/25	
Size: A3	Date: 2016-12-21 02:17:16	Rev:	
Plotted by eeshow 221aa28 20161208-00:03Z			

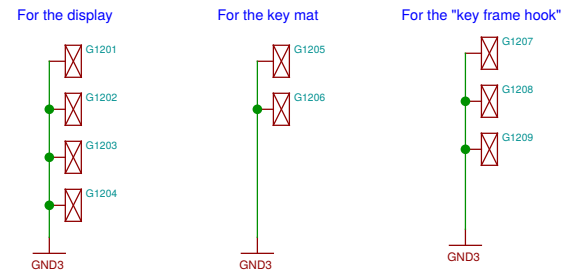


Sheet: /Audio Headset, ECI/		Date: 2016-12-21 02:12:34	
File: jack.sch		Rev: 1	
Title: Audio Headset, ECI		Plotted by eeshow 221aa28 20161208-00:03Z	
Size: A3		Id: 11/25	

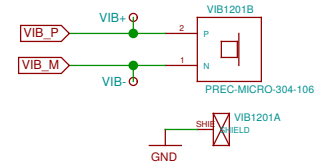
### No-Solder Components



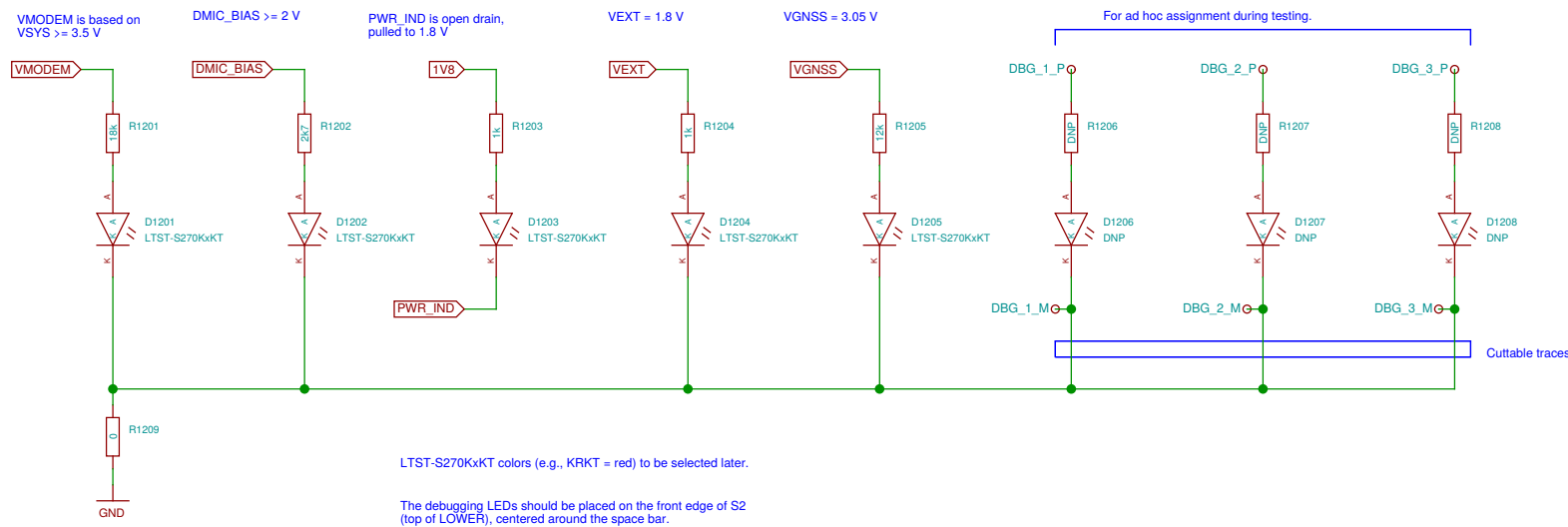
### Shield Contacts on UPPER



### Vibramotor



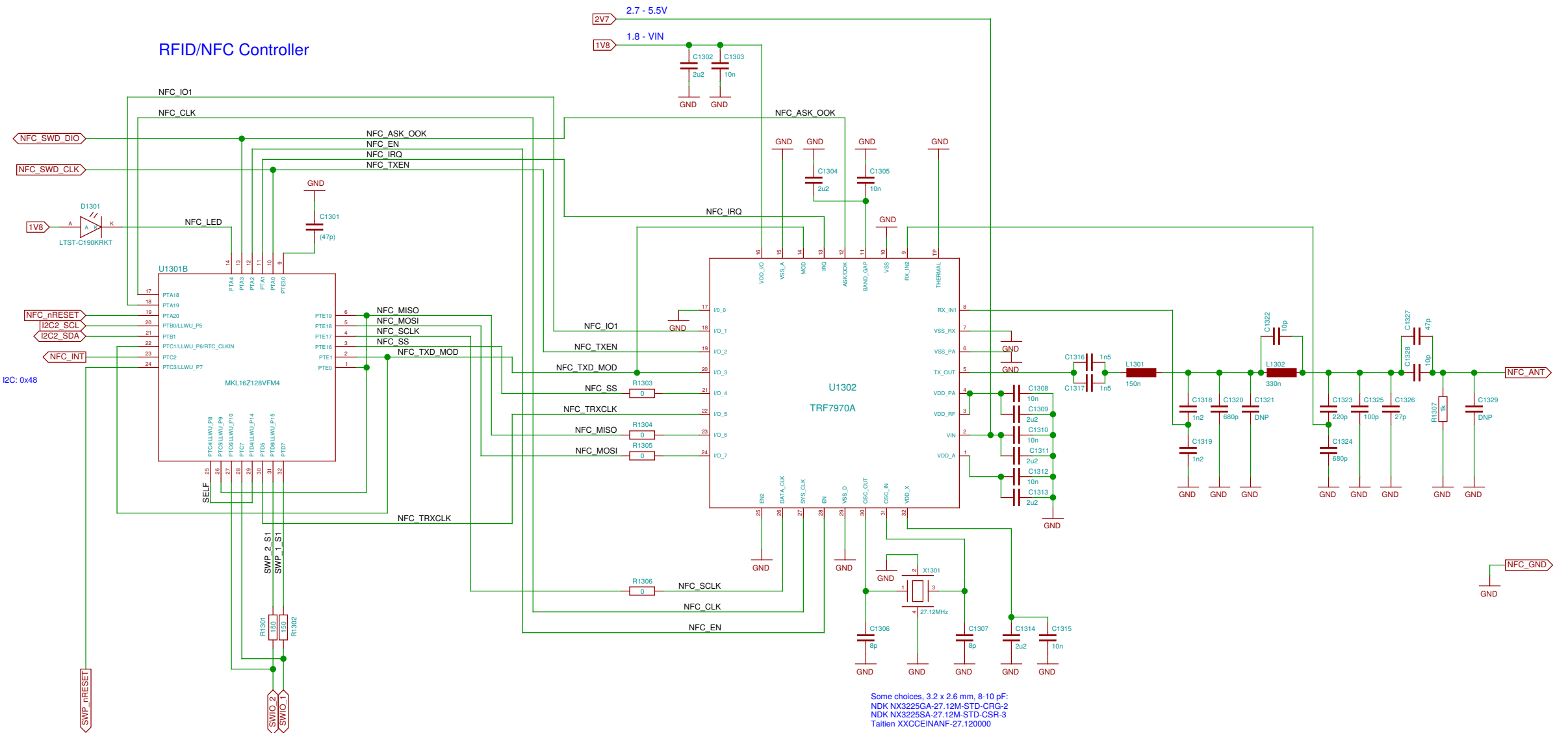
### Hardware scrutiny LEDs



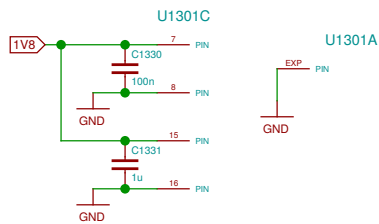
Sheet: /Misc/		Date: 2016-12-21 14:57:39	
File: misc.sch		Rev:	
Title: Misc			
Size: A3	Plotted by eeshow 221aa28 20161208-00:03Z		Id: 12/25

# RFID/NFC Transceiver

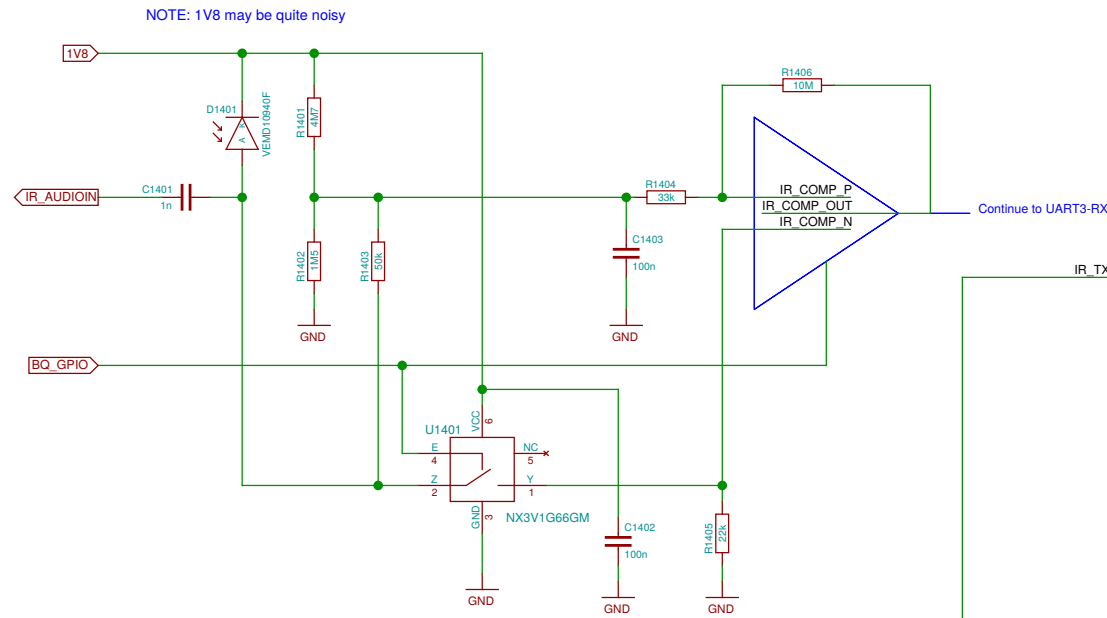
## RFID/NFC Controller



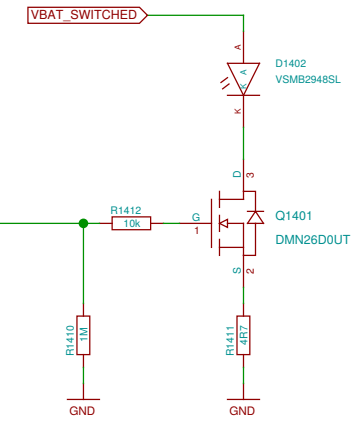
Some choices, 3.2 x 2.6 mm, 8-10 pF:  
 NDK NX3225GA-27.12M-STD-CRG-2  
 NDK NX3225SA-27.12M-STD-CSR-3  
 Tallien XXCCEINANF-27.120000



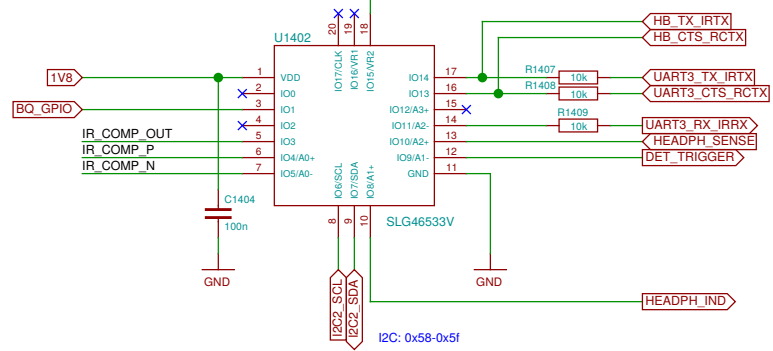
### IR receiver



### IR transmitter



### IR send/receive logic

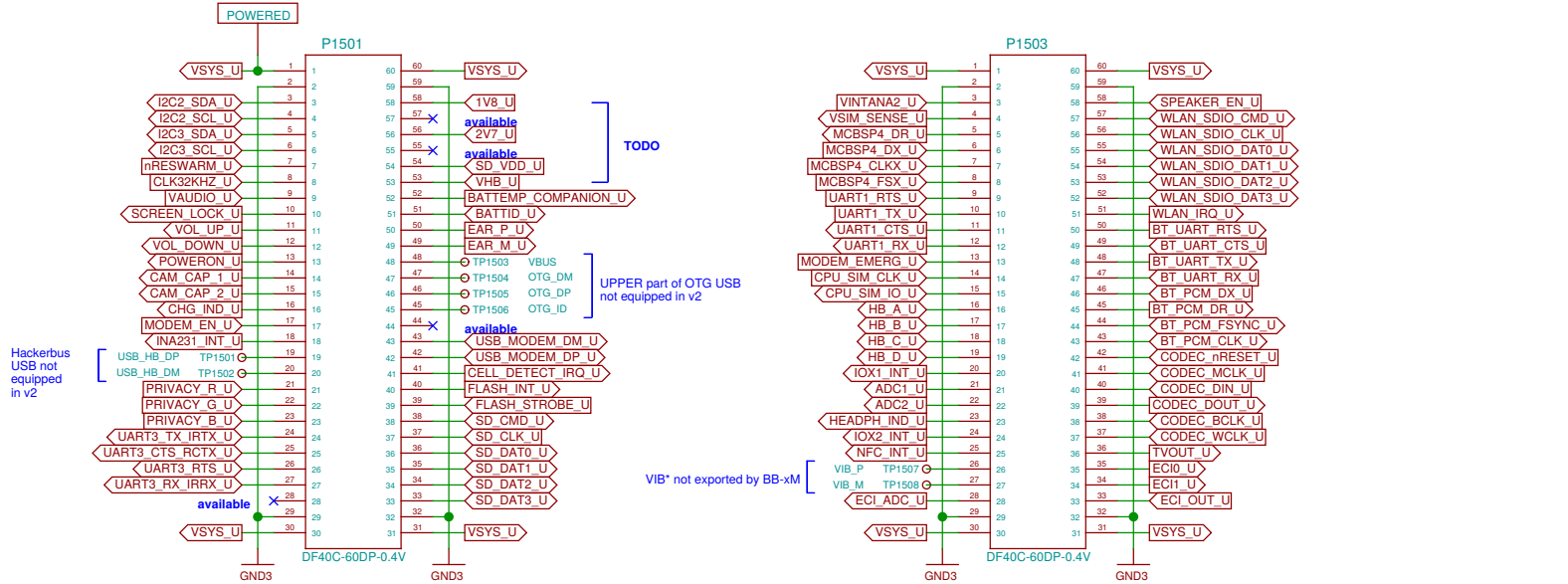


**TODO: update D1401 footprint**

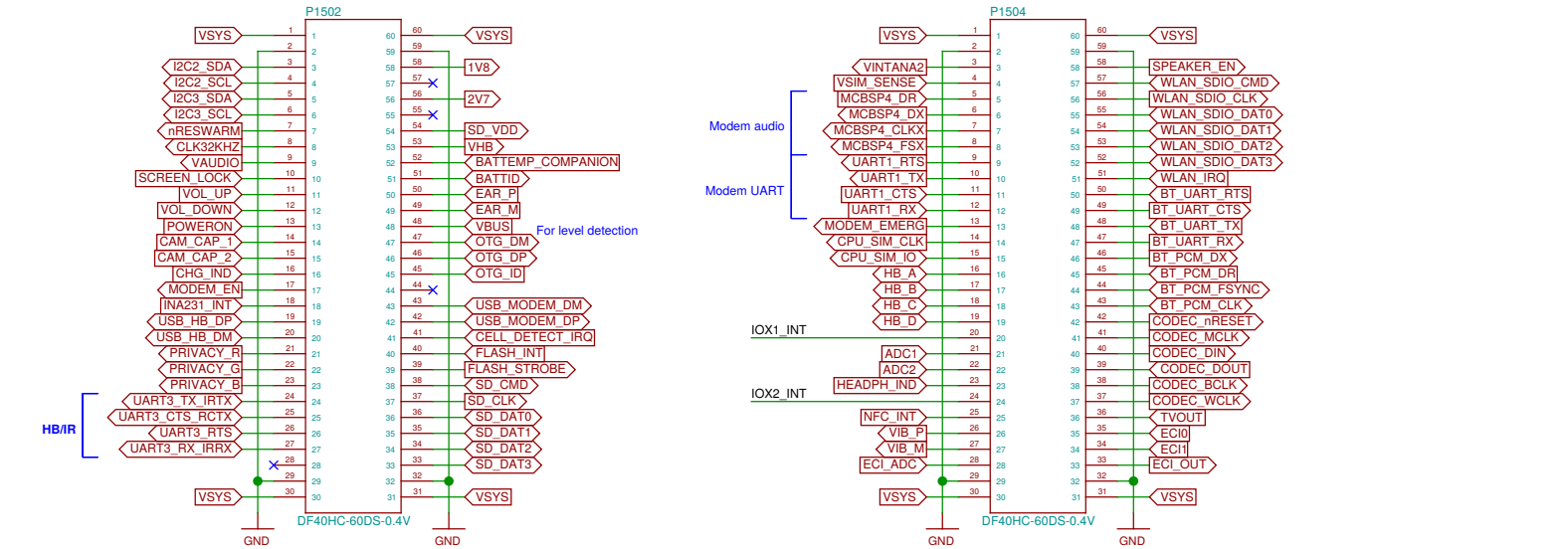
Sheet: /Infrared/		File: ir.sch	
Title: Infrared			
Size: A3	Date: 2016-12-21 02:12:34	Rev:	
Plotted by eeshow 221aa28 20161208-00:03Z		Id: 14/25	

# This is just the collection of signals we have.

## Assignment can still change, e.g., to improve layout.

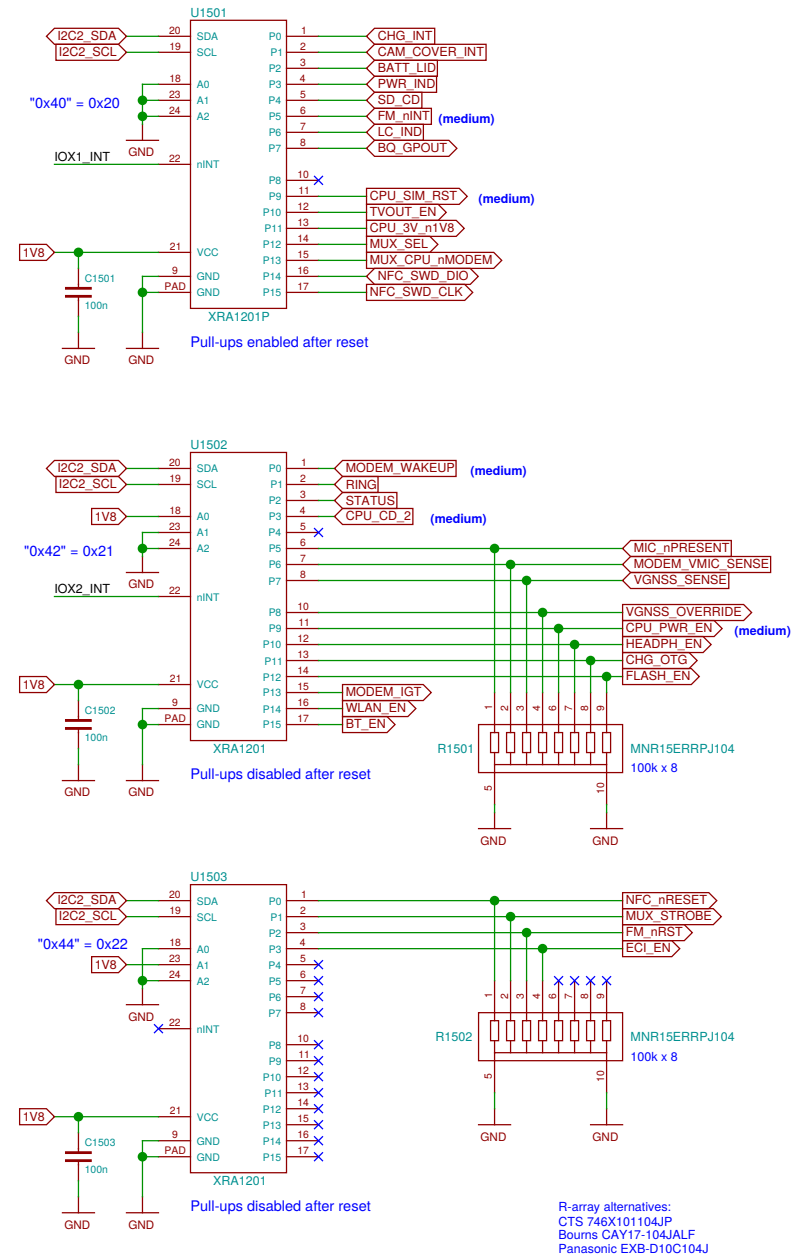


UPPER  
LOWER



Current rating per contact: 0.3 A

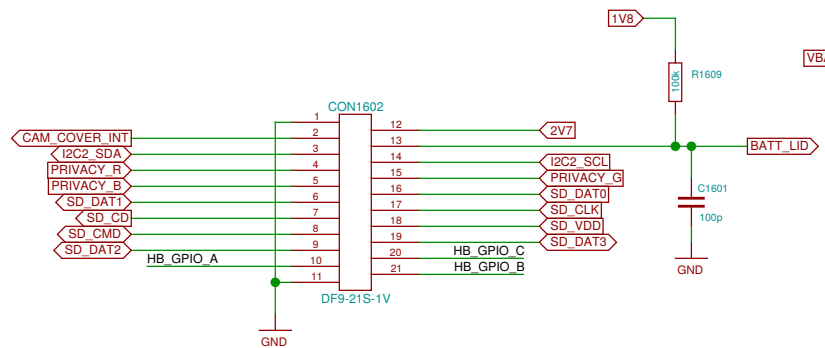
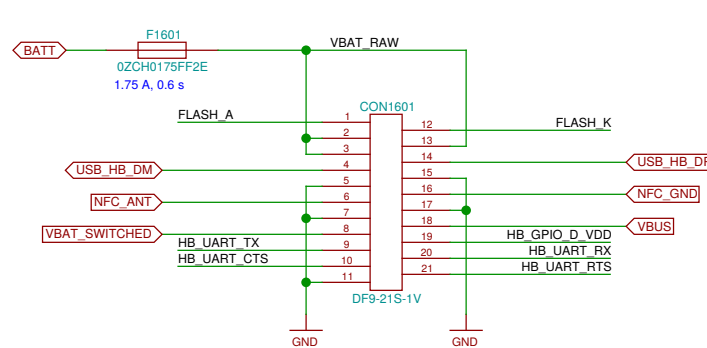
### IO expanders (on LOWER)



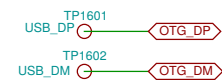
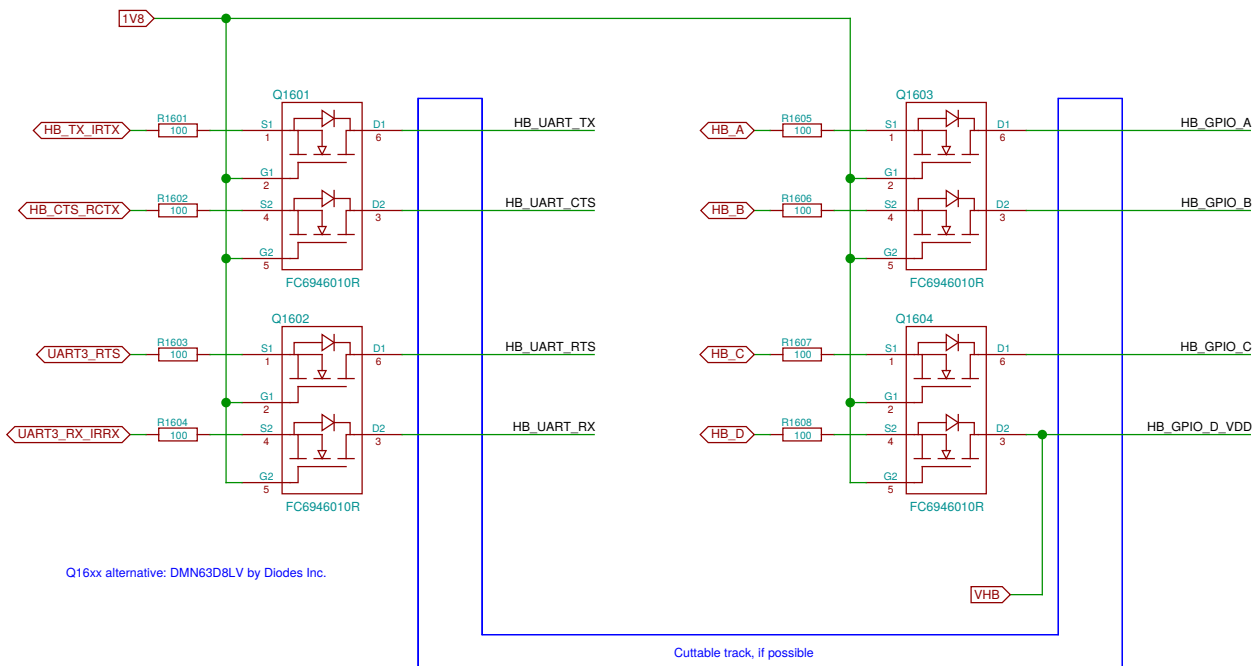
Sheet: /B2B LOWER-UPPER/		File: b2b.sch	
Title: B2B LOWER-UPPER			
Size: A3	Date: 2016-12-21 02:12:34	Rev:	
Plotted by eeshow 221aa28 20161208-00:03Z		Id: 15/25	

## LOWER-BOB Interconnect (LOWER side)

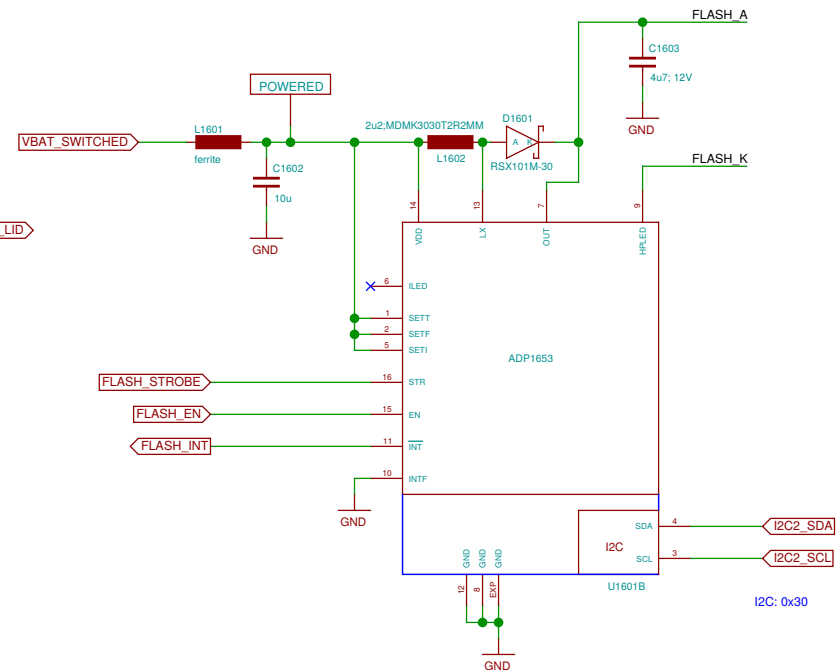
Defined in the Hackerbus specification, <http://neo900.org/stuff/papers/hb.pdf>



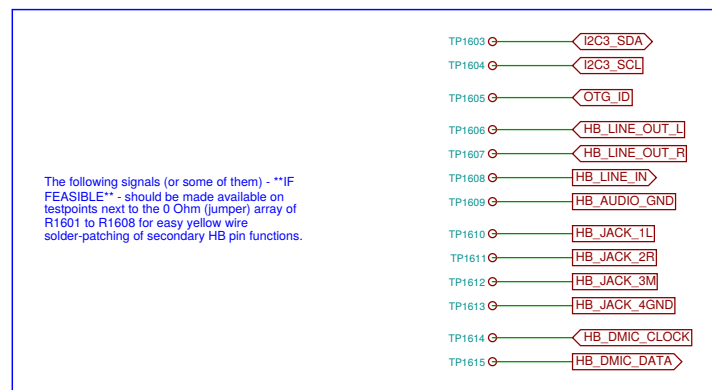
## Level shifters for Hackerbus GPIO and UART



## Flash/Torch

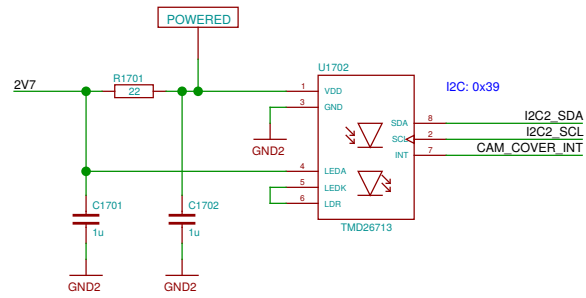


## Patch field

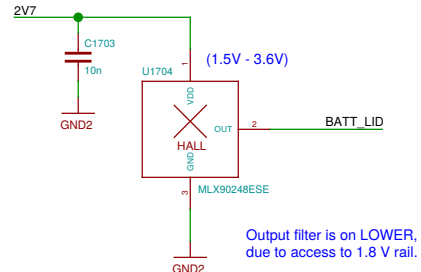




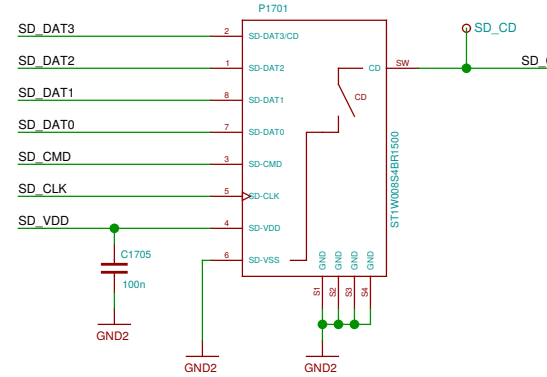
### Camera Cover detect



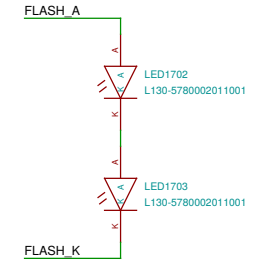
### Battery Cover detect



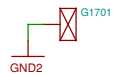
### Memory card holder



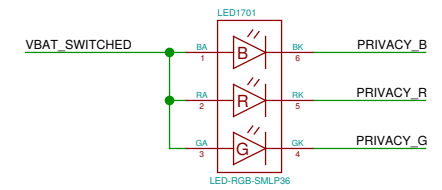
### Camera flash



### Camera lens plate

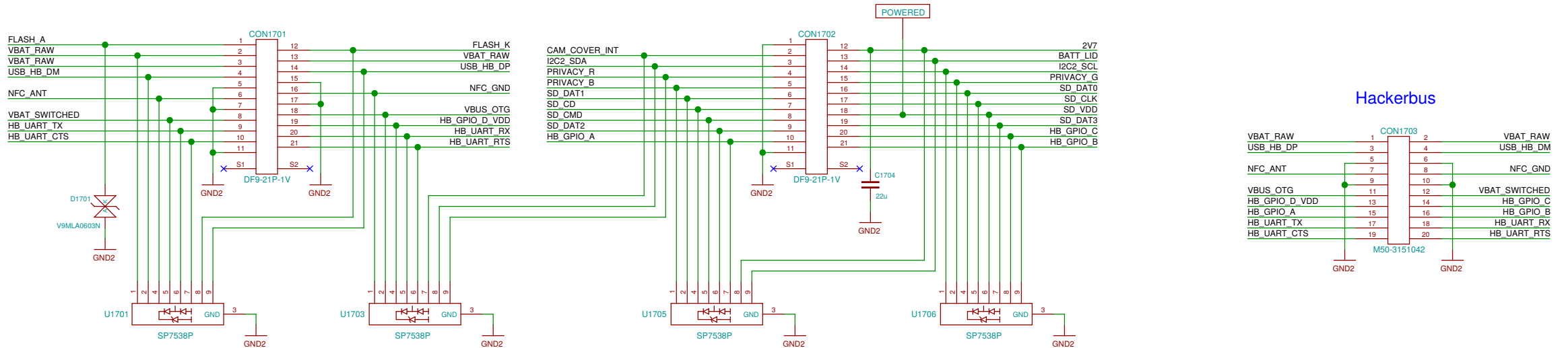


### Privacy LED



### LOWER-BOB Interconnect (BOB side)

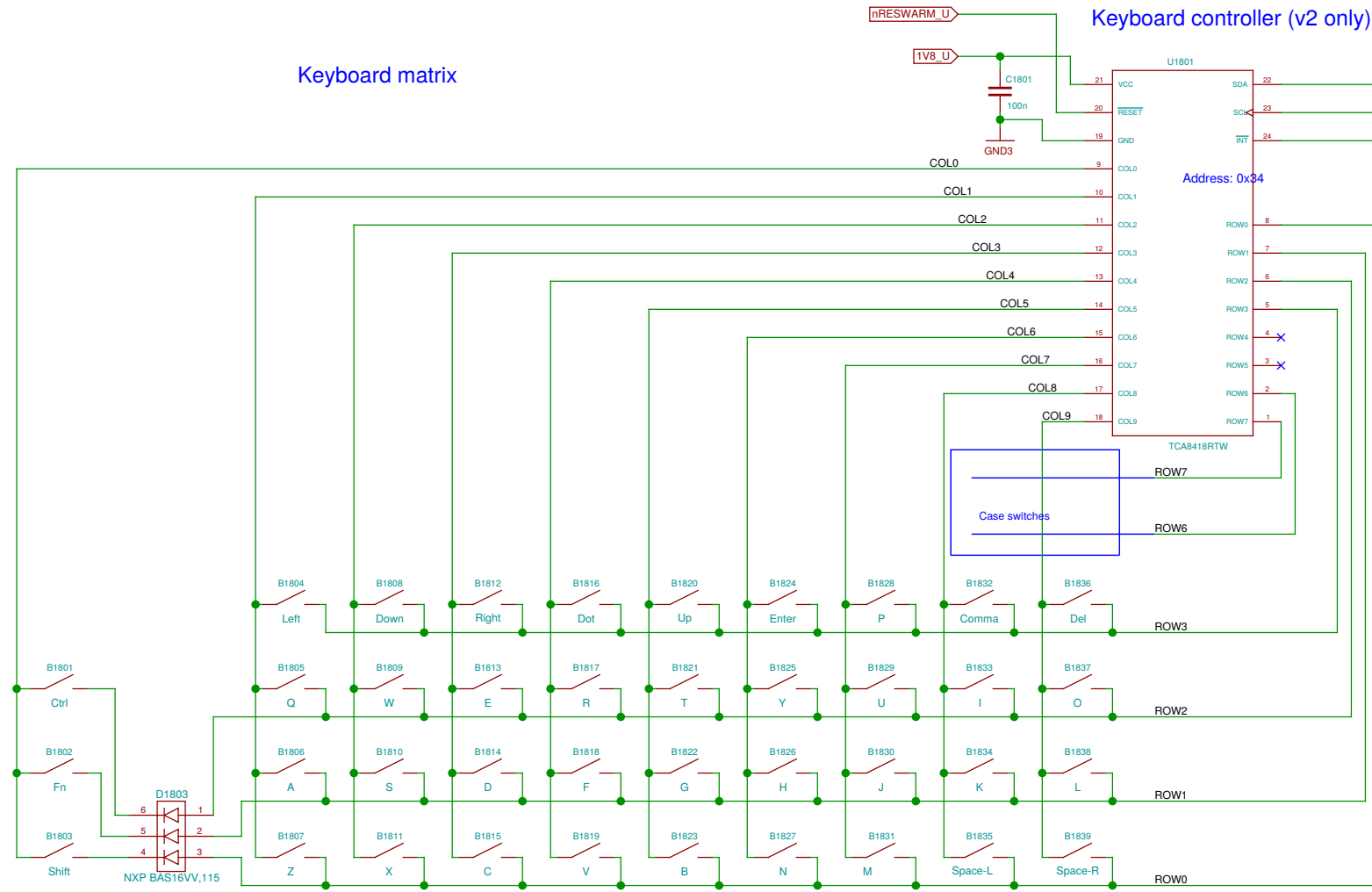
Defined in the Hackerbus specification, <http://neo900.org/stuff/papers/hb.pdf>



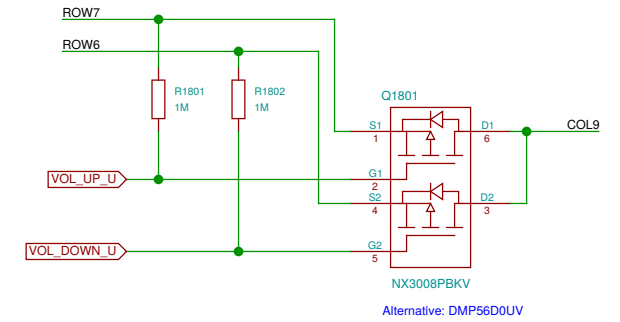
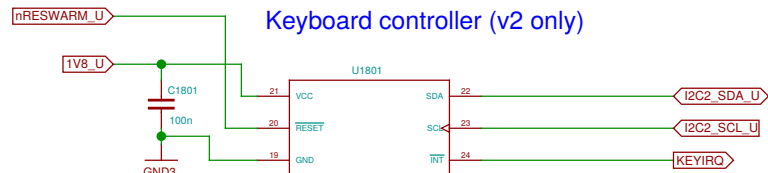
**ESD pin assignment is only indicative.  
Actual assignment to be defined by layout.**

Sheet: /uSD Breakout Board/ File: bob.sch		
Title: uSD Breakout Board		
Size: A3	Date: 2016-12-21 02:12:34	Rev:
Plotted by eeshow 221aa28 20161208-00:03Z		Id: 17/25

# Keyboard matrix



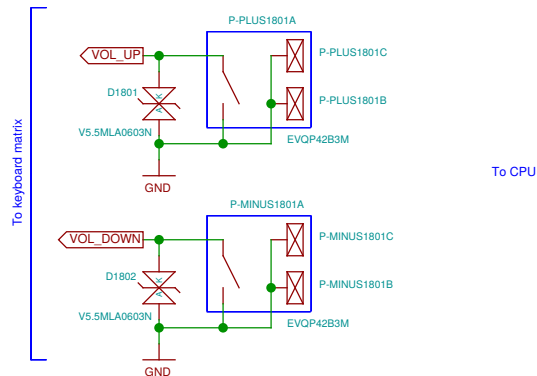
## Keyboard controller (v2 only)



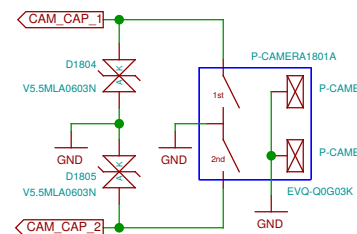
Alternative: Diodes Inc. BAS16VV-7  
Warning: Diodes Inc. have cathodes on pin 1 side, NXP anodes !

UPPER  
LOWER

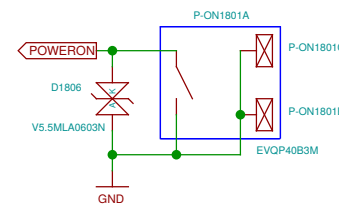
### Volume



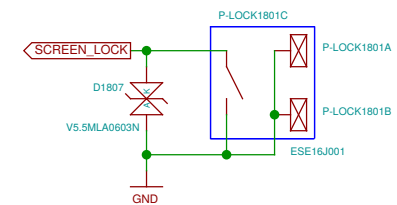
### Camera trigger



### On-off



### Lock switch

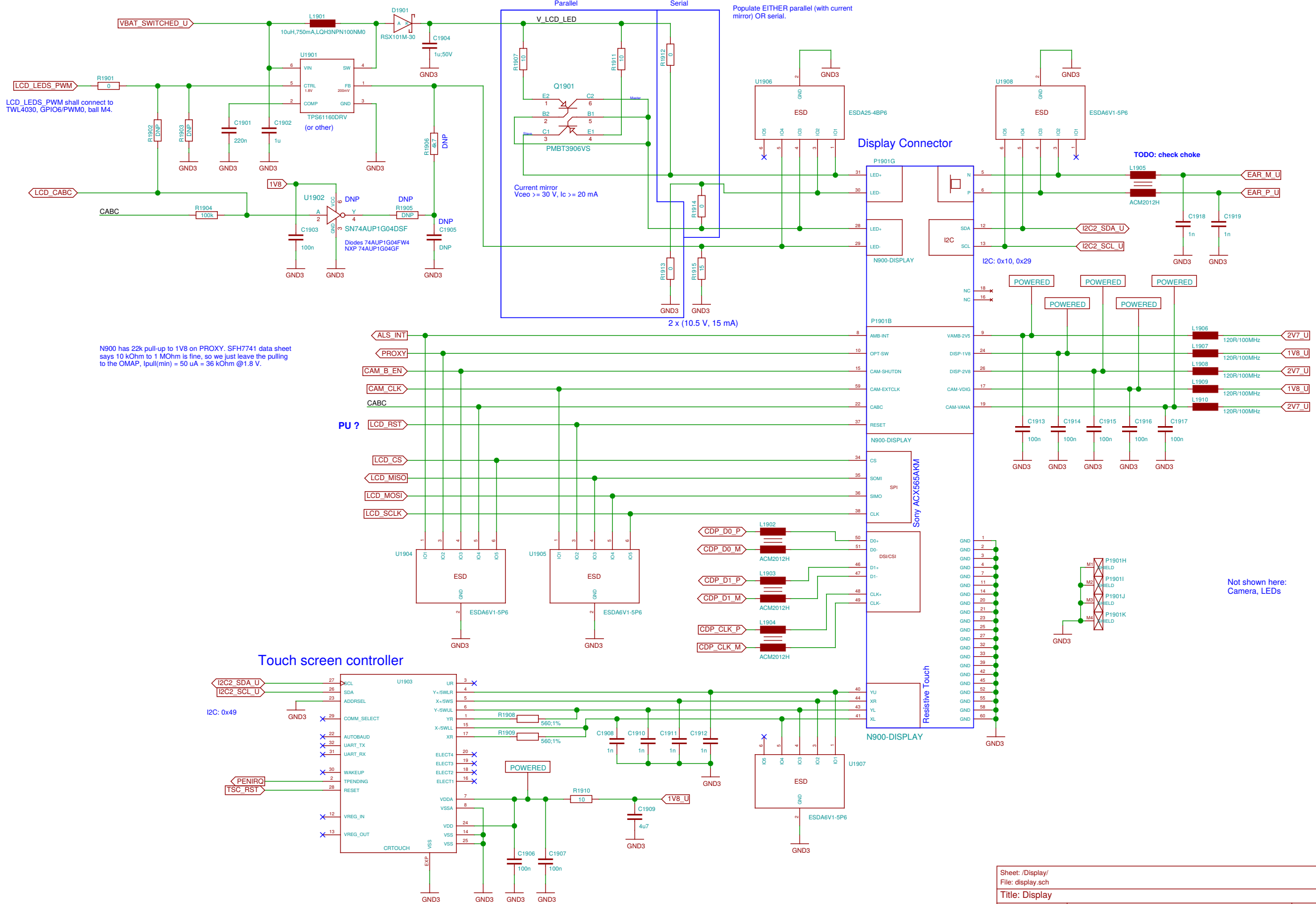


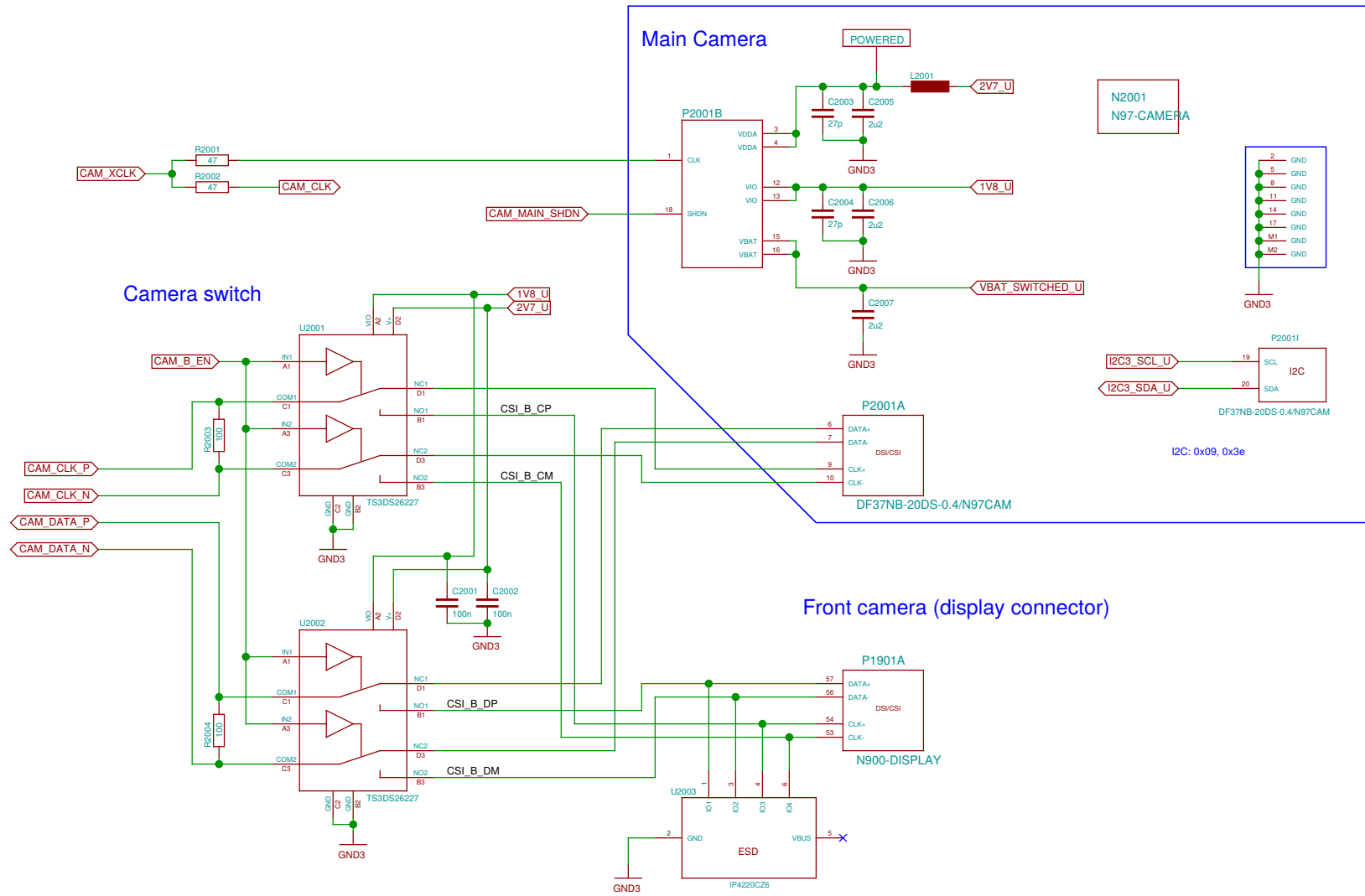
Sheet: /Keypad and buttons/  
File: keys.sch

Title: Keypad and buttons

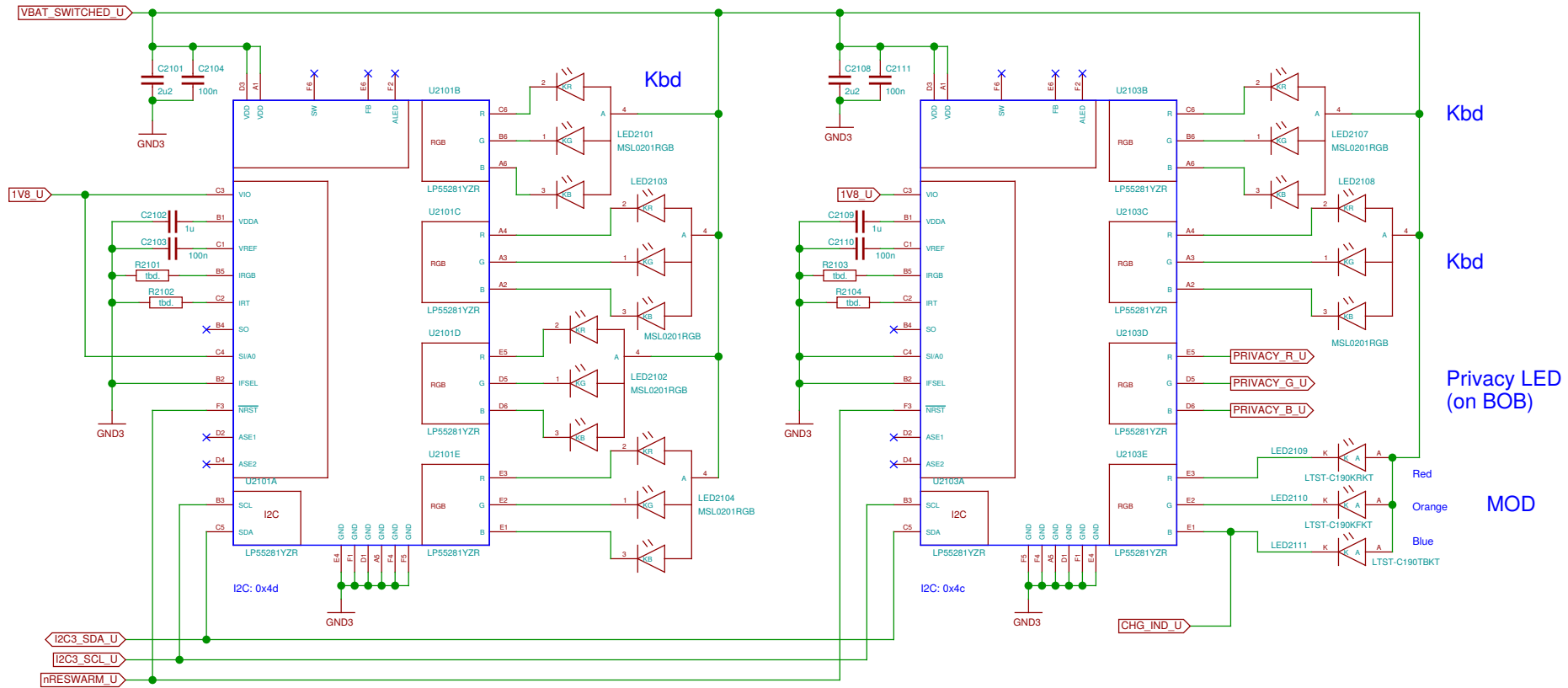
Size: A3 Date: 2016-12-21 02:12:34  
Plotted by eeshow 221aa28 20161208-00:03Z

Rev:  
Id: 18/25

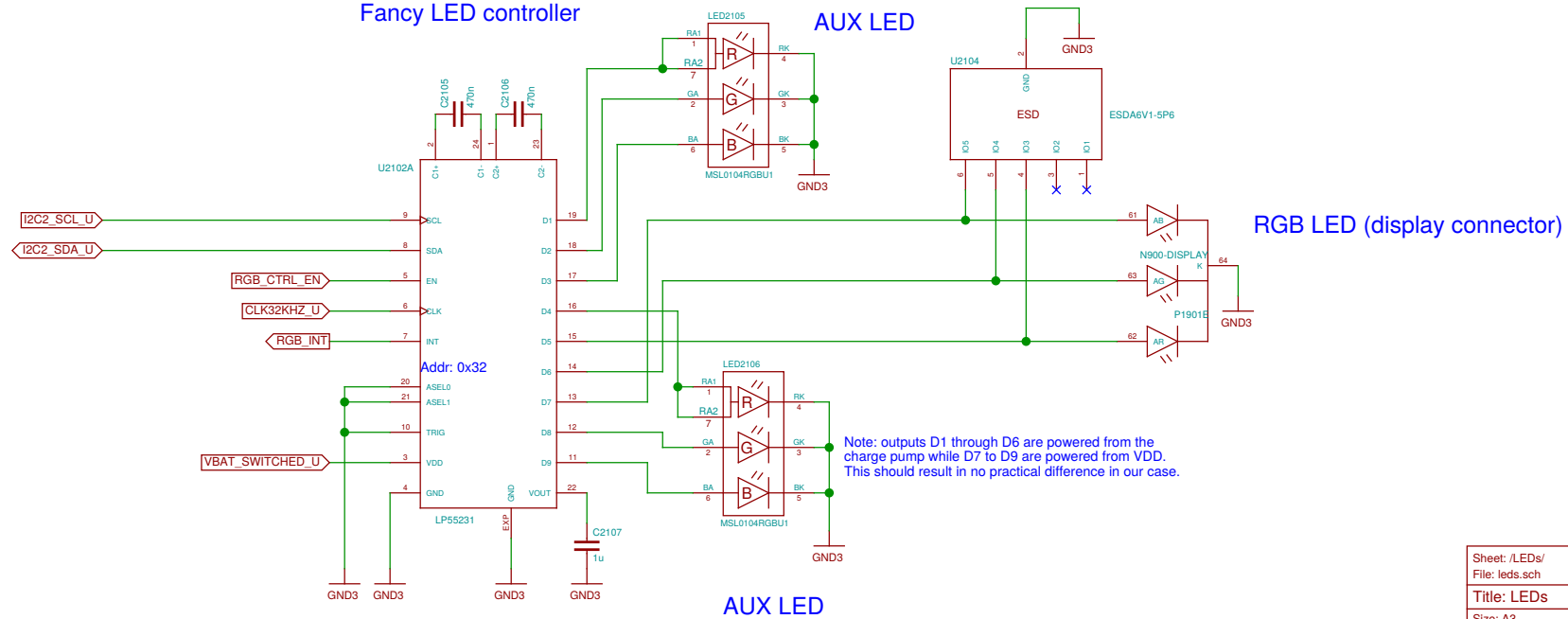




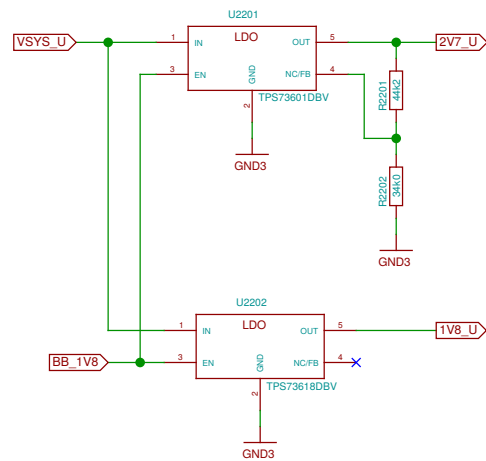
### Basic LED controllers



### Fancy LED controller



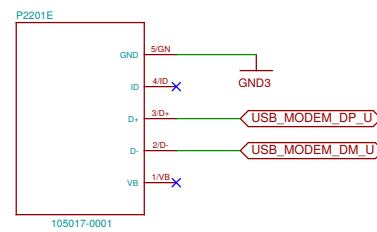
simple capless 400mA LDO for TPS65950 substitute  
(only for prototype)



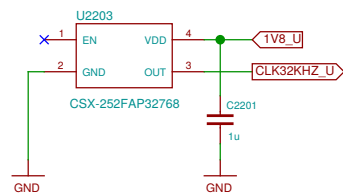
TODO: use REGEN ?

### Modem USB

connect to BB  
by some Micro-USB cable

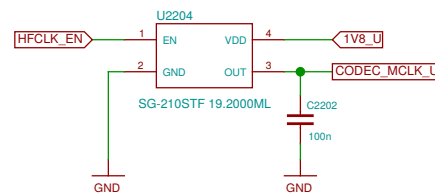


### 32 kHz clock



Alternative: OYKTGLJANF-0.032768

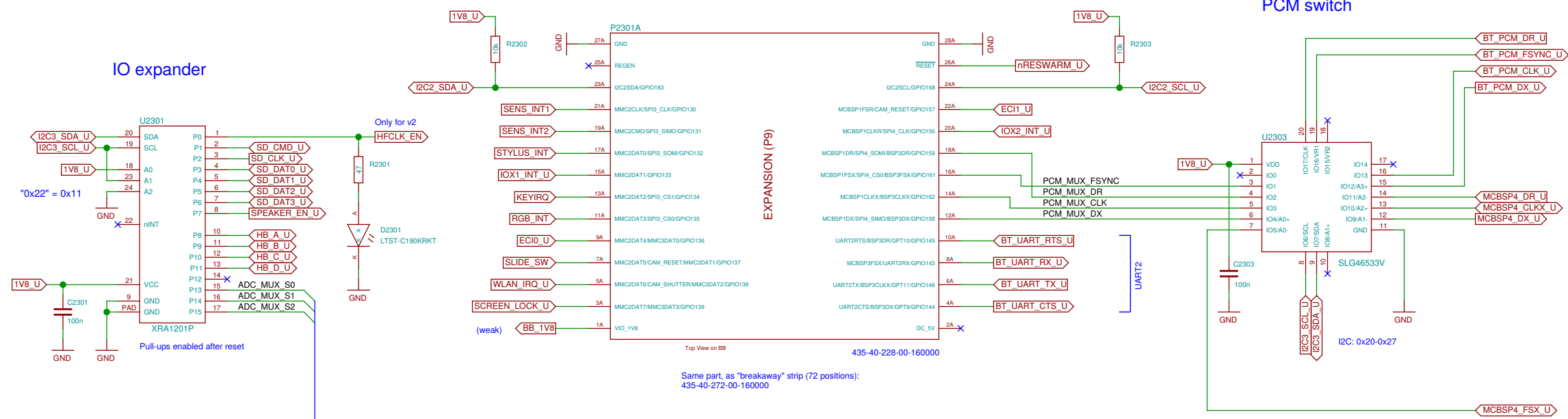
### 19.2 MHz clock



Alternative: KC2520B19.2000C1GE00

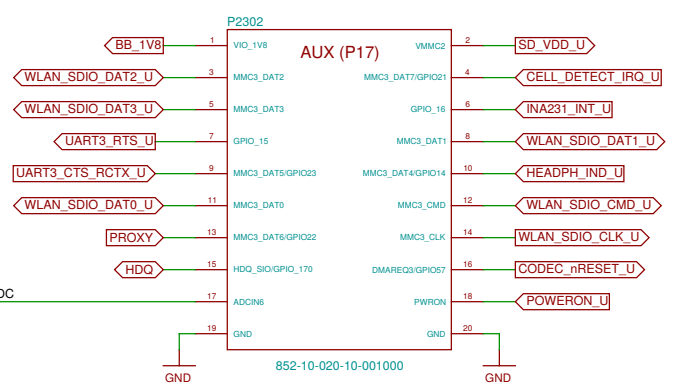
Sheet: /Adaptation (v2 only)/		
File: v2.sch		
Title: Adaptation (v2 only)		
Size: A3	Date: 2016-12-21 02:12:34	Rev:
Plotted by eeshow 221aa28 20161208-00:03Z		Id: 22/25

### BB-xM Main Expansion Header (P9, 7.24)



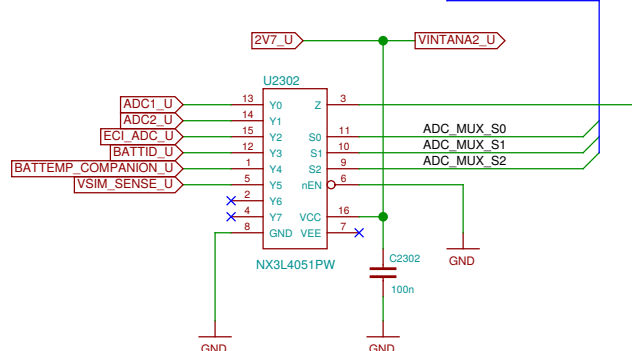
Same part, as "breakaway" strip (72 positions):  
435-40-272-00-160000

### Auxiliary Expansion Header (P17, 7.26)



Same part, as "breakaway" strip (100 positions):  
852-10-100-10-001000

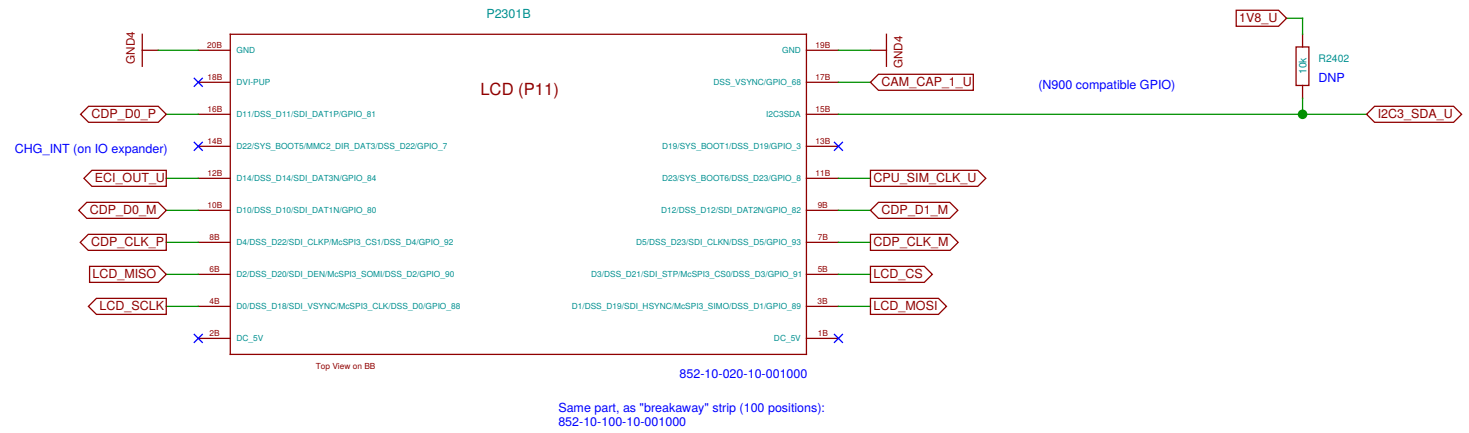
### ADC multiplexer



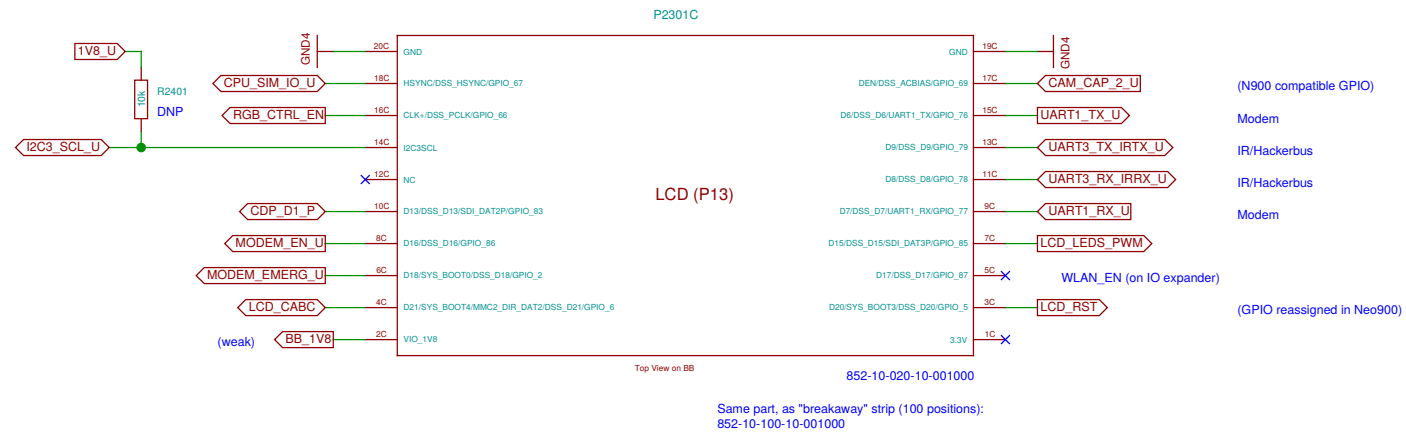
No UART3\_RTS on BB-xM, using GPIO  
No UART3\_CTS on BB-xM, using GPIO

FM\_nINT (on IO expander)

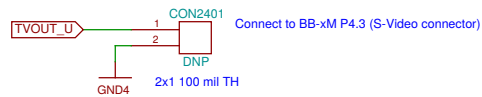
P11 (7.25)



P13 (7.25)

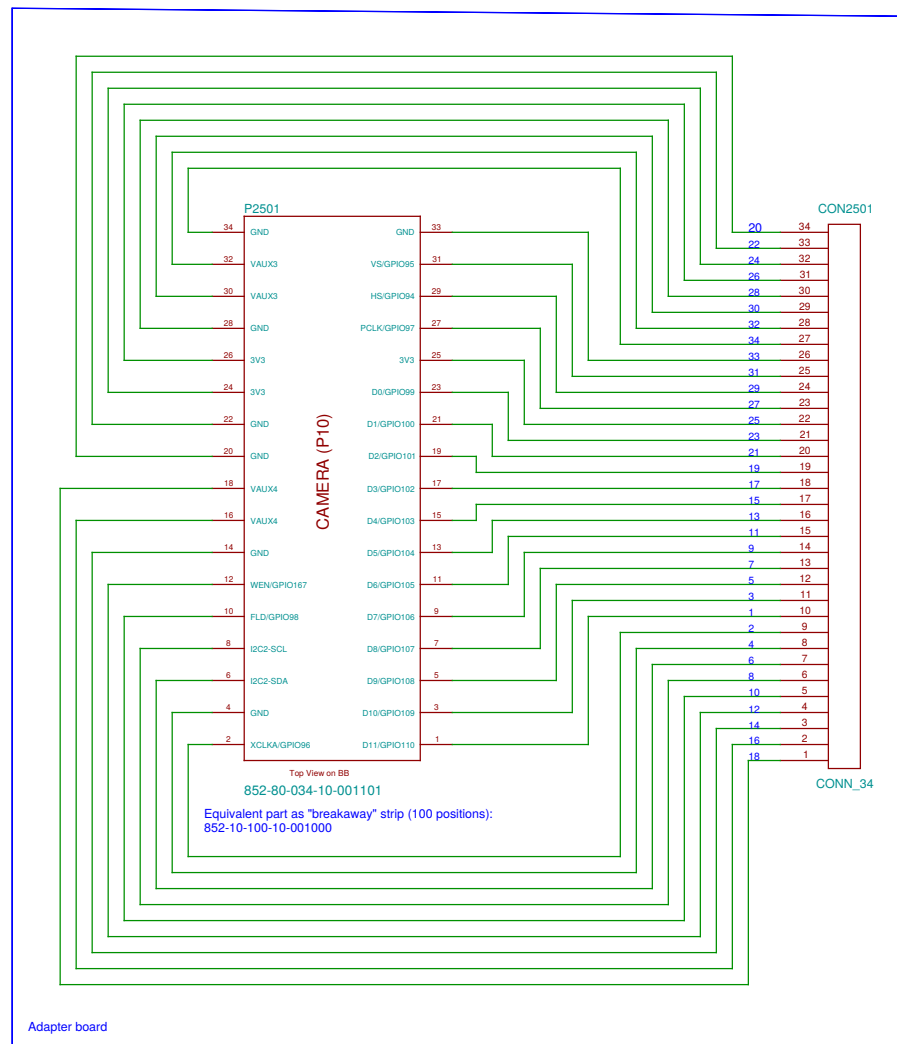


P4 (7.19)

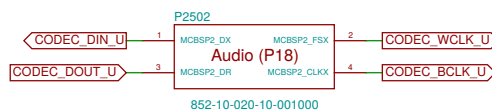
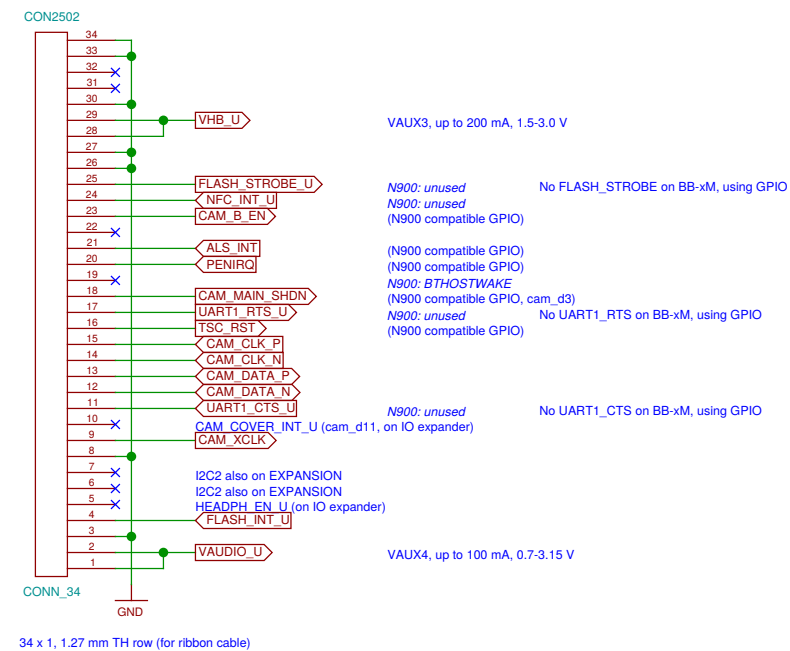




# Processor Camera Port Interface (P10, 7.20.3)



Adapter board



This part is a "breakaway" strip (20 positions) and needs to be customized (cut) before assembly.  
Alternatively, 852-10-100-10-001000 (100 positions) could be used.

Sheet: /BB-xM Adapter (CAM)/  
File: bbcam.sch

Title: BB-xM Adapter (CAM)

Size: A3 Date: 2016-12-21 02:12:34  
Plotted by eeshow 221aa28 20161208-00:03Z

Rev:  
Id: 25/25