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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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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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Display

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Cameras

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LEDs

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V

Sheet: Adaptation (v2 only)



Adaptation (v2 only)

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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

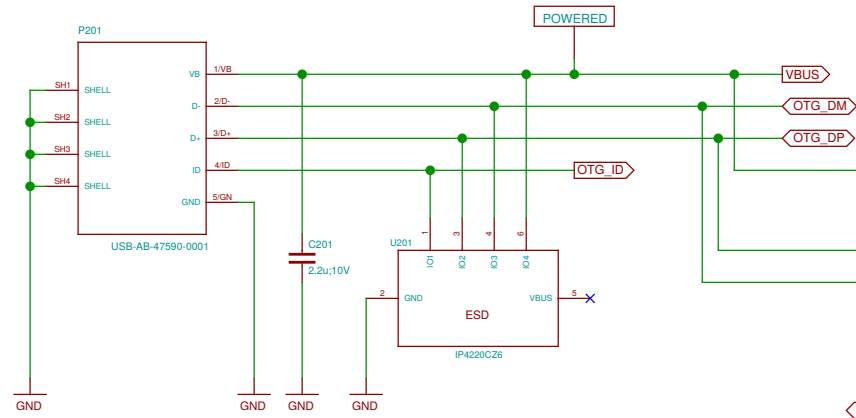
Circuits that exist in the v2 prototype only  
and that will not be part of the final design.

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

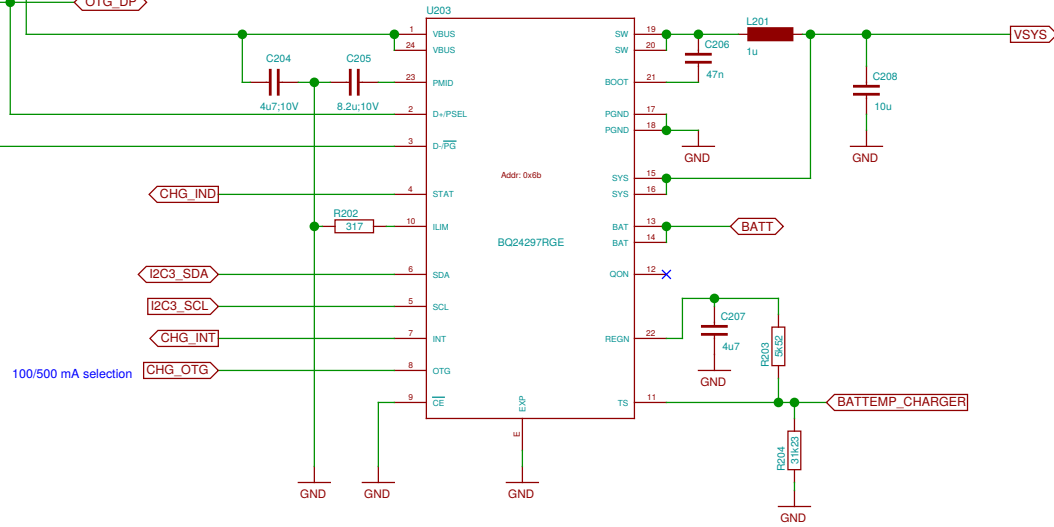
Signals that exist on both LOWER and UPPER (and maybe also BOB)  
have a \_U suffix on UPPER. No suffix is needed to distinguish  
between LOWER and BOB because all BOB components are on  
the same sheet and wires connecting them use sheet-local labels.

|                                            |                           |      |          |
|--------------------------------------------|---------------------------|------|----------|
| Sheet: /                                   |                           |      |          |
| File: neo900.sch                           |                           |      |          |
| Title: Neo900                              |                           |      |          |
| Size: A3                                   | Date: 2016-11-18 15:49:26 | Rev: |          |
| Plotted by eeshow e90e612+ 20161120-16:10Z |                           |      | Id: 1/25 |

### USB OTG connector

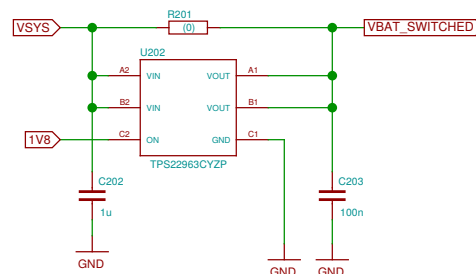


### Battery charger with USB OTG

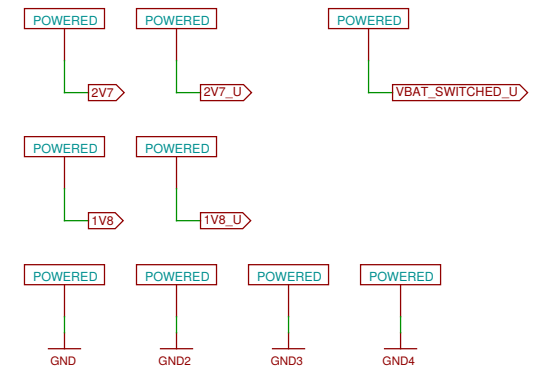


### Power distribution and sequencing

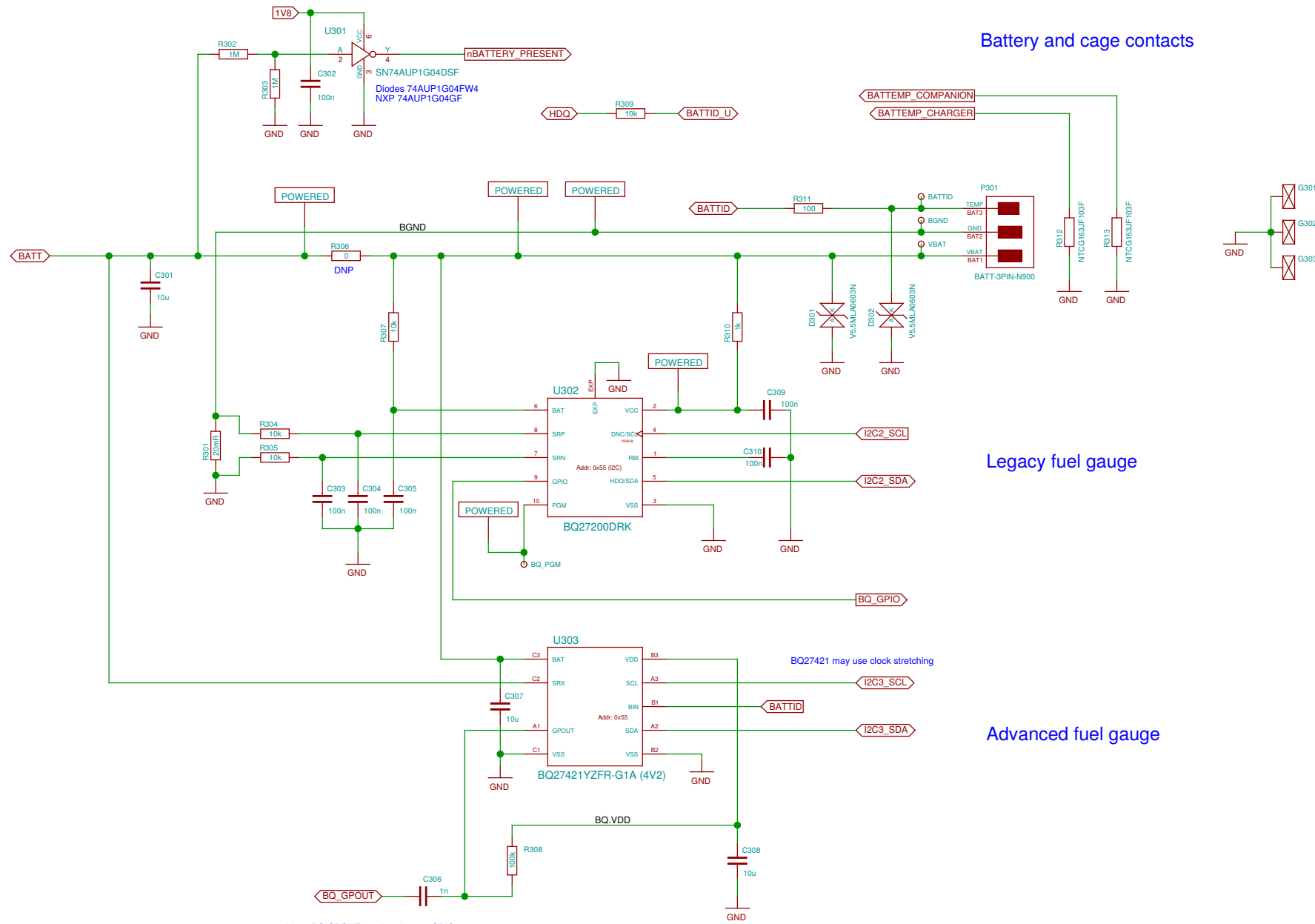
Most high-current consumers are on VBAT\_SWITCHED.  
1V8 signals that the regulators on UPPER are operational.



### KiCad bureaucracy



|                                            |                           |                   |  |
|--------------------------------------------|---------------------------|-------------------|--|
| Sheet: /Charger/OTG/                       |                           | File: charger.sch |  |
| Title: Charger/OTG                         |                           |                   |  |
| Size: A3                                   | Date: 2016-11-18 15:49:26 | Rev:              |  |
| Plotted by eeshow e90e612+ 20161120-16:10Z |                           | Id: 2/25          |  |



Battery and cage contacts

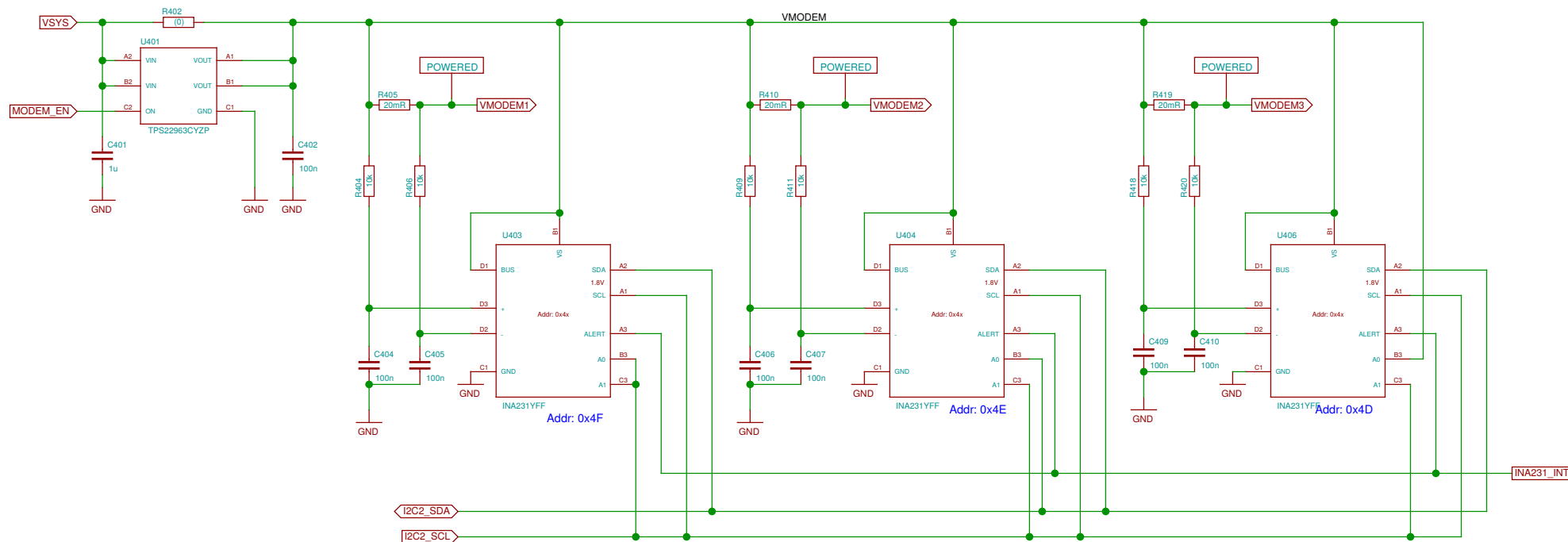
Legacy fuel gauge

Advanced fuel gauge

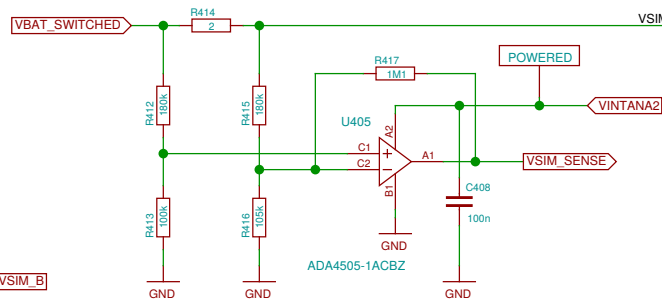
Note: BQ.GPOUT needs pull-up at GPIO.

|                   |  |                                            |  |
|-------------------|--|--------------------------------------------|--|
| Sheet: /Battery/  |  | Date: 2016-11-18 04:02:08                  |  |
| File: battery.sch |  | Rev: 3/25                                  |  |
| Title: Battery    |  | Plotted by eeshow e90e612+ 20161120-16:10Z |  |
| Size: A3          |  |                                            |  |

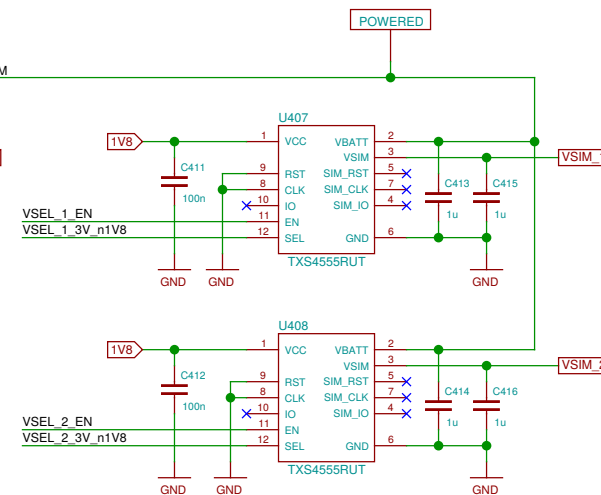
### Modem current monitor



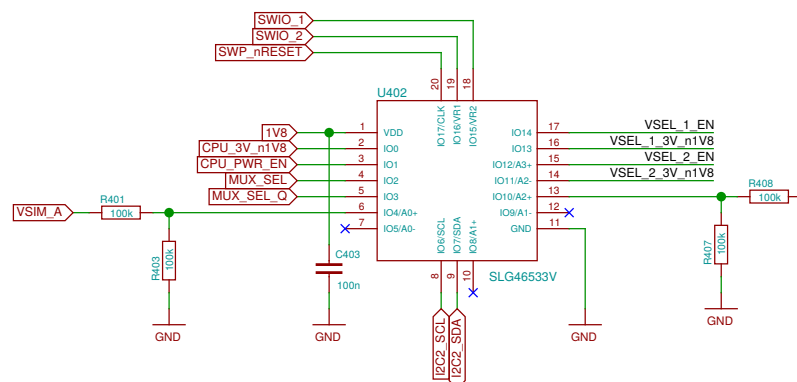
### SIM current sensing



### SIM power supply

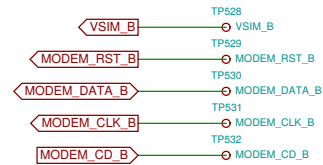


### SIM power selection

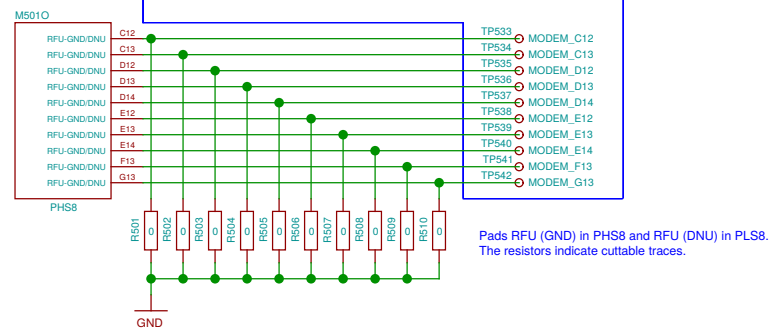
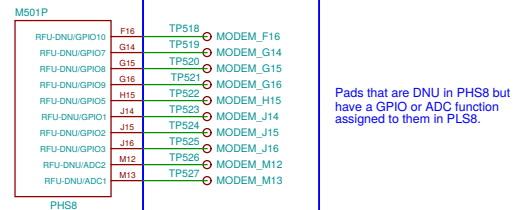
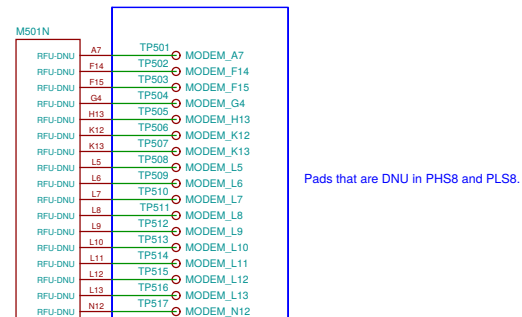


**TODO: update SLG design for changed pins**

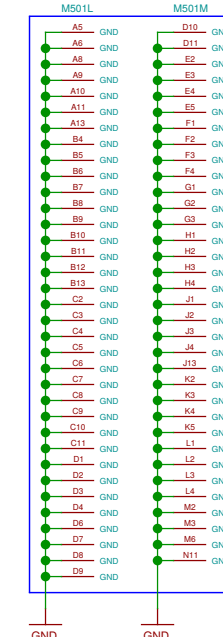
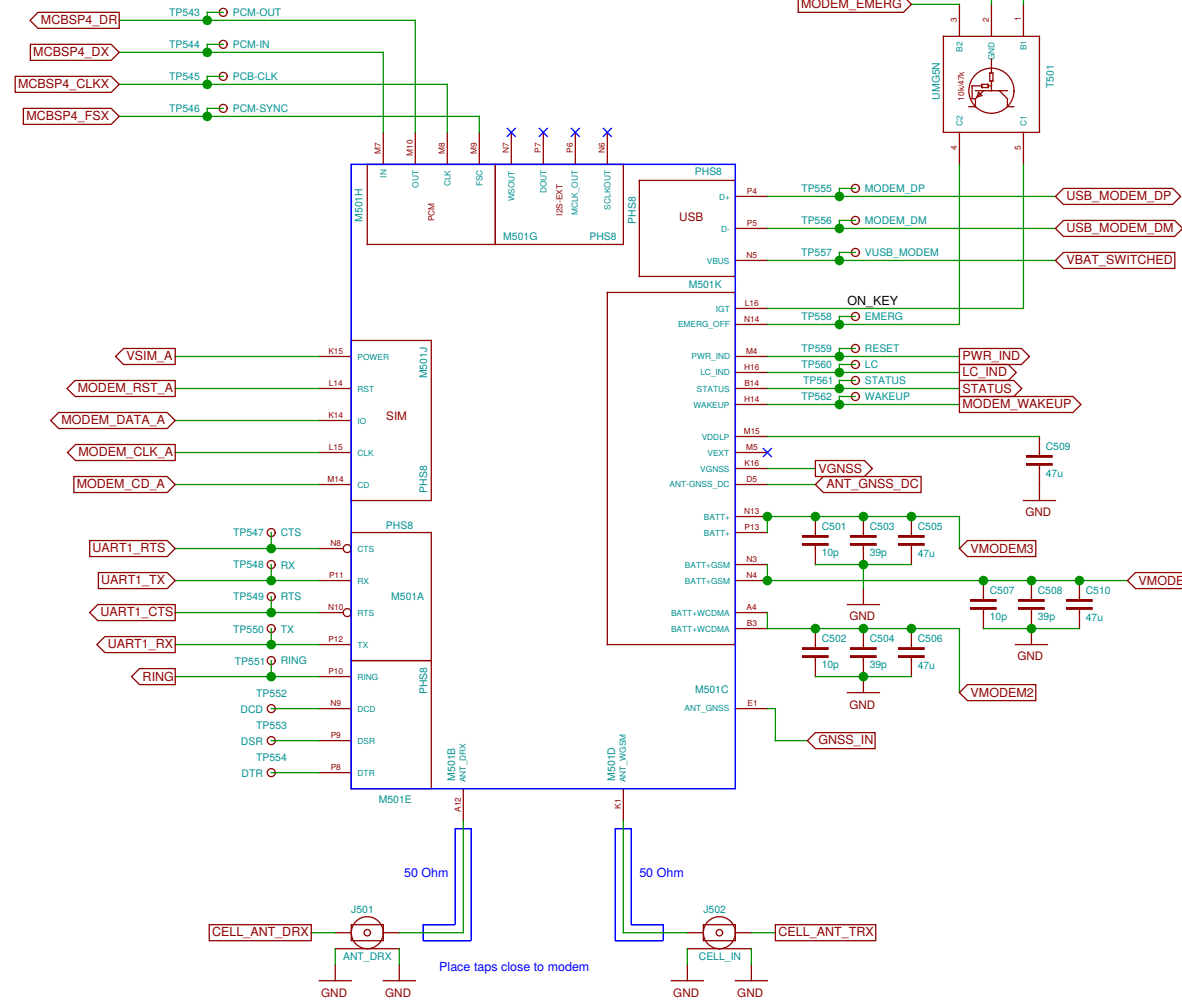
### SIM B bus



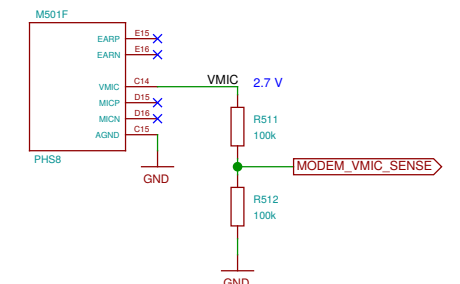
17+10+10 = 37 test points. PCB space permitting, to be arranged in a 6 x 6 + 1 grid with 1.0 mm pitch. This patch field is to be placed adjacent to the SIM B bus test points.

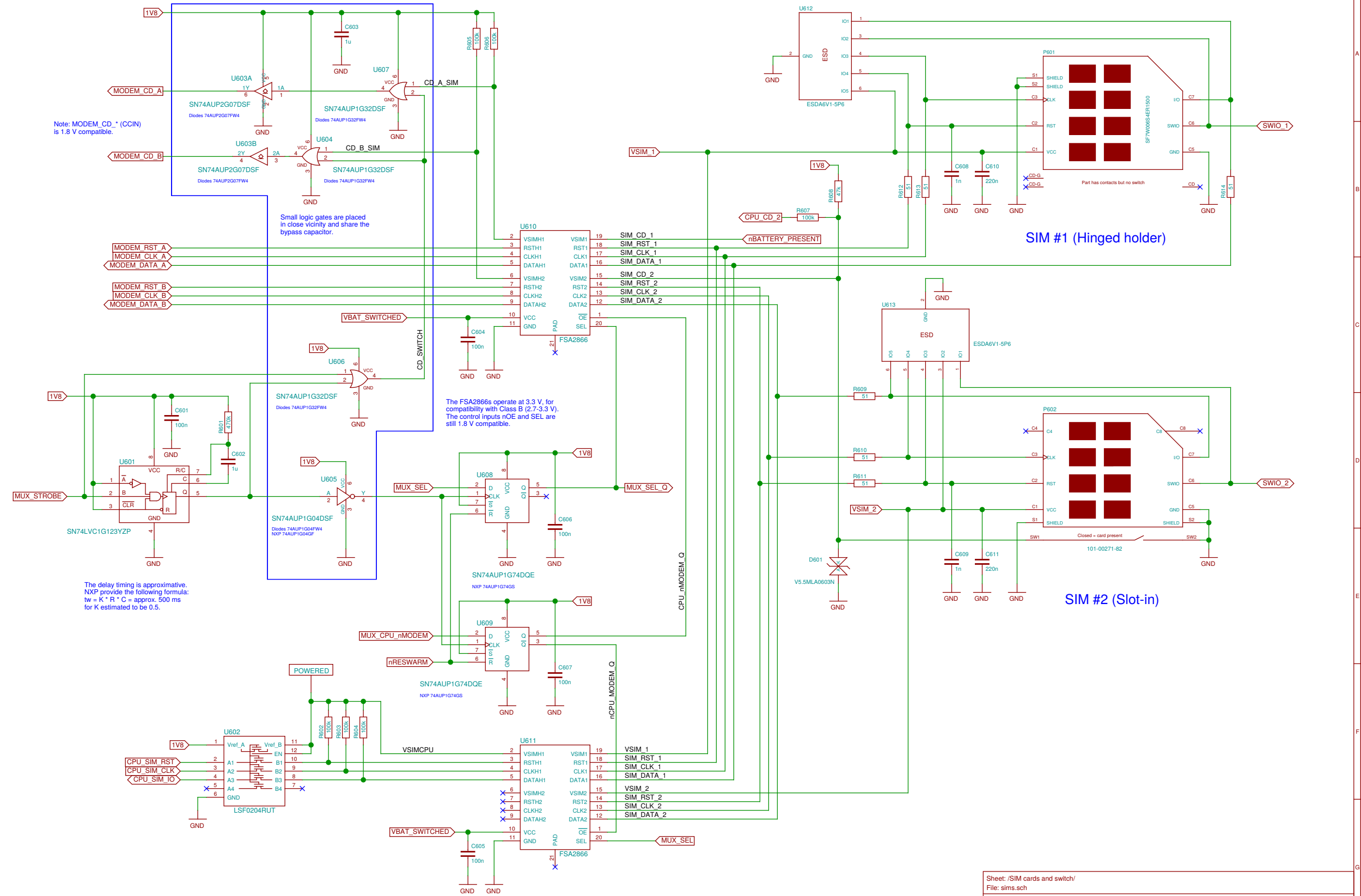


### Modem (module)



### Anti-eavesdropping





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

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

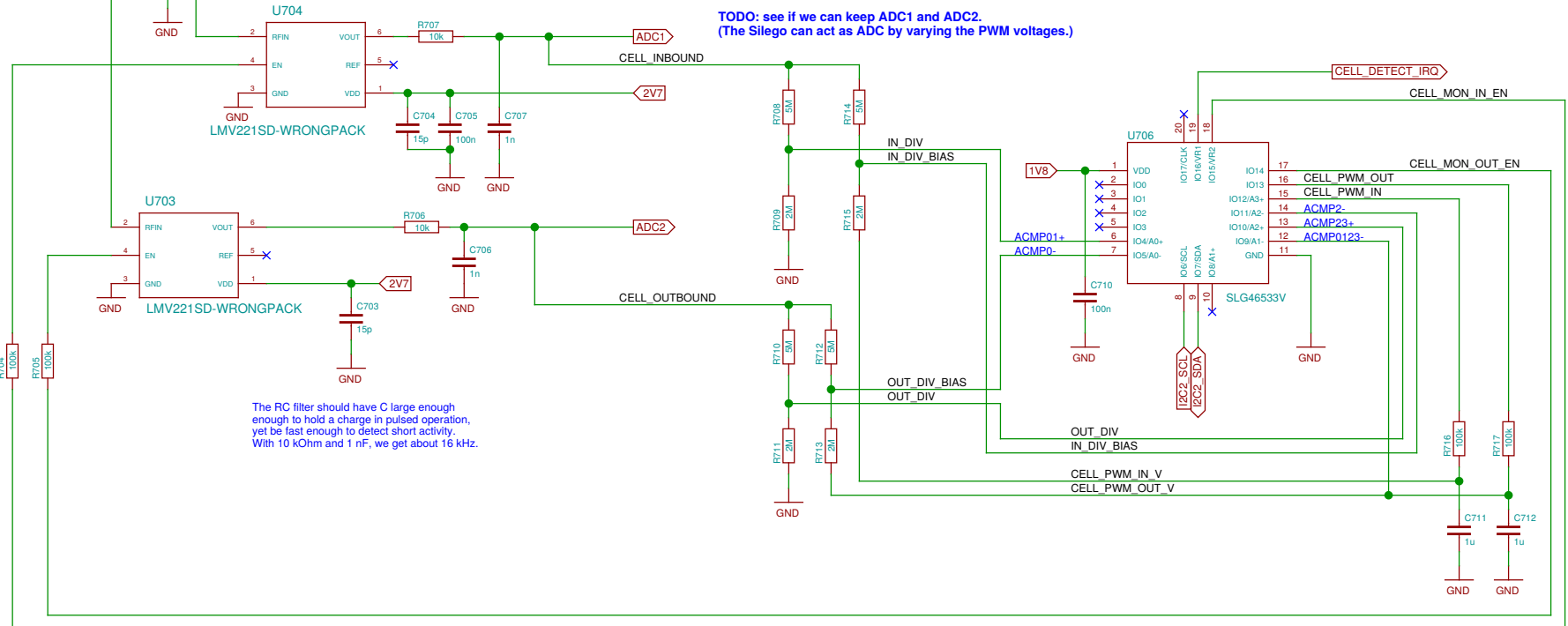
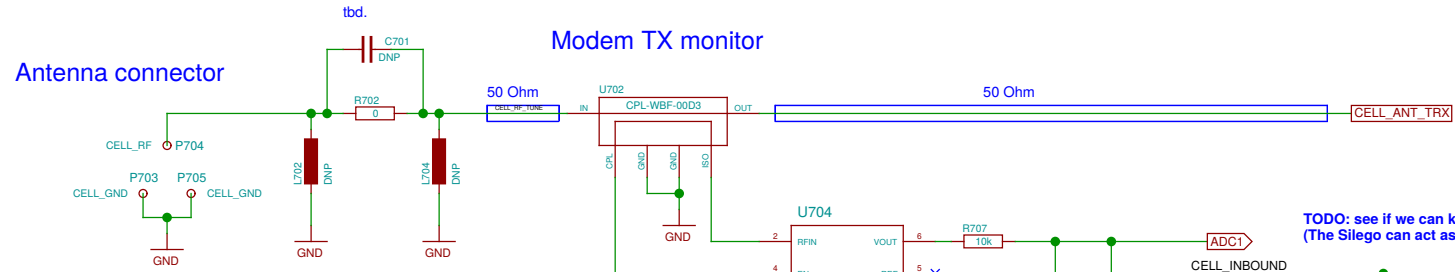
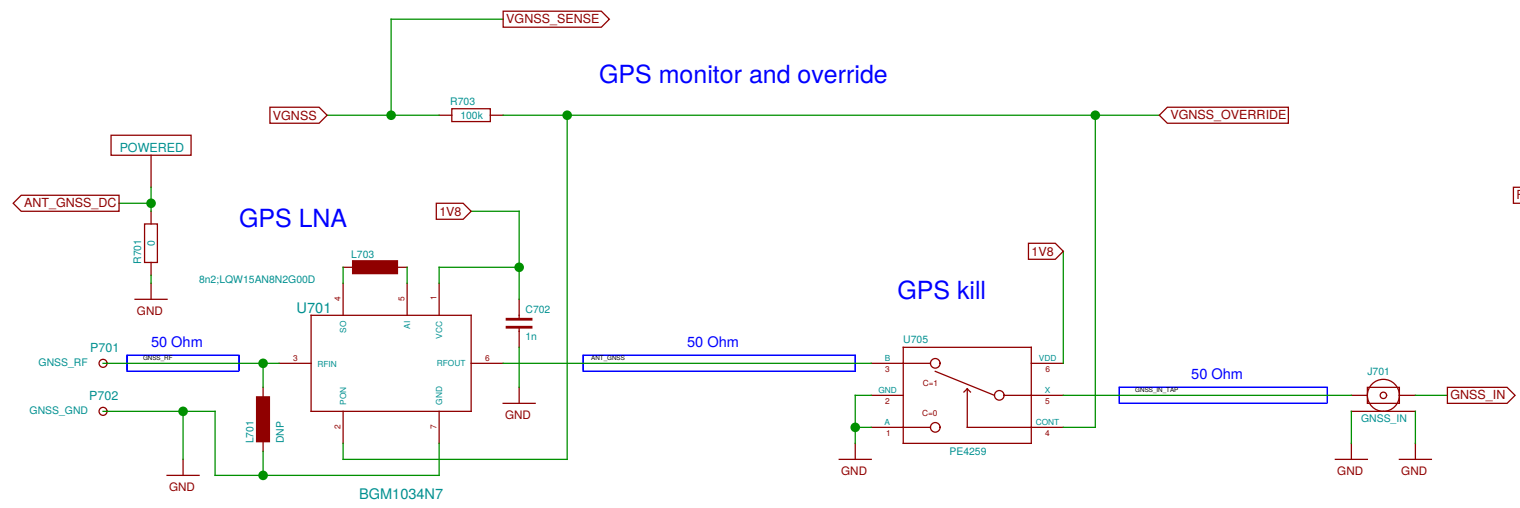
The FSA2866s operate at 3.3 V, for compatibility with Class B (2.7-3.3 V). The control inputs nOE and SEL are still 1.8 V compatible.

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)

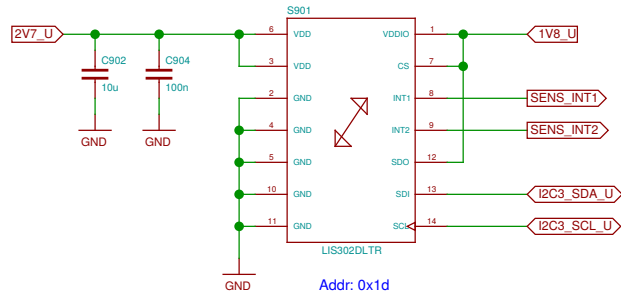
|                                                 |                           |          |
|-------------------------------------------------|---------------------------|----------|
| Sheet: /SIM cards and switch/<br>File: sims.sch |                           |          |
| Title: SIM cards and switch                     |                           |          |
| Size: A3                                        | Date: 2016-11-21 23:56:50 | Rev:     |
| Plotted by eeshow e90e812+ 20161120-16:10Z      |                           | Id: 6/25 |



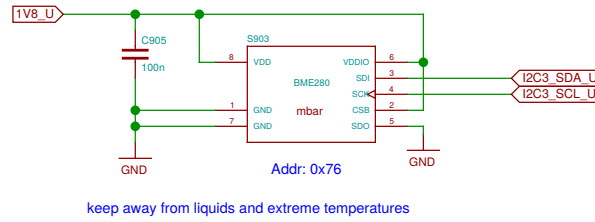




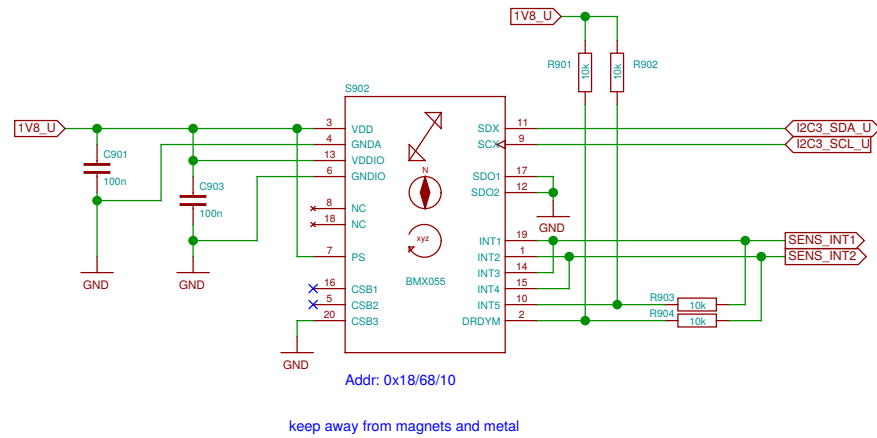
### Acceleration (legacy)



### Pressure, humidity

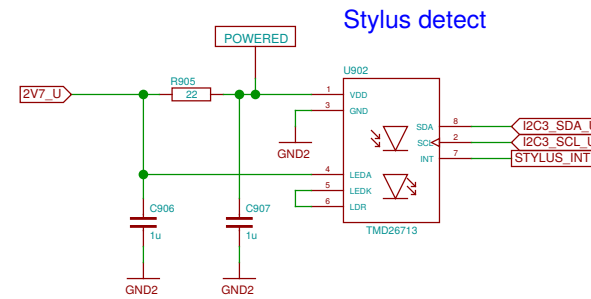


### 9-axis (acceleration, gyroscope, magnetometer)

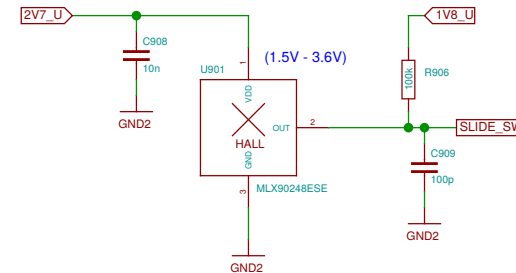


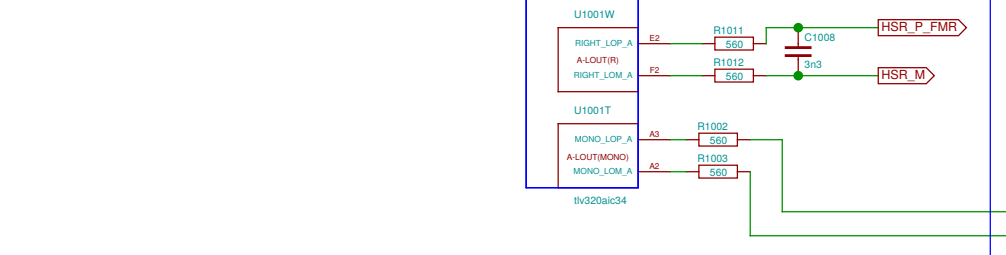
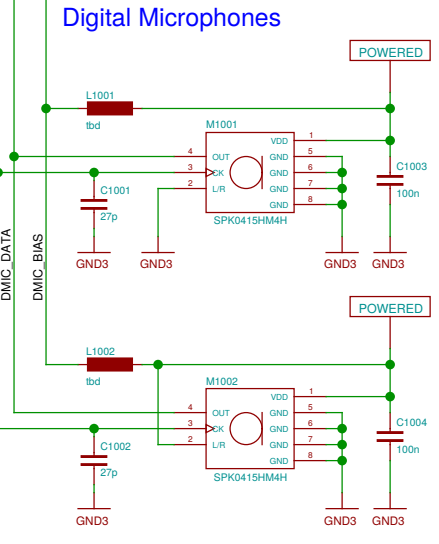
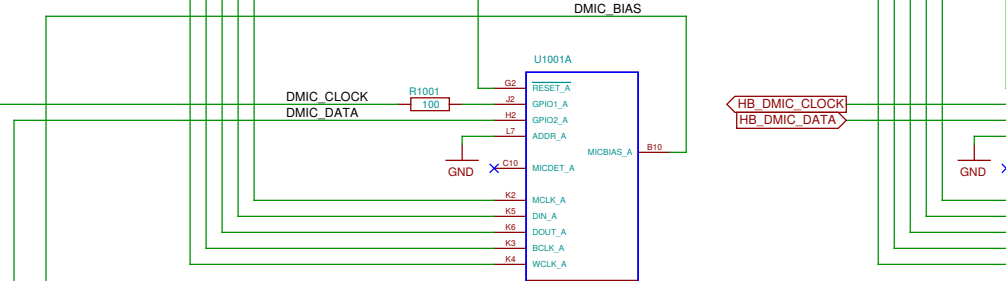
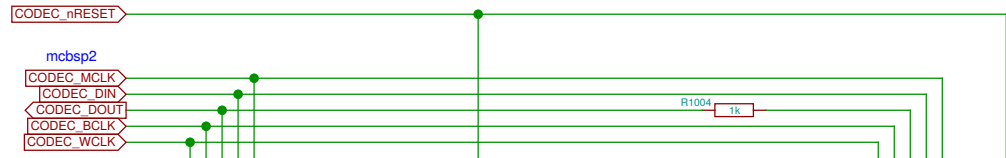
### UPPER LOWER

### Stylus detect

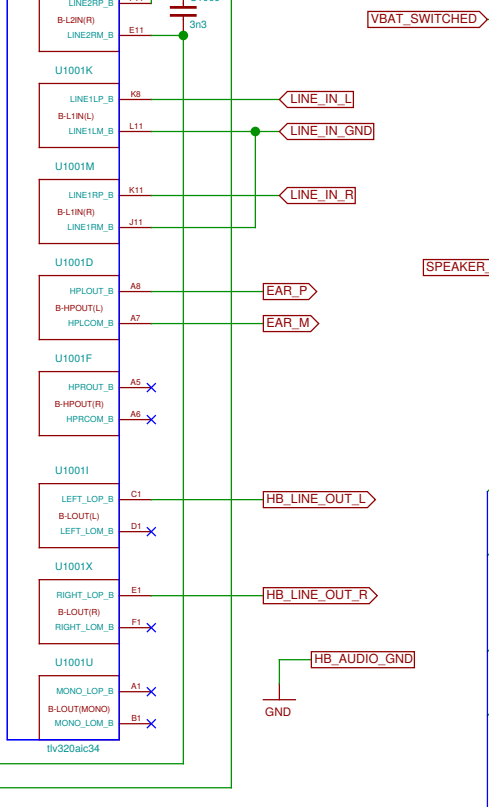
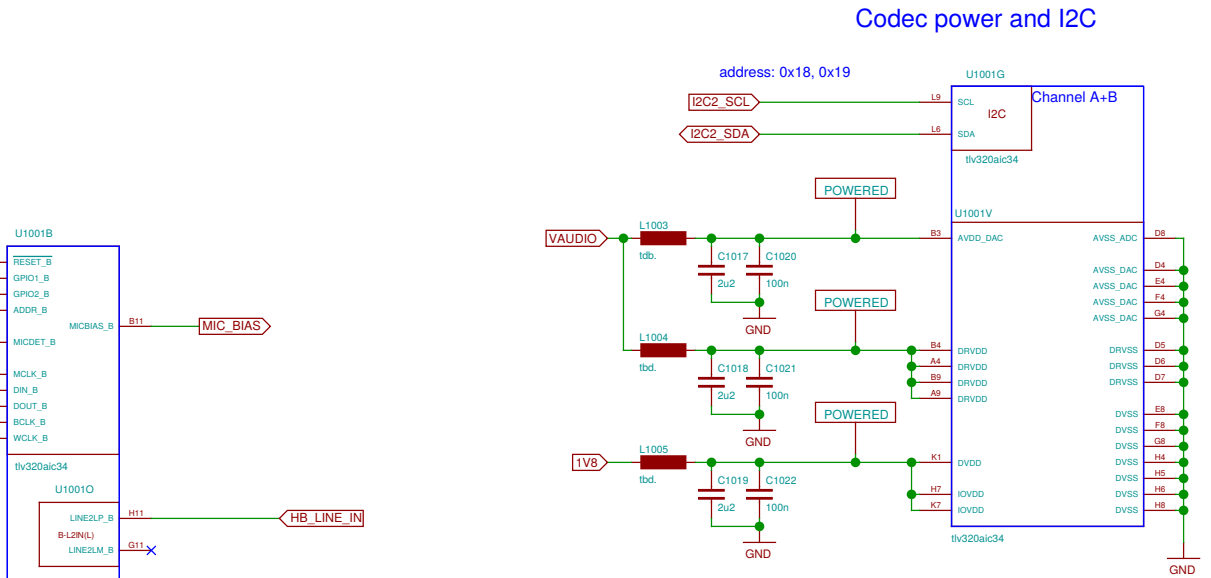


### Slide sensor

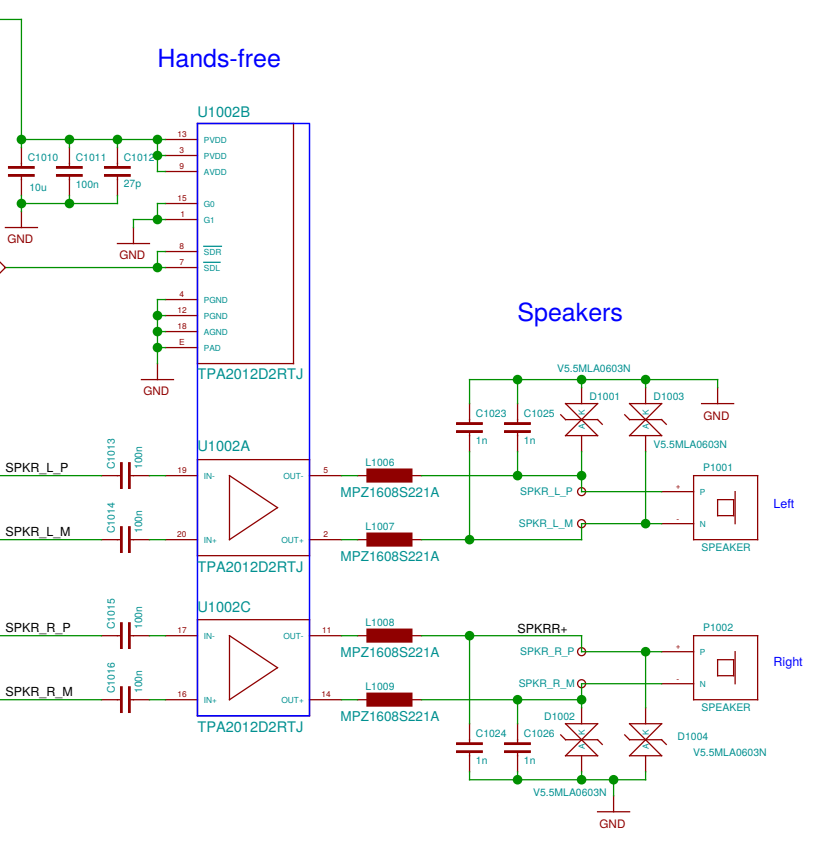




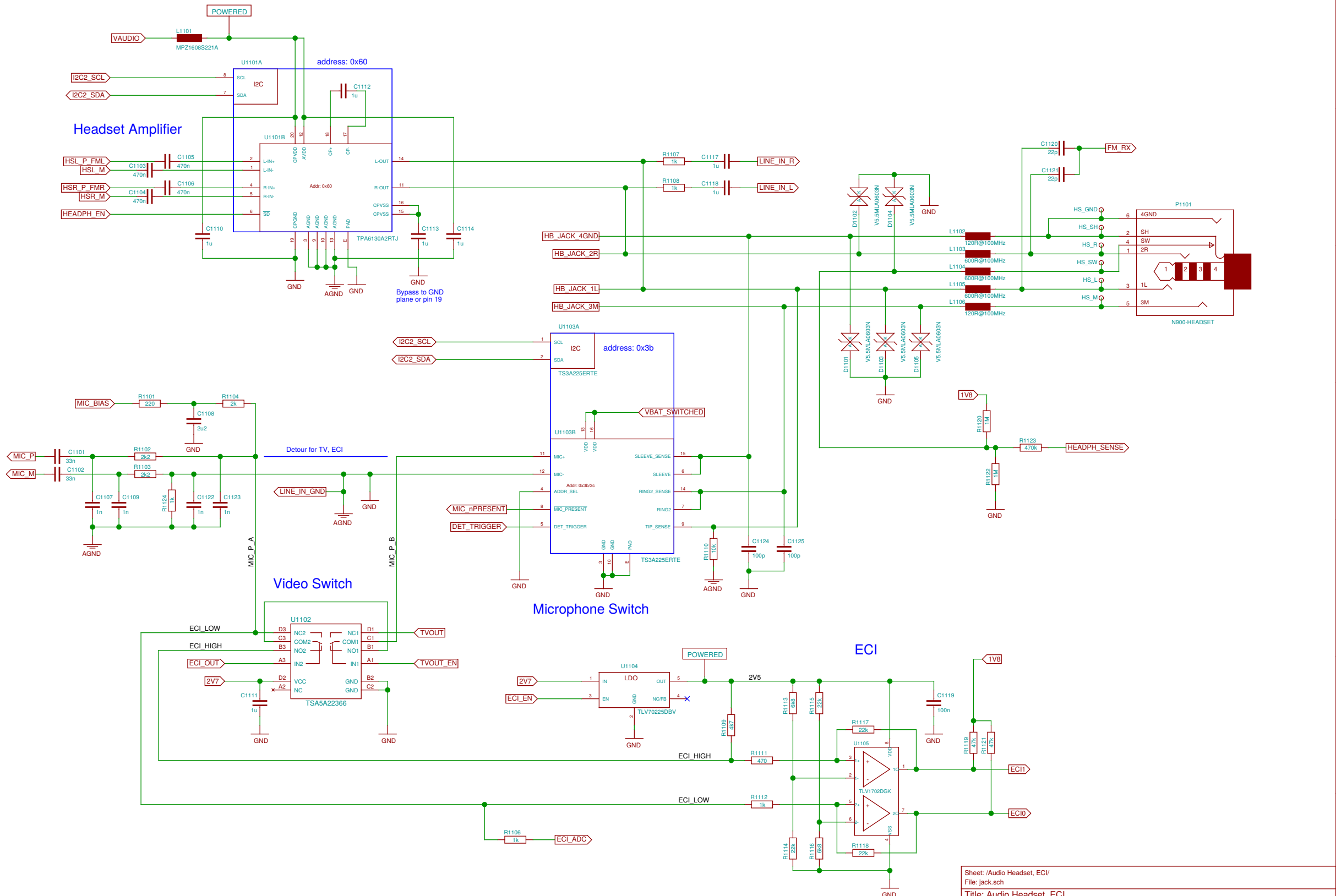
Codec



Codec

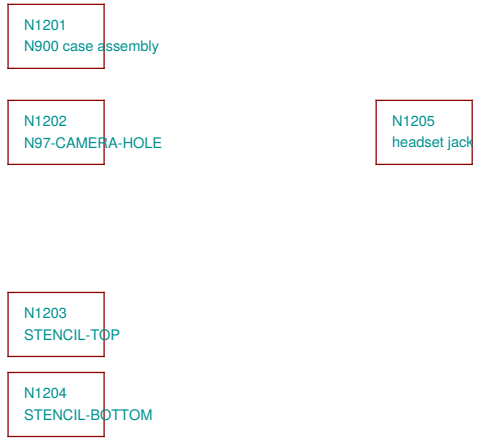


|                      |                           |                                            |           |
|----------------------|---------------------------|--------------------------------------------|-----------|
| Sheet: /Audio Codec/ |                           | Date: 2016-11-18 15:49:26                  |           |
| File: codec.sch      |                           | Rev: 1                                     |           |
| Title: Audio Codec   |                           | Plotted by eeshow e90e812+ 20161120-16:10Z |           |
| Size: A3             | Date: 2016-11-18 15:49:26 | Rev: 1                                     | Id: 10/25 |

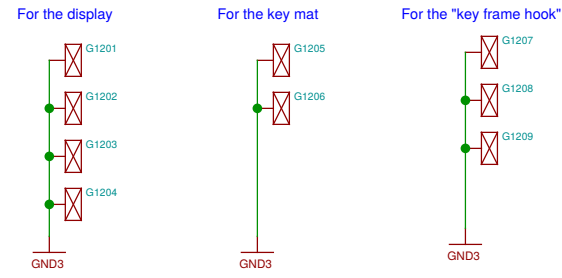


|                             |                           |                 |  |
|-----------------------------|---------------------------|-----------------|--|
| Sheet: /Audio Headset, ECI/ |                           | File: jack.sch  |  |
| Title: Audio Headset, ECI   |                           |                 |  |
| Size: A3                    | Date: 2016-11-18 15:49:26 | Rev:            |  |
| Plotted by: eeshow e90e812* |                           | 20161120-16:10Z |  |
| Id: 11/25                   |                           |                 |  |

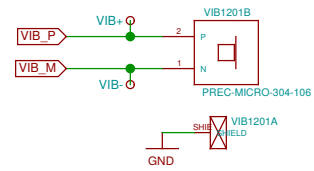
### No-Solder Components



### Shield Contacts on UPPER

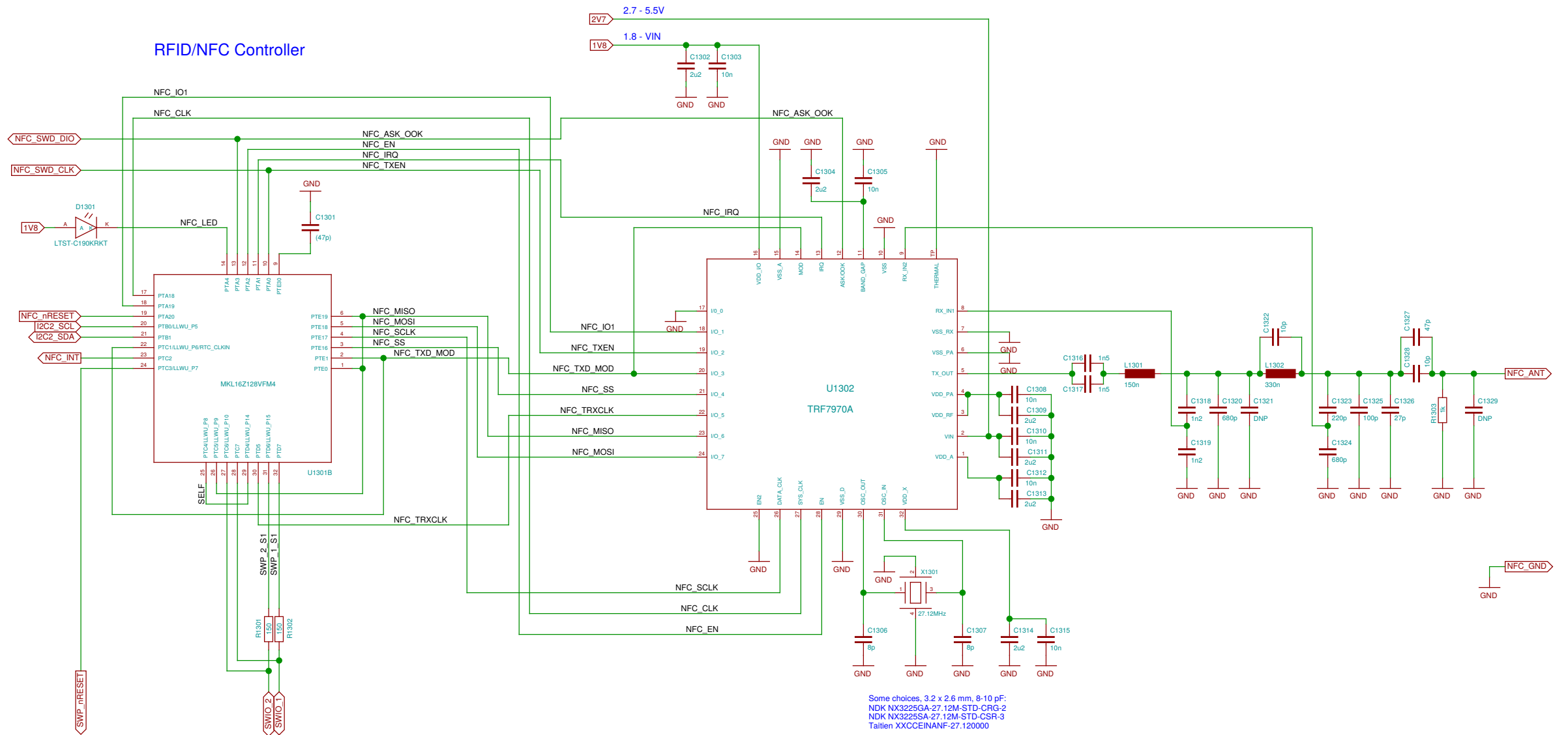


### Vibramotor

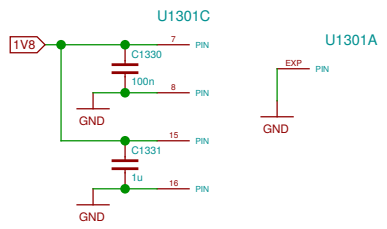


|                                            |                           |           |
|--------------------------------------------|---------------------------|-----------|
| Sheet: /Misc/                              |                           |           |
| File: misc.sch                             |                           |           |
| Title: Misc                                |                           |           |
| Size: A3                                   | Date: 2016-11-18 15:49:26 | Rev:      |
| Plotted by eeshow e90e612+ 20161120-16:10Z |                           | Id: 12/25 |

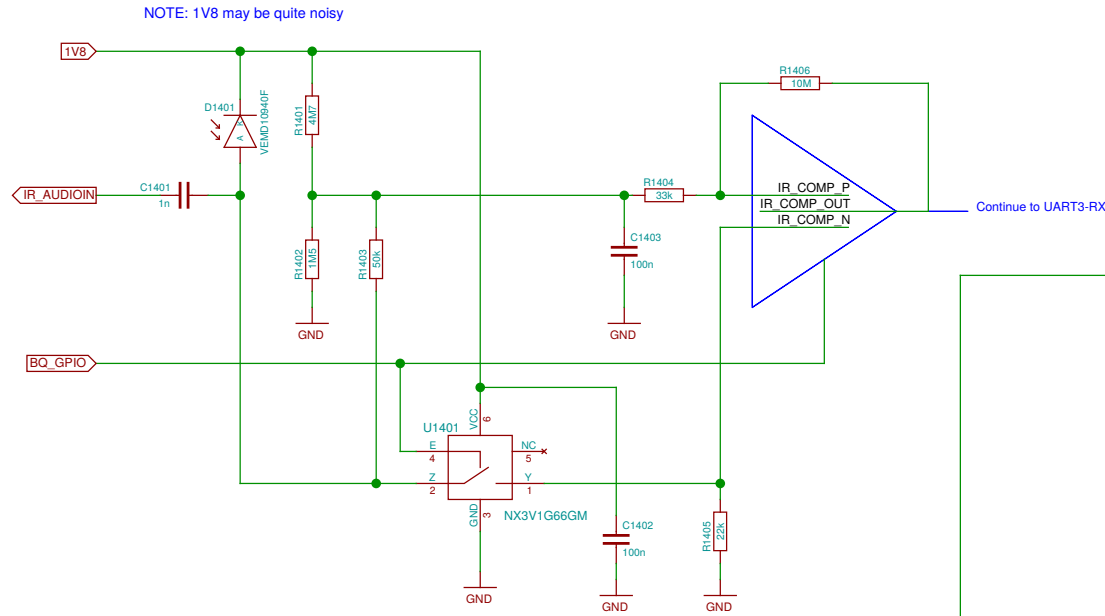
# RFID/NFC Transceiver



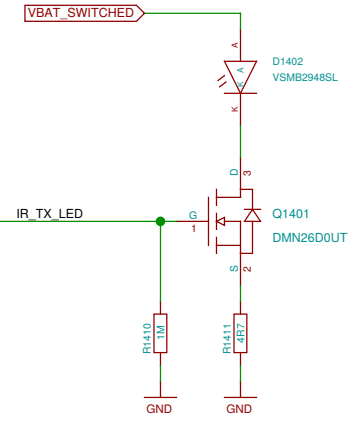
Some choices, 3.2 x 2.6 mm, 8-10 pF:  
 NDK NX3225GA-27.12M-STD-CRG-2  
 NDK NX3225SA-27.12M-STD-CSR-3  
 Tallien XXCCEINANF-27.120000



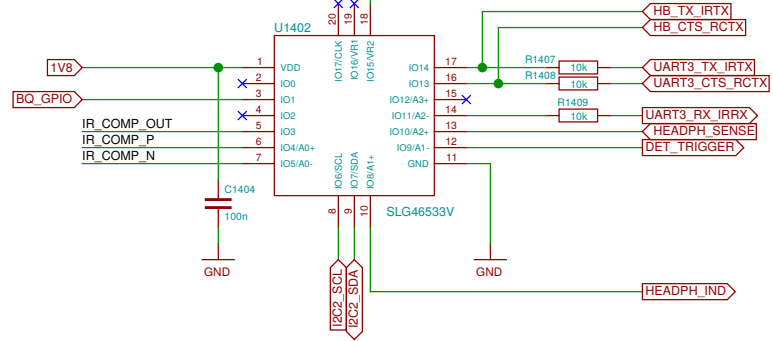
### IR receiver



### IR transmitter



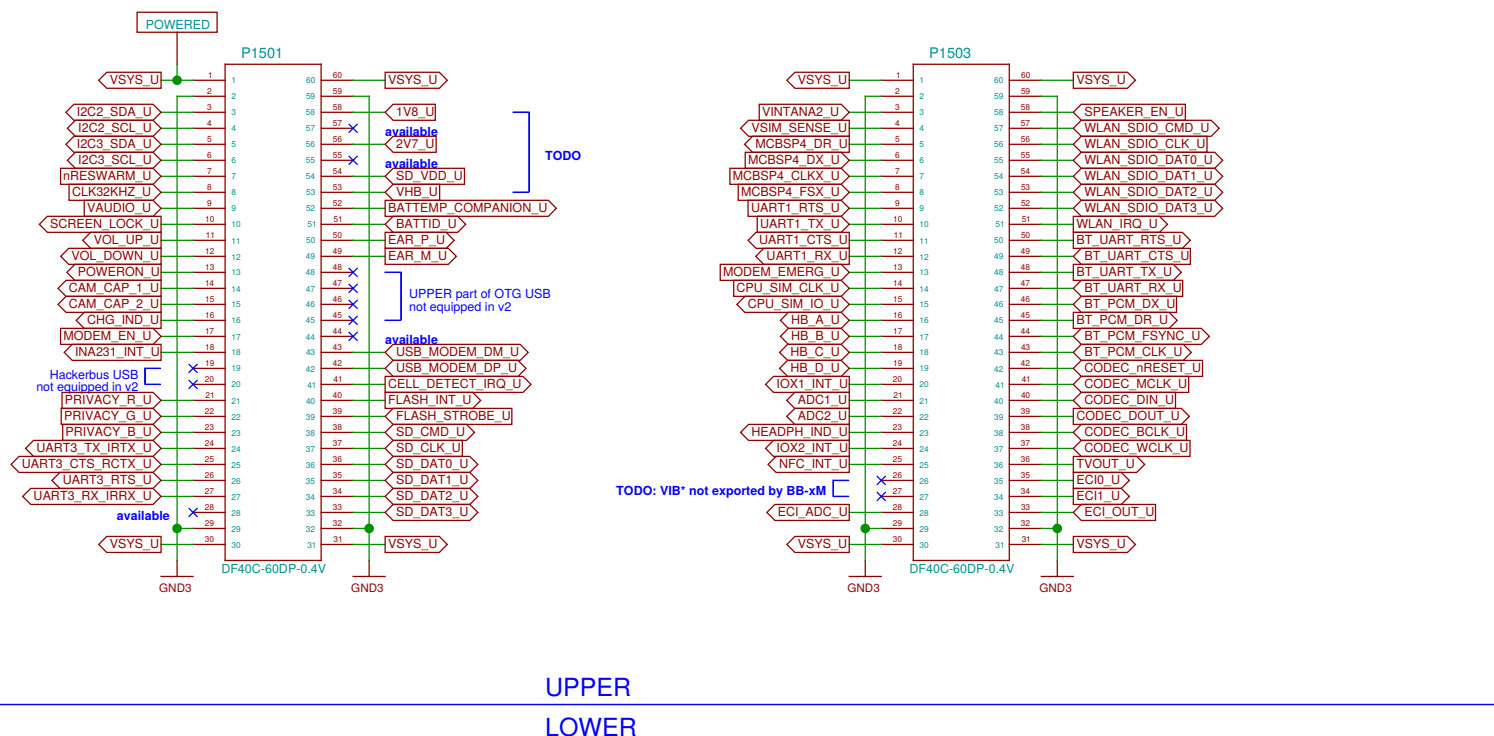
### IR send/receive logic



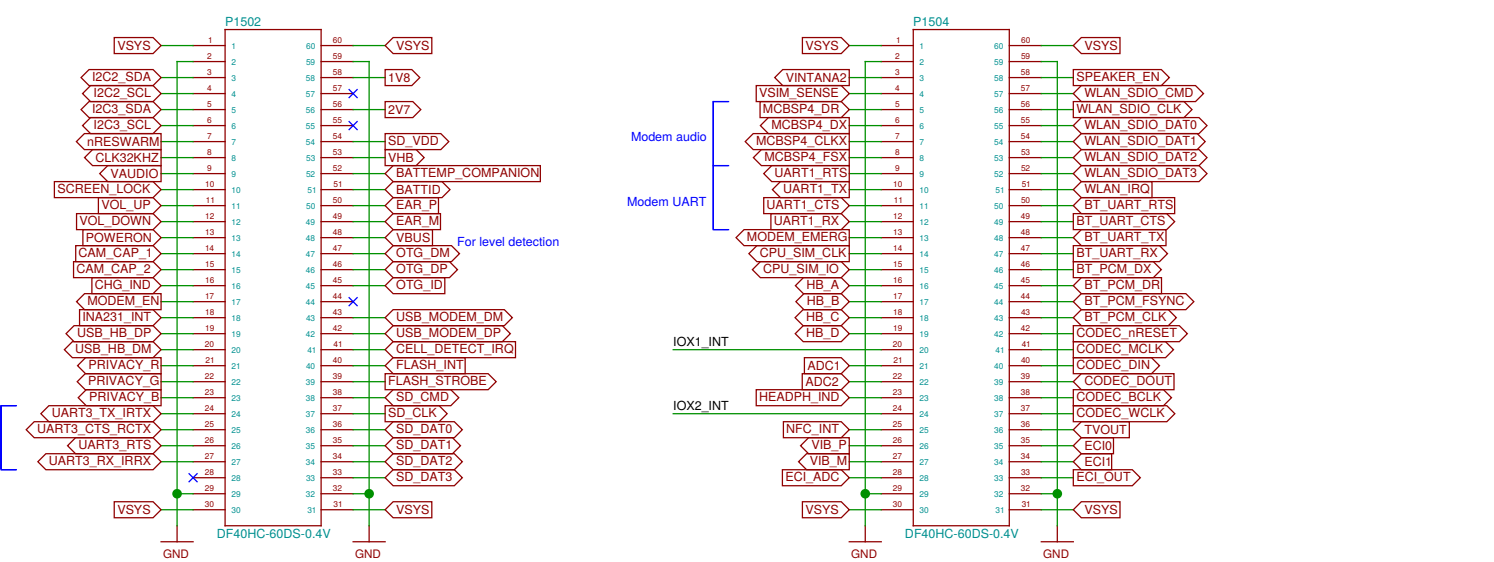
**TODO: update D1401 footprint**

|                                            |                           |              |  |
|--------------------------------------------|---------------------------|--------------|--|
| Sheet: /Infrared/                          |                           | File: ir.sch |  |
| Title: Infrared                            |                           |              |  |
| Size: A3                                   | Date: 2016-11-18 15:48:54 | Rev:         |  |
| Plotted by eeshow e90e612+ 20161120-16:10Z |                           | Id: 14/25    |  |

# This is just the collection of signals we have. Proper assignment still pending.

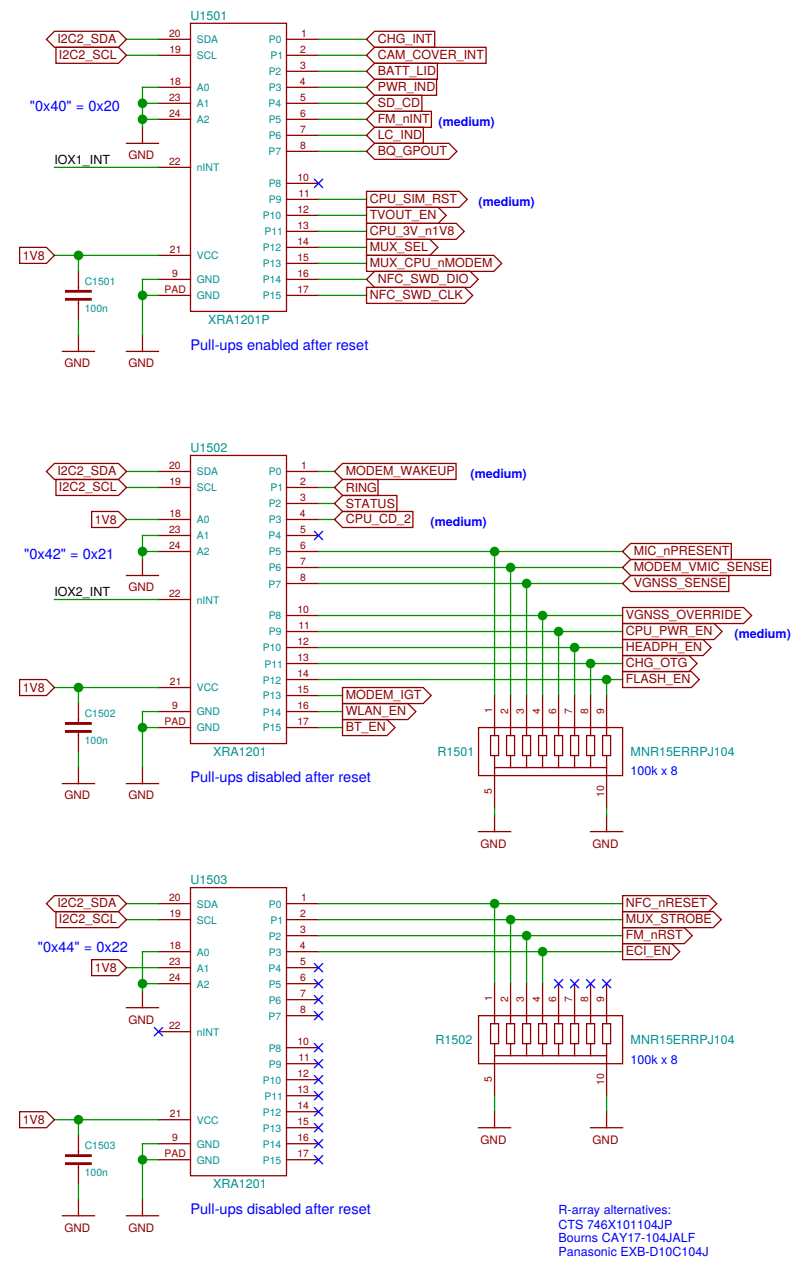


UPPER  
LOWER



Current rating per contact: 0.3 A

## IO expanders (on LOWER)

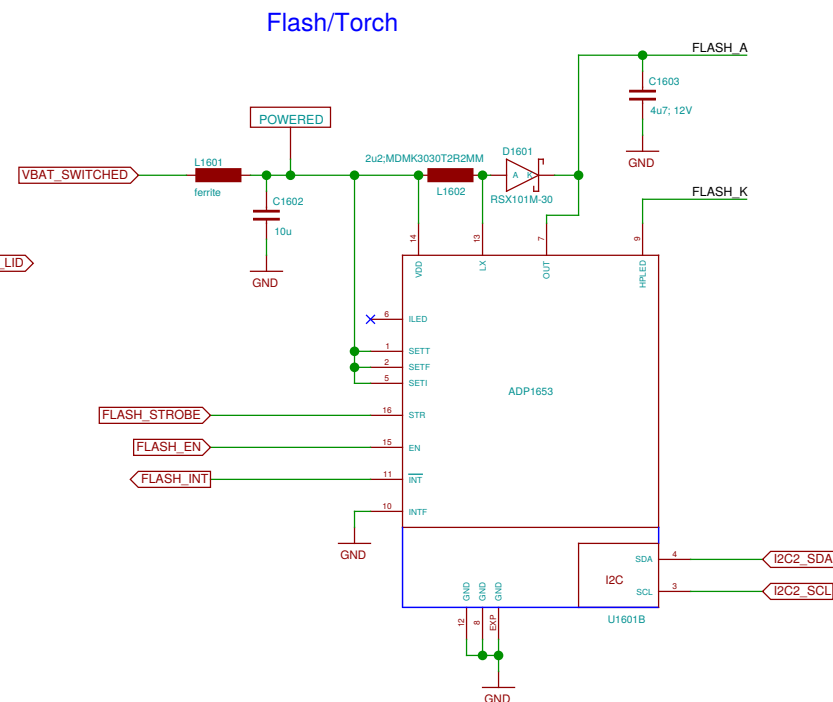
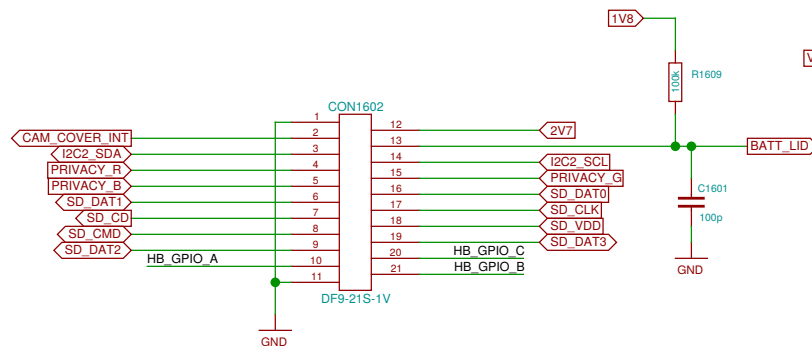
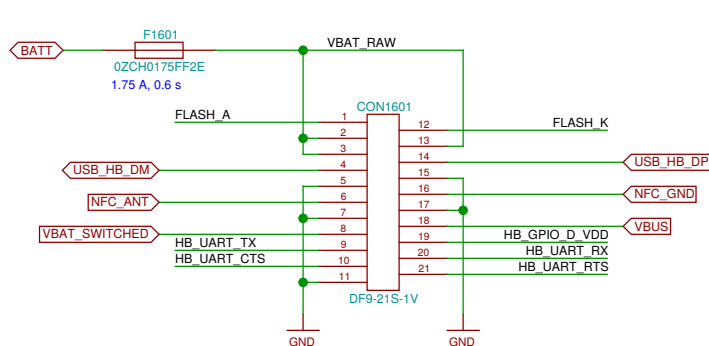


R-array alternatives:  
CTS 746X101104JP  
Bourns CAY17-104JALF  
Panasonic EXB-D10C104J

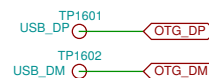
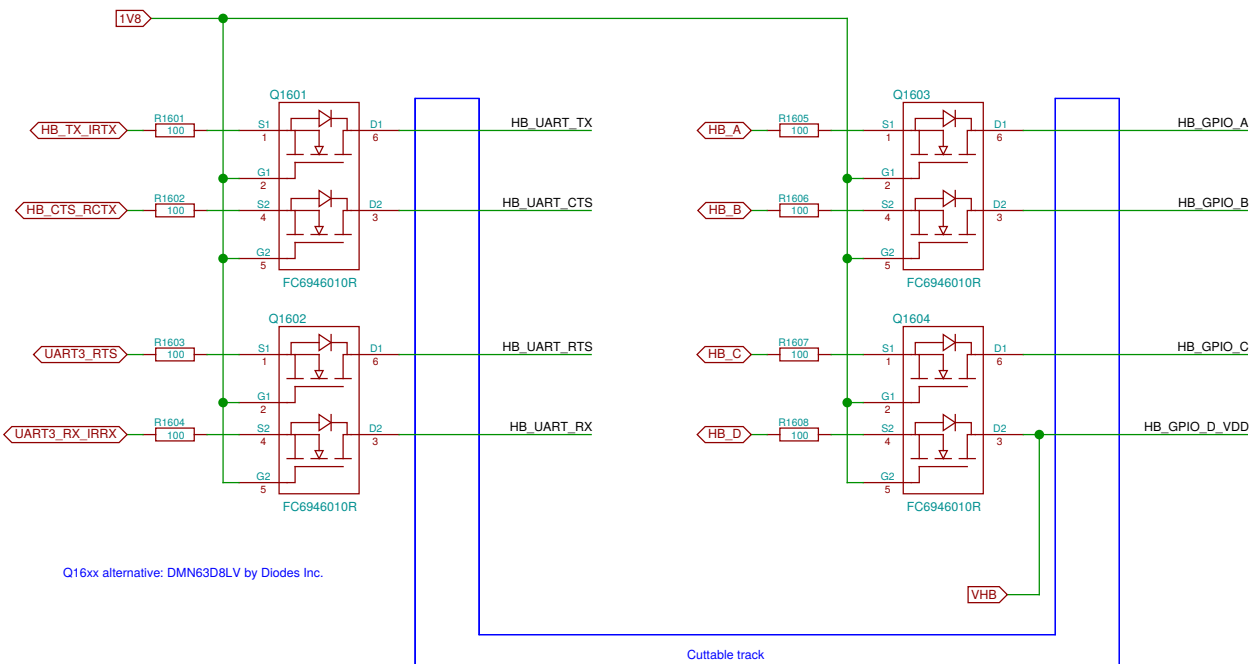
|                                           |                           |
|-------------------------------------------|---------------------------|
| Sheet: /B2B LOWER-UPPER/<br>File: b2b.sch |                           |
| Title: B2B LOWER-UPPER                    |                           |
| Size: A3                                  | Date: 2016-11-18 15:48:54 |
| Plotted by: eeshow e90e812                | 20161120-16:10:2          |
| Rev:                                      | Id: 15/25                 |

## LOWER-BOB Interconnect (LOWER side)

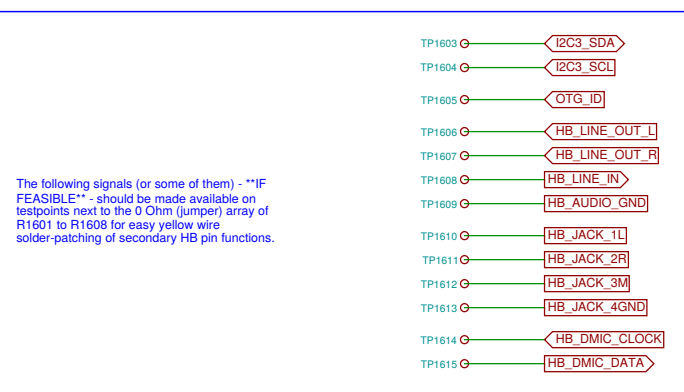
Defined in the Hackerbus specification, <http://neo900.org/stuff/papers/hb.pdf>



## Level shifters for Hackerbus GPIO and UART

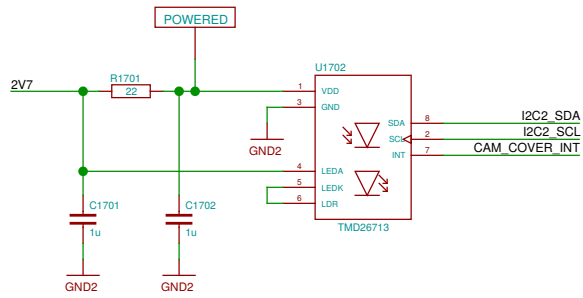


## Patch field

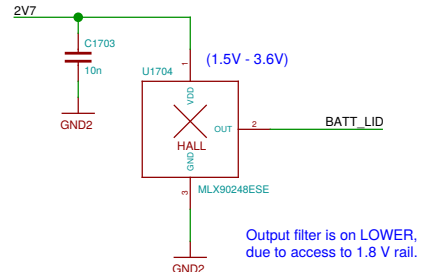




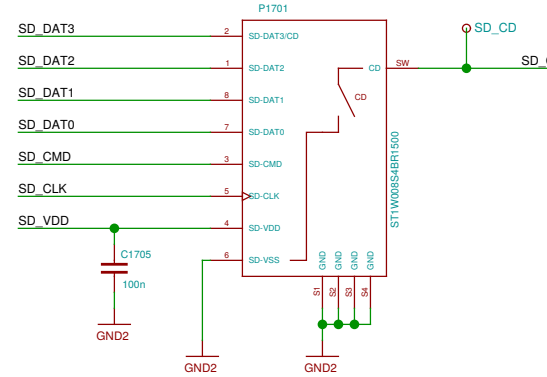
### Camera Cover detect



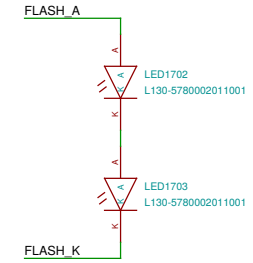
### Battery Cover detect



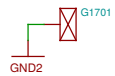
### Memory card holder



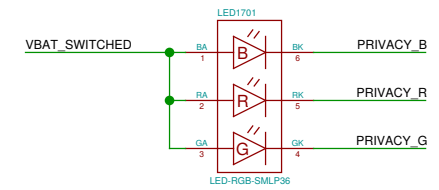
### Camera flash



### Camera lens plate

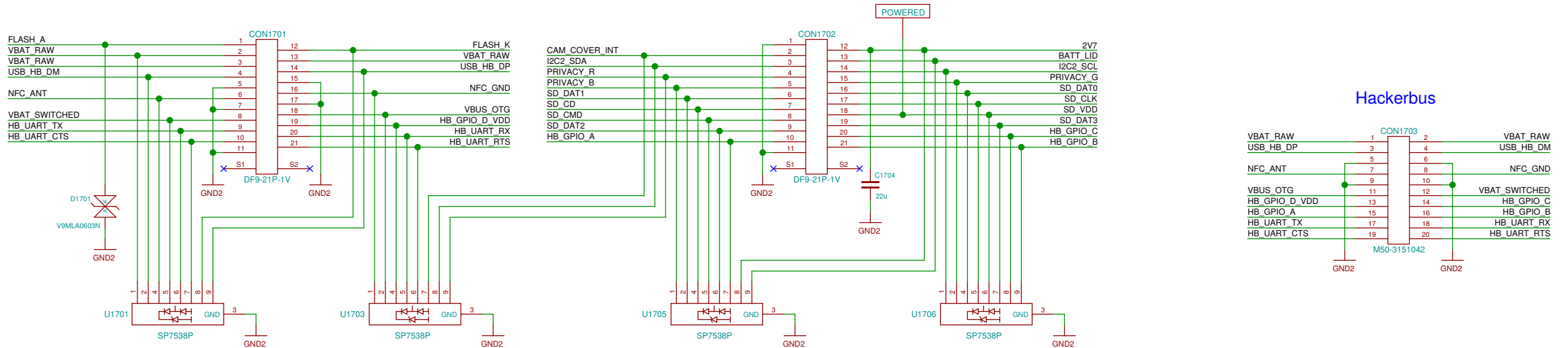


### Privacy LED



### LOWER-BOB Interconnect (BOB side)

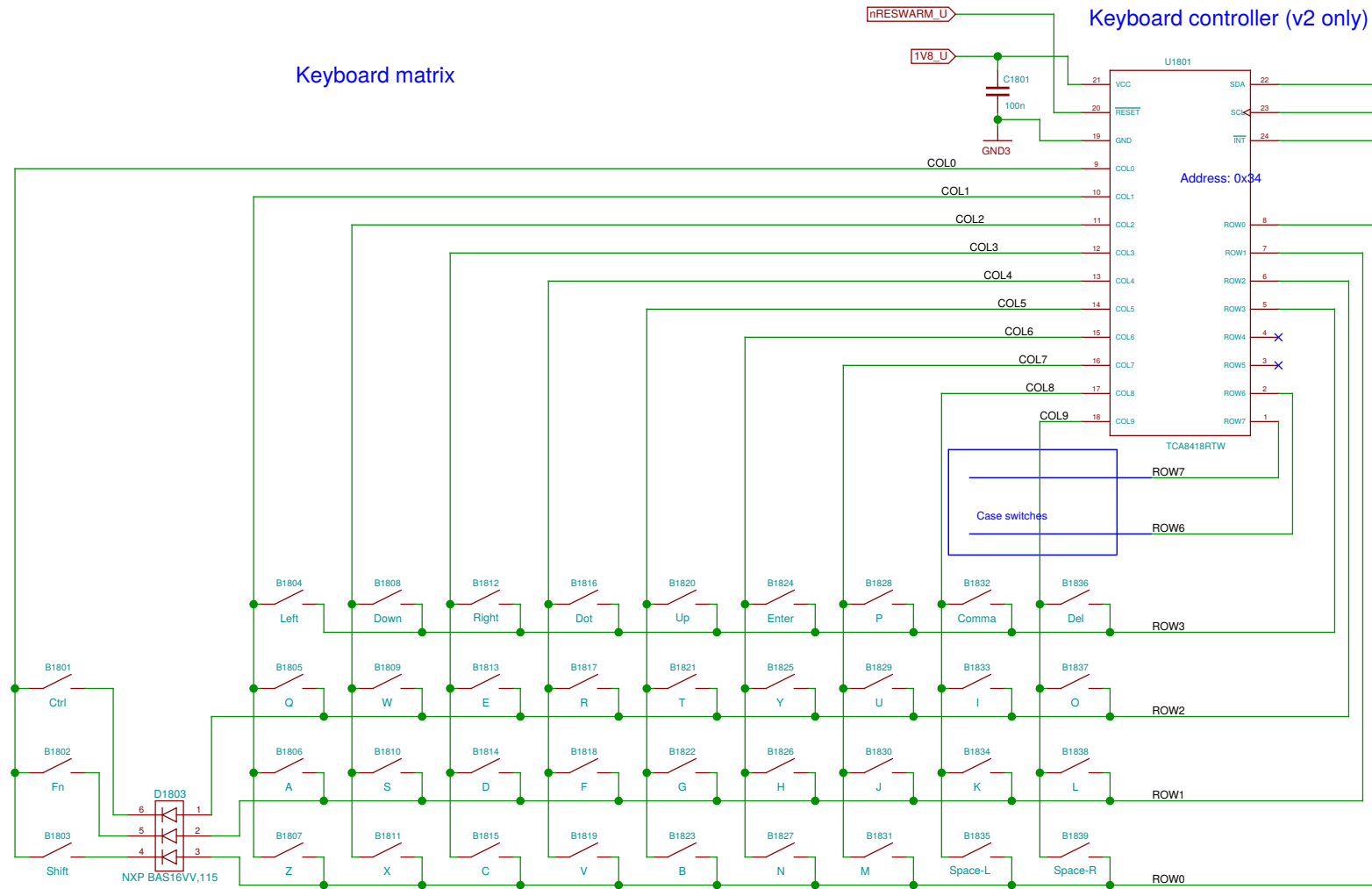
Defined in the Hackerbus specification, <http://neo900.org/stuff/papers/hb.pdf>



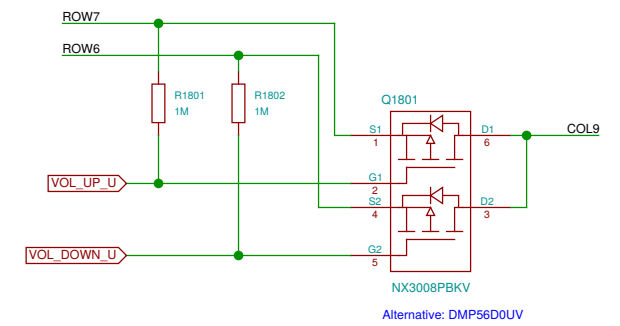
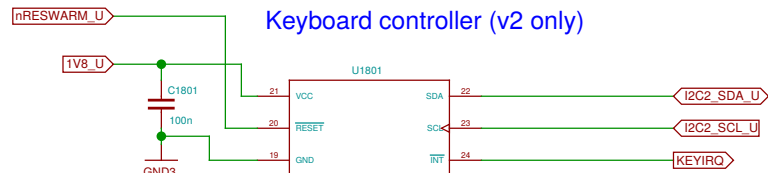
**ESD pin assignment is only indicative.  
Actual assignment to be defined by layout.**

|                                              |                           |           |
|----------------------------------------------|---------------------------|-----------|
| Sheet: /uSD Breakout Board/<br>File: bob.sch |                           |           |
| Title: uSD Breakout Board                    |                           |           |
| Size: A3                                     | Date: 2016-11-20 14:27:47 | Rev:      |
| Plotted by eeshow e90e812+ 20161120-16:10Z   |                           | Id: 17/25 |

# Keyboard matrix



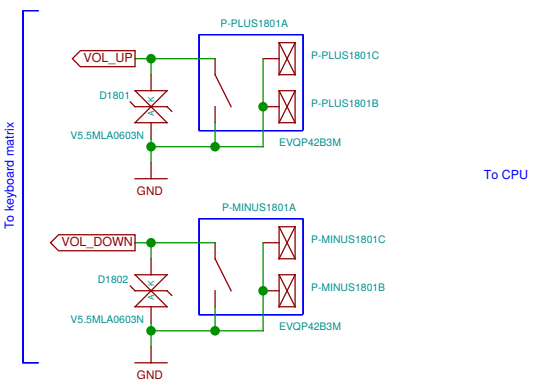
## Keyboard controller (v2 only)



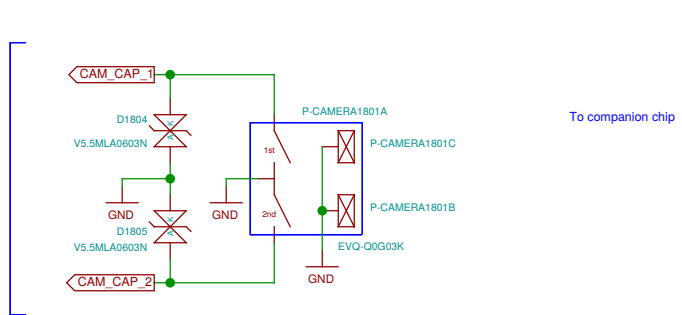
Alternative: Diodes Inc. BAS16VV-7  
Warning: Diodes Inc. have cathodes on pin 1 side, NXP anodes!

UPPER  
LOWER

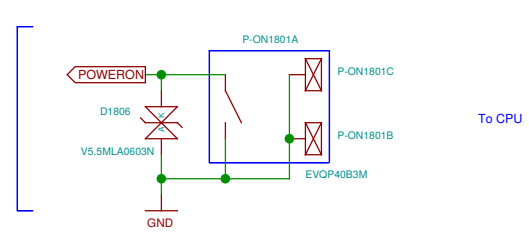
### Volume



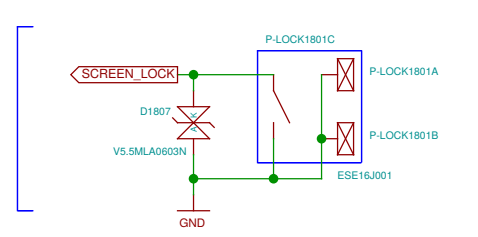
### Camera trigger



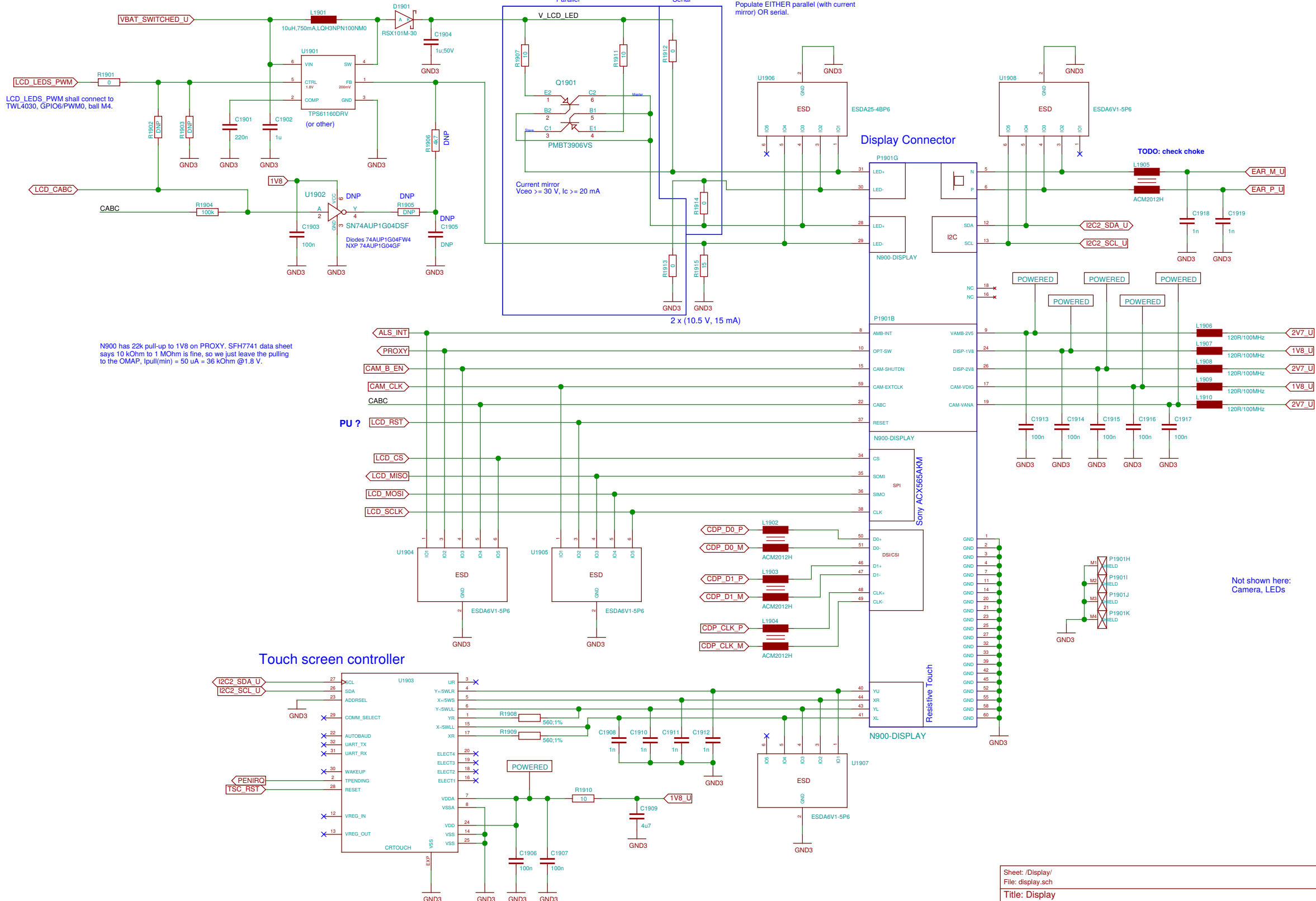
### On-off



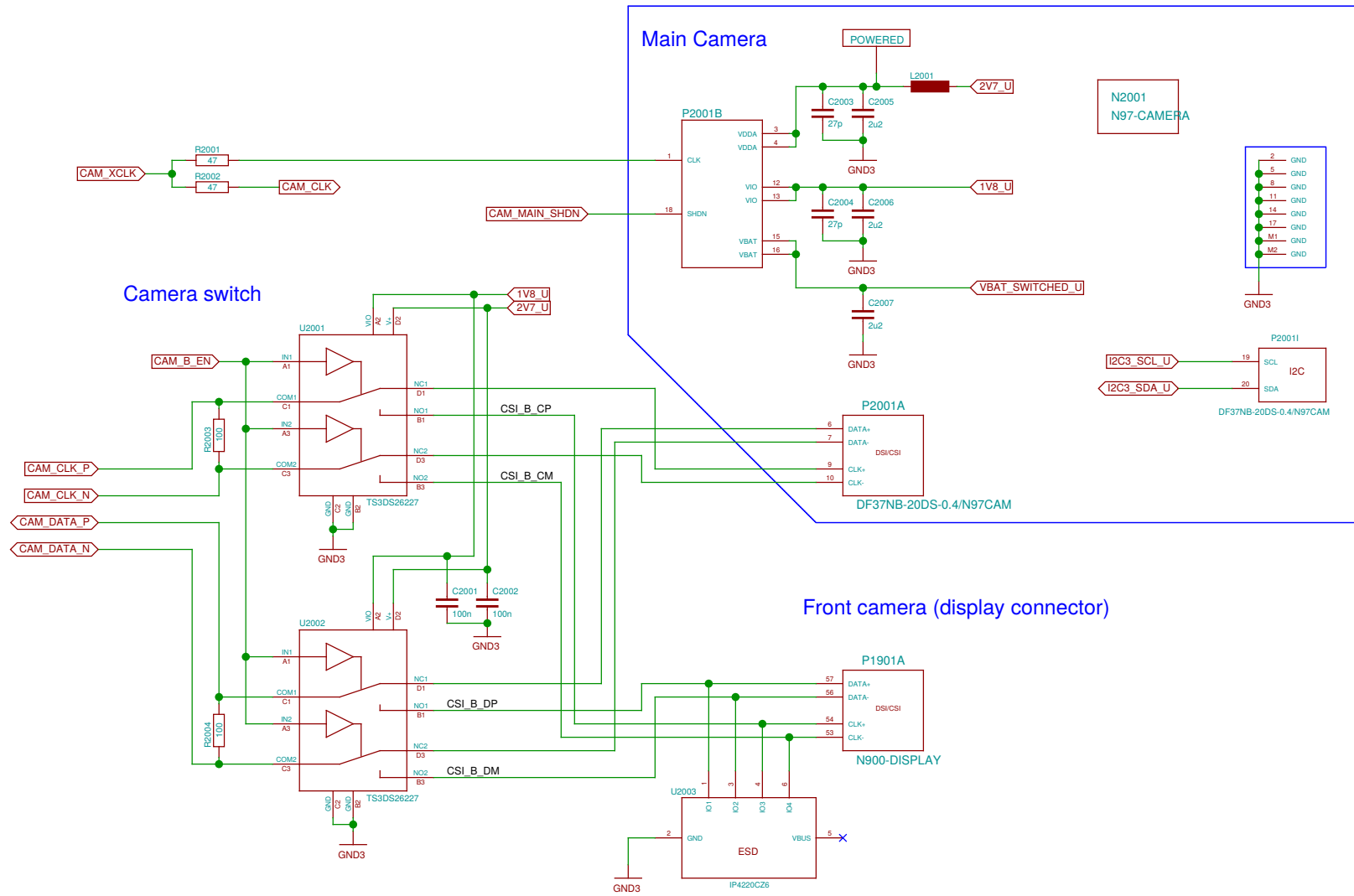
### Lock switch



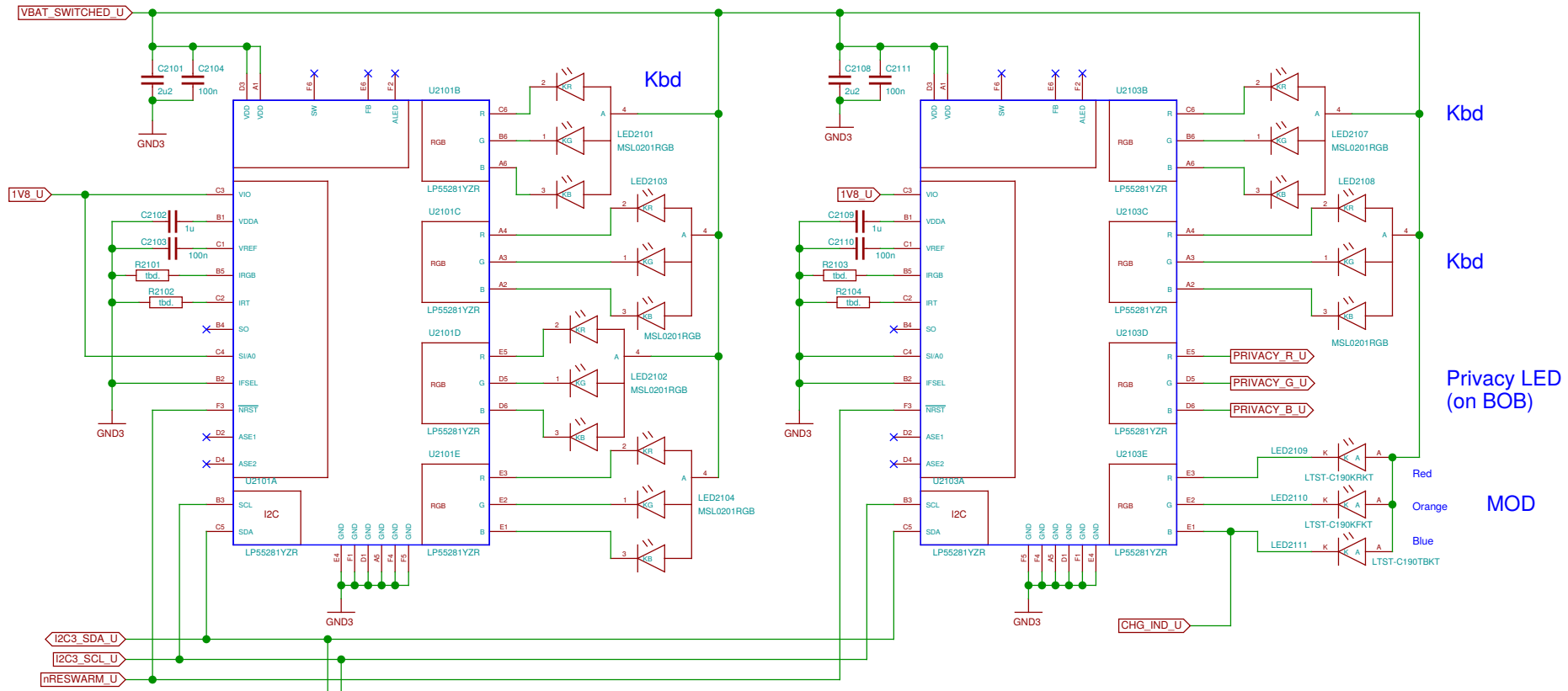
|                                            |                           |           |
|--------------------------------------------|---------------------------|-----------|
| Sheet: /Keypad and buttons/                |                           |           |
| File: keys.sch                             |                           |           |
| Title: Keypad and buttons                  |                           |           |
| Size: A3                                   | Date: 2016-11-18 15:48:54 | Rev:      |
| Plotted by eeshow e90e812+ 20161120-16:10Z |                           | Id: 18/25 |



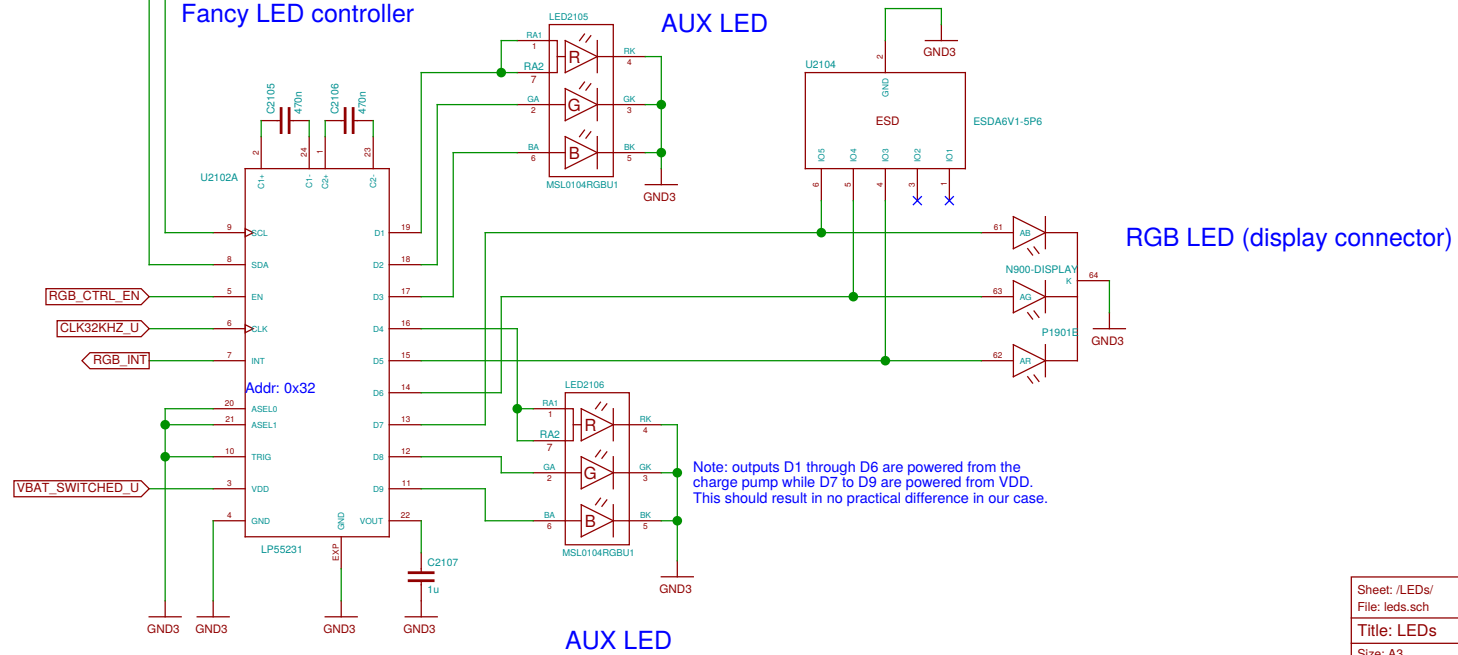
|                   |                                             |                           |  |
|-------------------|---------------------------------------------|---------------------------|--|
| Sheet: /Display/  |                                             | Date: 2016-11-18 04:02:08 |  |
| File: display.sch |                                             | Rev:                      |  |
| Title: Display    |                                             | Id: 19/25                 |  |
| Size: A3          | Plotted by: eeshow e90e812+ 20161120-16:10Z |                           |  |



### Basic LED controllers

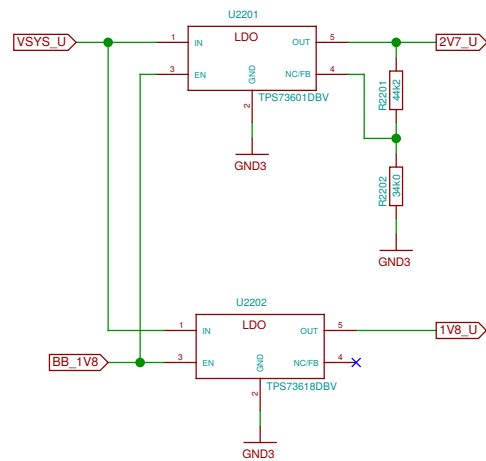


### Fancy LED controller



|                |                             |                           |  |
|----------------|-----------------------------|---------------------------|--|
| Sheet: /LEDs/  |                             | Date: 2016-11-18 15:48:54 |  |
| File: leds.sch |                             | Rev:                      |  |
| Title: LEDs    |                             | Id: 21/25                 |  |
| Size: A3       | Plotted by: eeshow e90e612+ | 20161120-16:10Z           |  |

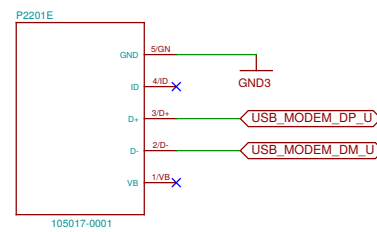
simple capless 400mA LDO for TPS65950 substitute  
(only for prototype)



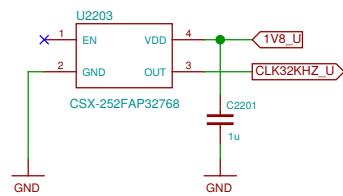
TODO: use REGEN ?

### Modem USB

connect to BB  
by some Micro-USB cable

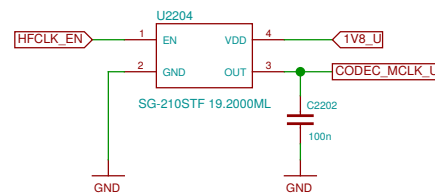


### 32 kHz clock



Alternative: OYKTGLJANF-0.032768

### 19.2 MHz clock

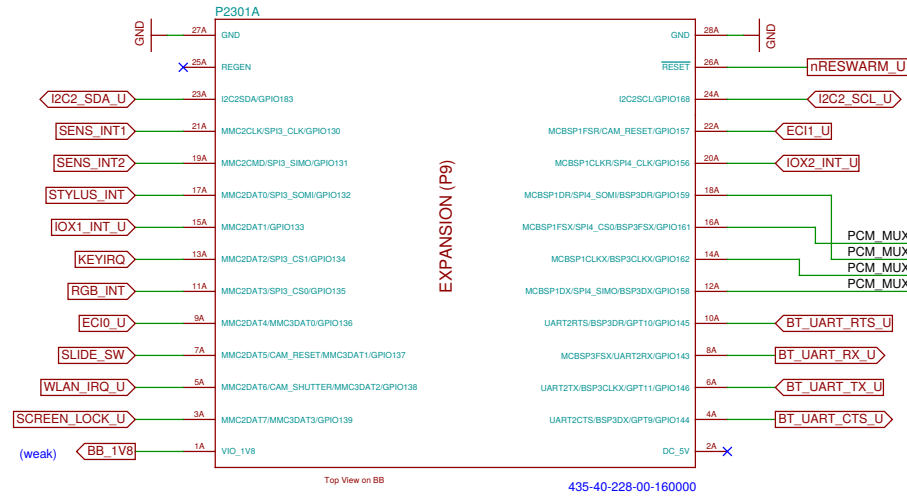


Alternative: KC2520B19.2000C1GE00

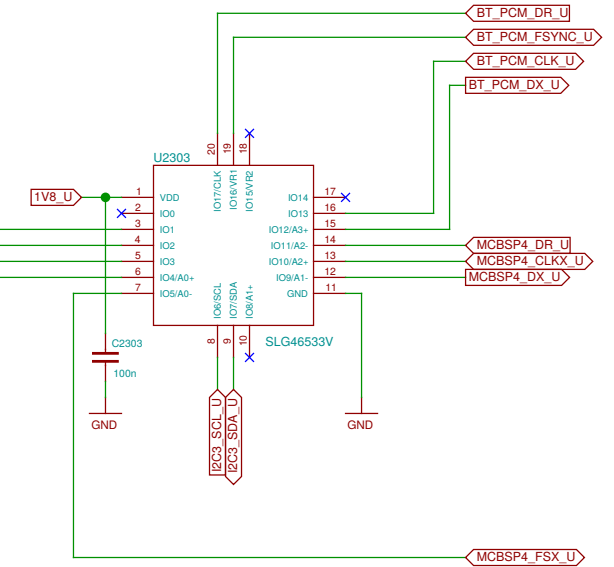
|                                            |                           |           |
|--------------------------------------------|---------------------------|-----------|
| Sheet: /Adaptation (v2 only)/              |                           |           |
| File: v2.sch                               |                           |           |
| Title: Adaptation (v2 only)                |                           |           |
| Size: A3                                   | Date: 2016-11-18 15:49:26 | Rev:      |
| Plotted by eeshow e90e612+ 20161120-16:10Z |                           | Id: 22/25 |

# TODO: update pin names in footprint

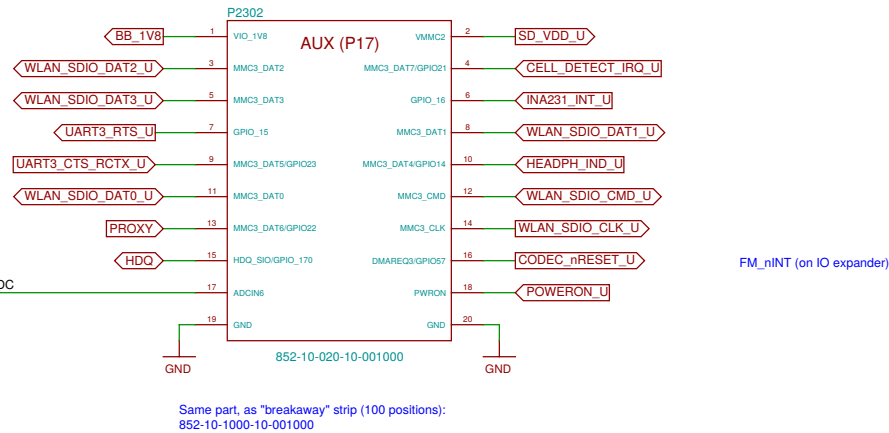
## BB-xM Main Expansion Header (P9, 7.24)



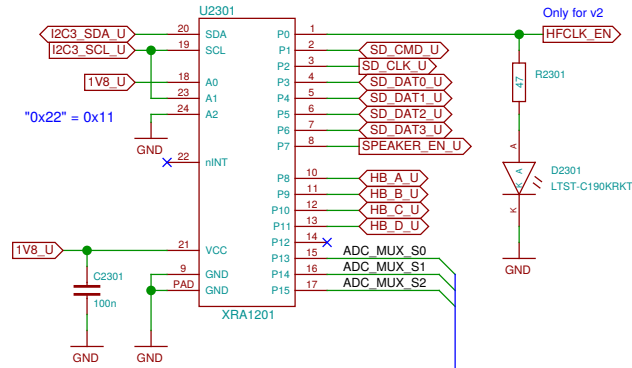
## PCM switch



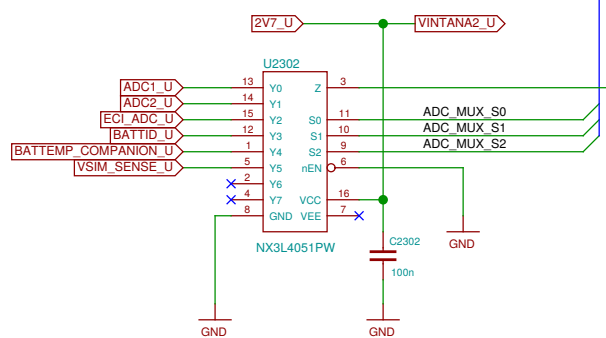
## Auxiliary Expansion Header (P17, 7.26)



## IO expander



## ADC multiplexer

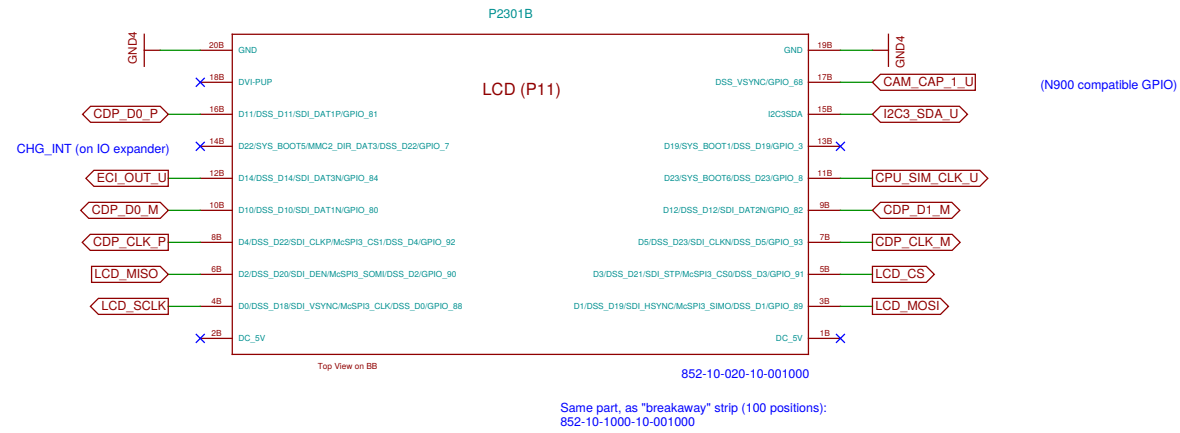


No UART3\_RTS on BB-xM, using GPIO  
No UART3\_CTS on BB-xM, using GPIO

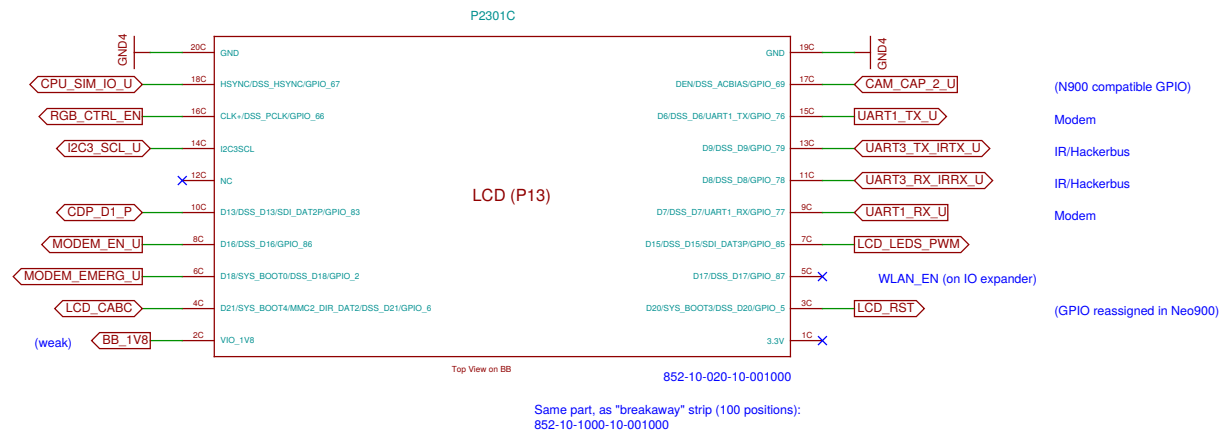
FM\_nINT (on IO expander)

# TODO: update pin names in footprint

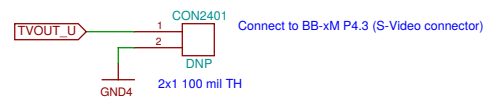
P11 (7.25)



P13 (7.25)

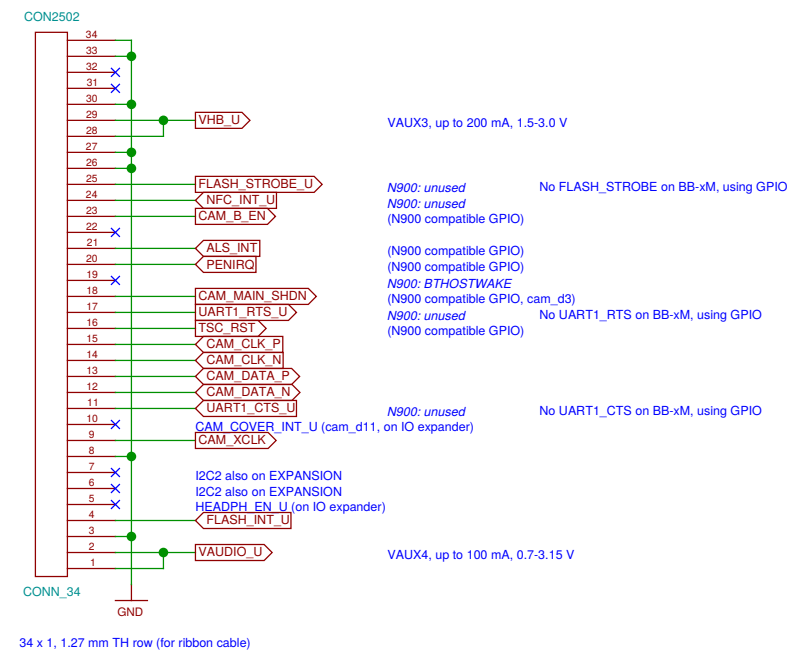
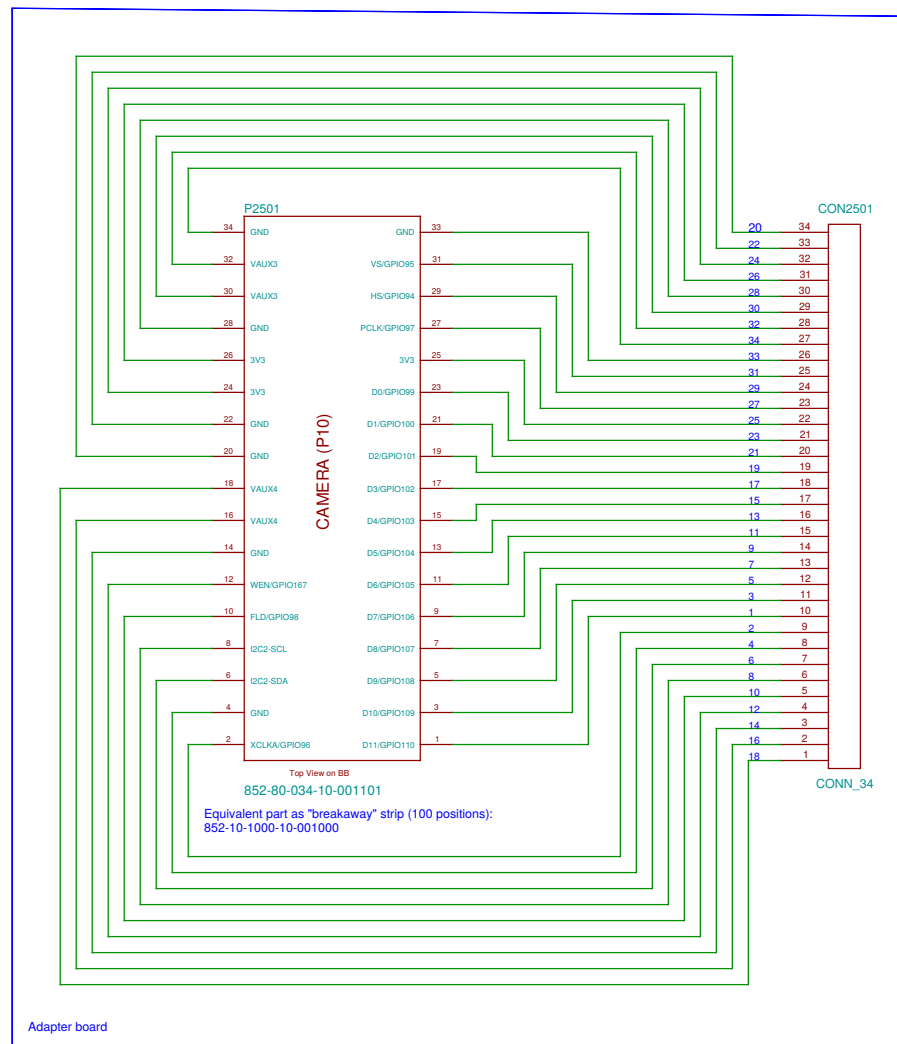


P4 (7.19)

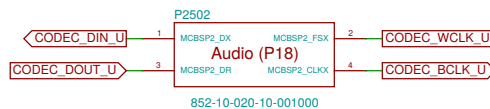




## Processor Camera Port Interface (P10, 7.20.3)



**TODO: update pin names in footprint**



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.