

# TS-7990

This board can drive one of three LCD panels

## BOM Issues:

CPU (U4) can be Quad or Single Core  
RAM (U22, U23) can be 512MB or 1 GB  
K1 (WiFi module) is optional  
R34 is populated when WiFi radio (K1) present  
R36 and R39 populated to indicate CPU type  
Mini-PCIe connector (J3 and U45) is optional  
GPS radio (K2, CN6, PF2, L9) is optional  
Accel (U21) is optional  
CH1, R33, R35, R37, R155, R156 not populated

CN8 is for MT LCD (400 nit)  
CN1 is for LXD LCD (800 nit)  
CN8 and CN1 are never both populated  
When CN1 is pop, so is R39

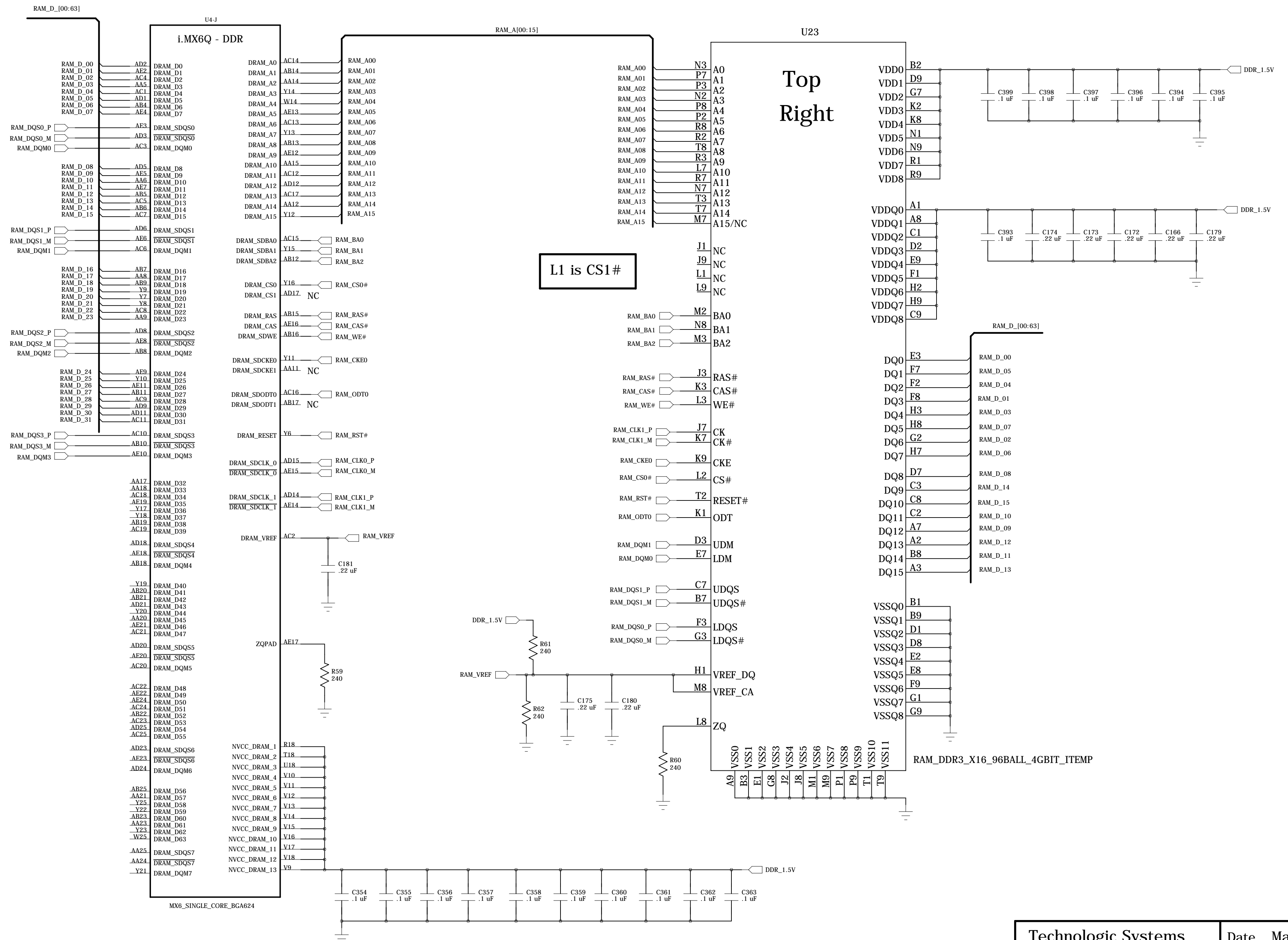
## Either

C139-C142 populated for SATA

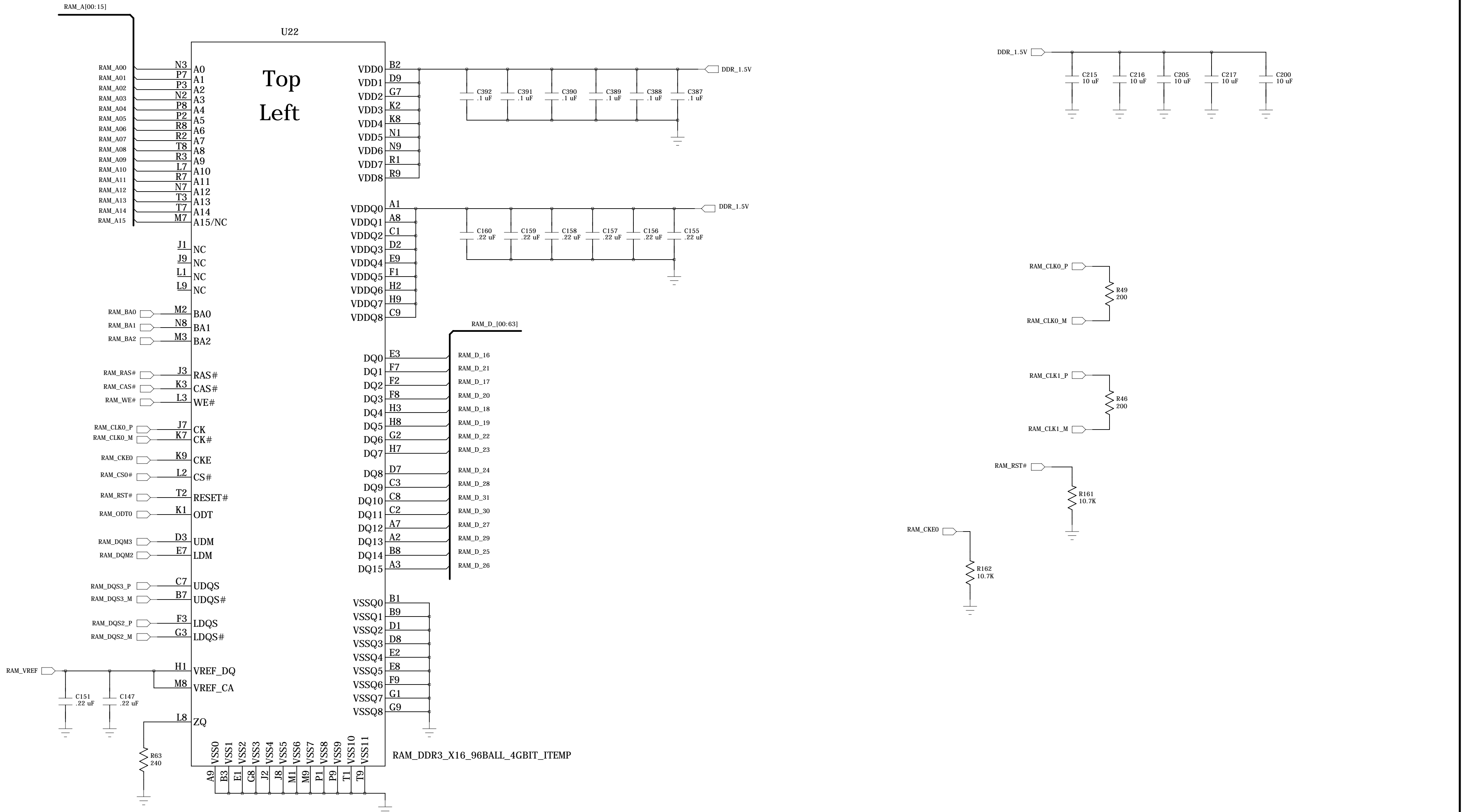
## OR

C295-C298 populated for PCIe

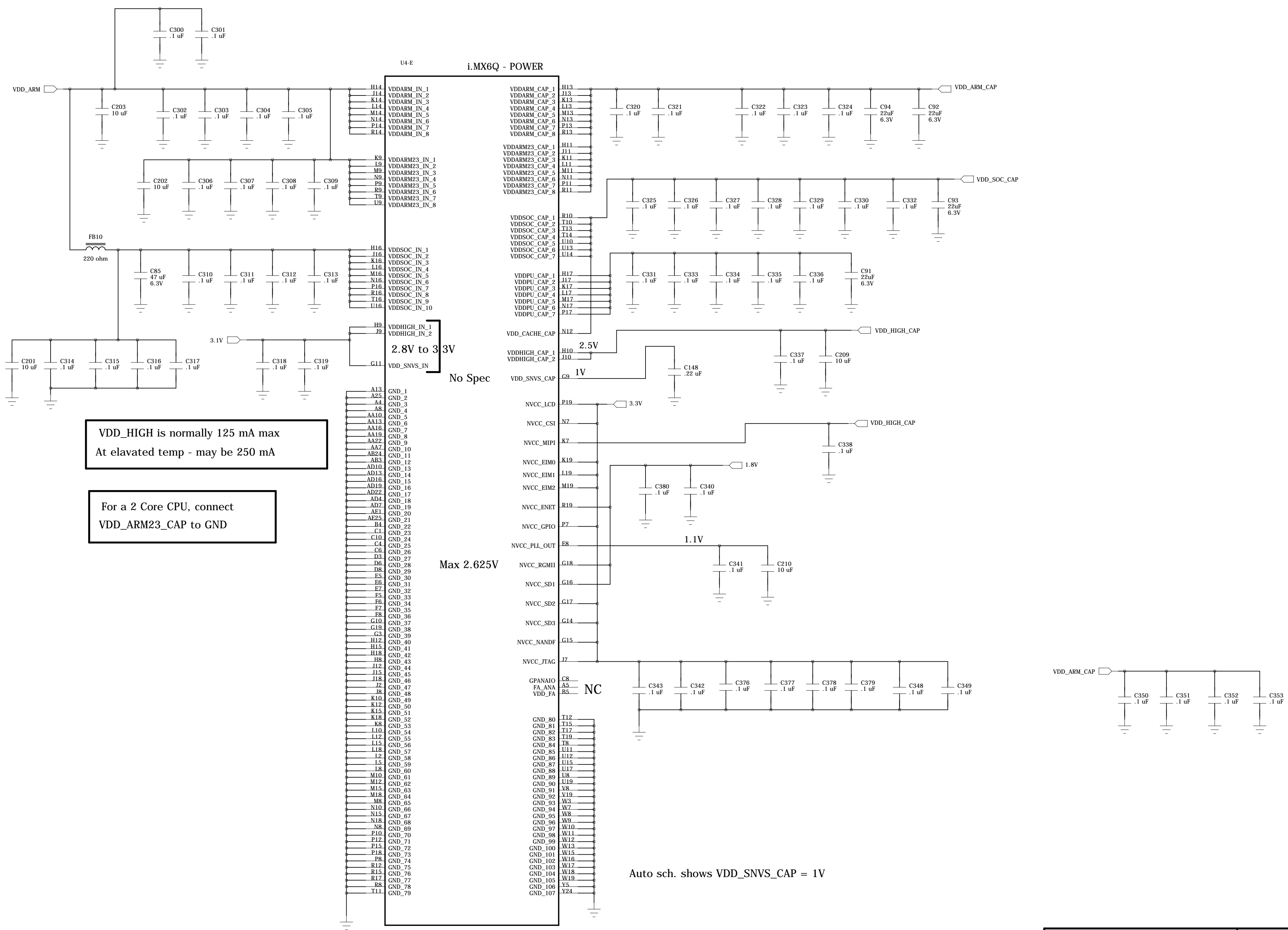
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# RAM Data bits 16-31



# iMX6 Power Pins



VDD\_HIGH is normally 125 mA max  
At elevated temp - may be 250 mA

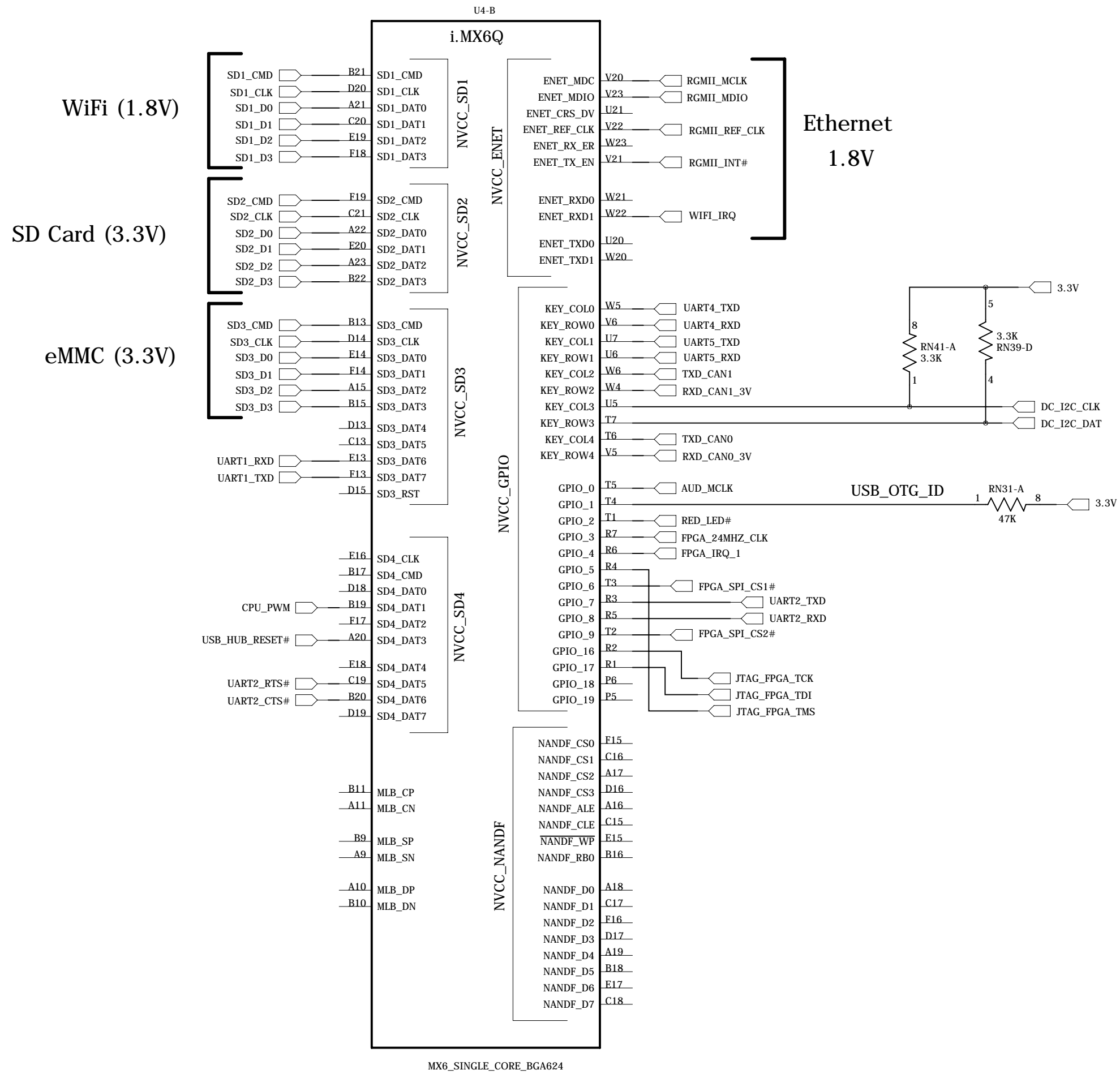
For a 2 Core CPU, connect  
VDD\_ARM23\_CAP to GND

2.8V to 3.3V  
No Spec

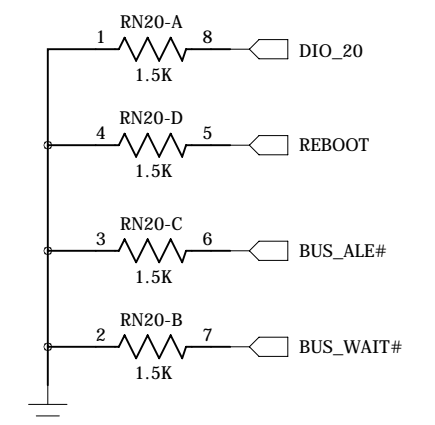
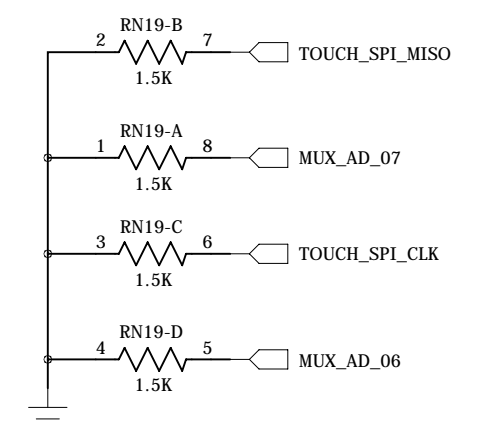
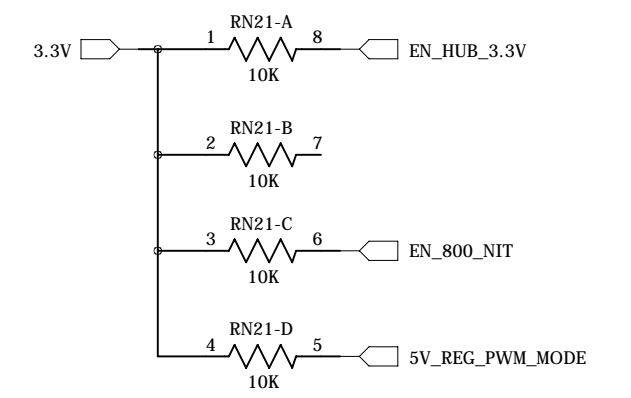
Max 2.625V

Auto sch. shows VDD\_SNVS\_CAP = 1V

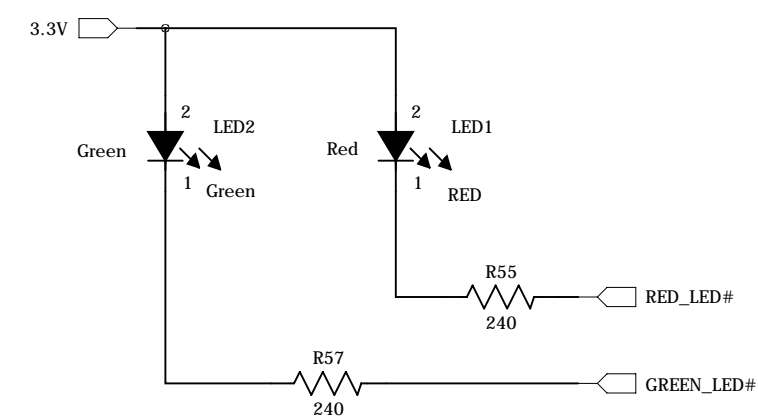
# SD, GPIO, NAND



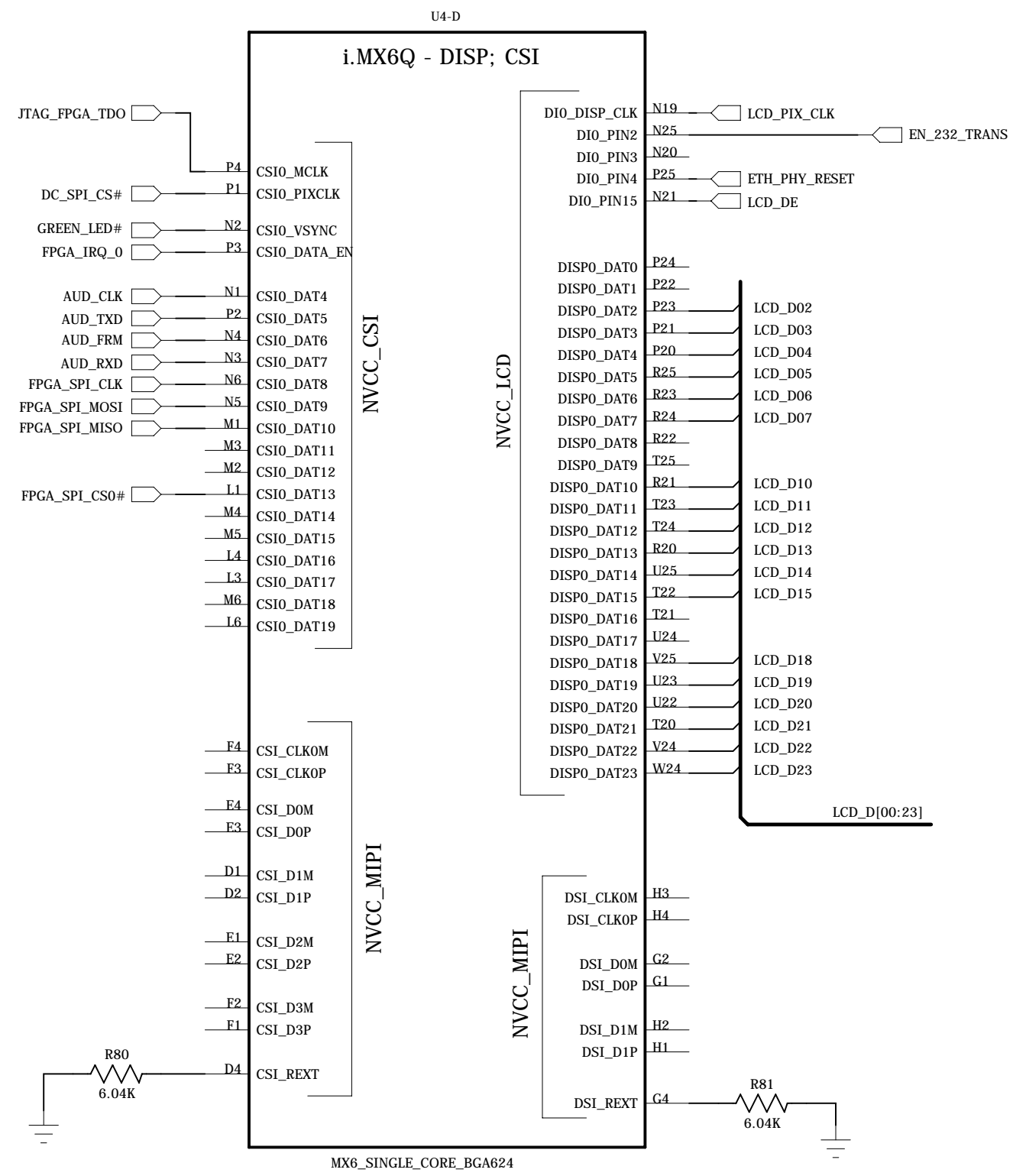
## Bias Res.



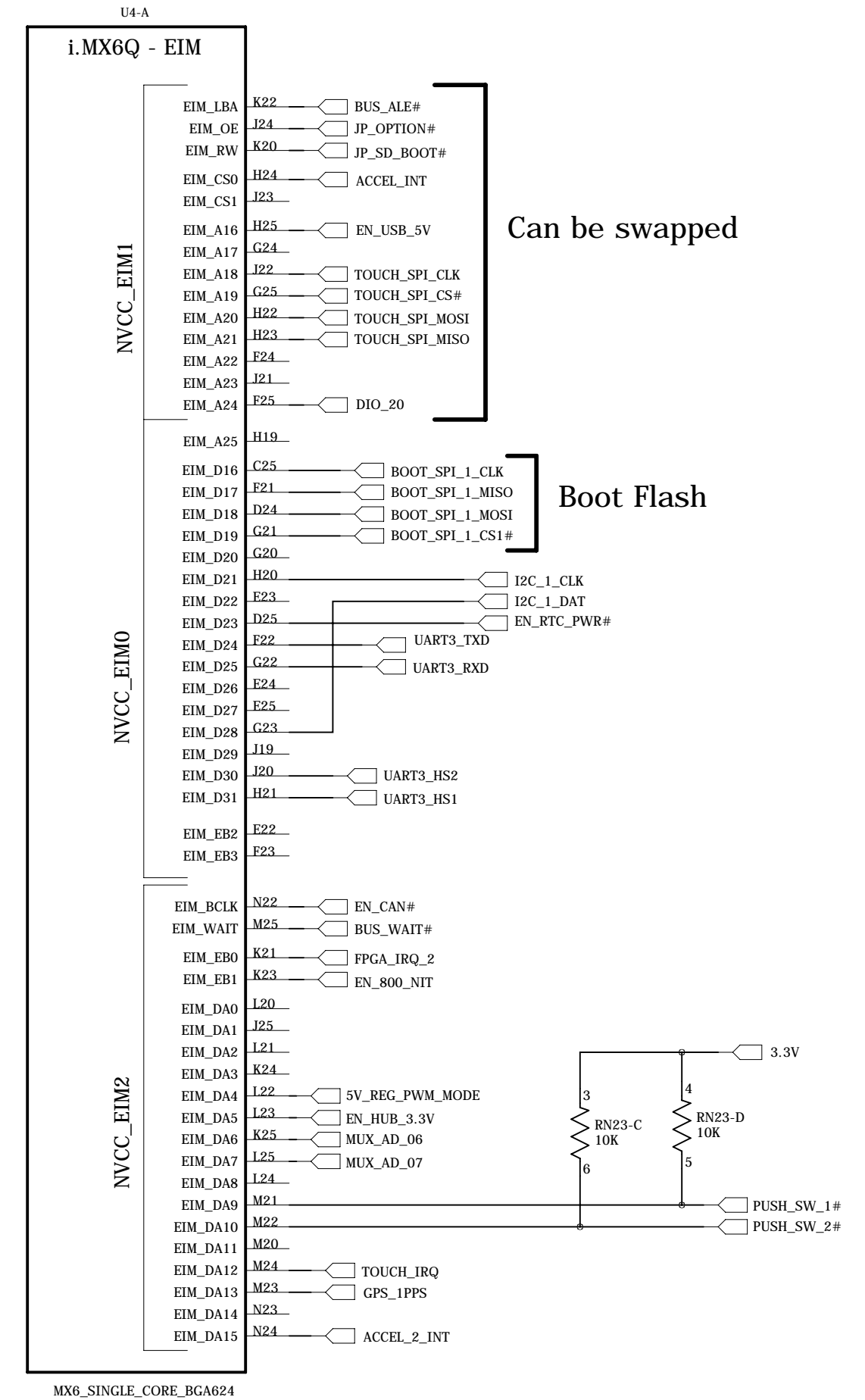
## iMX6 LEDs



# LCD

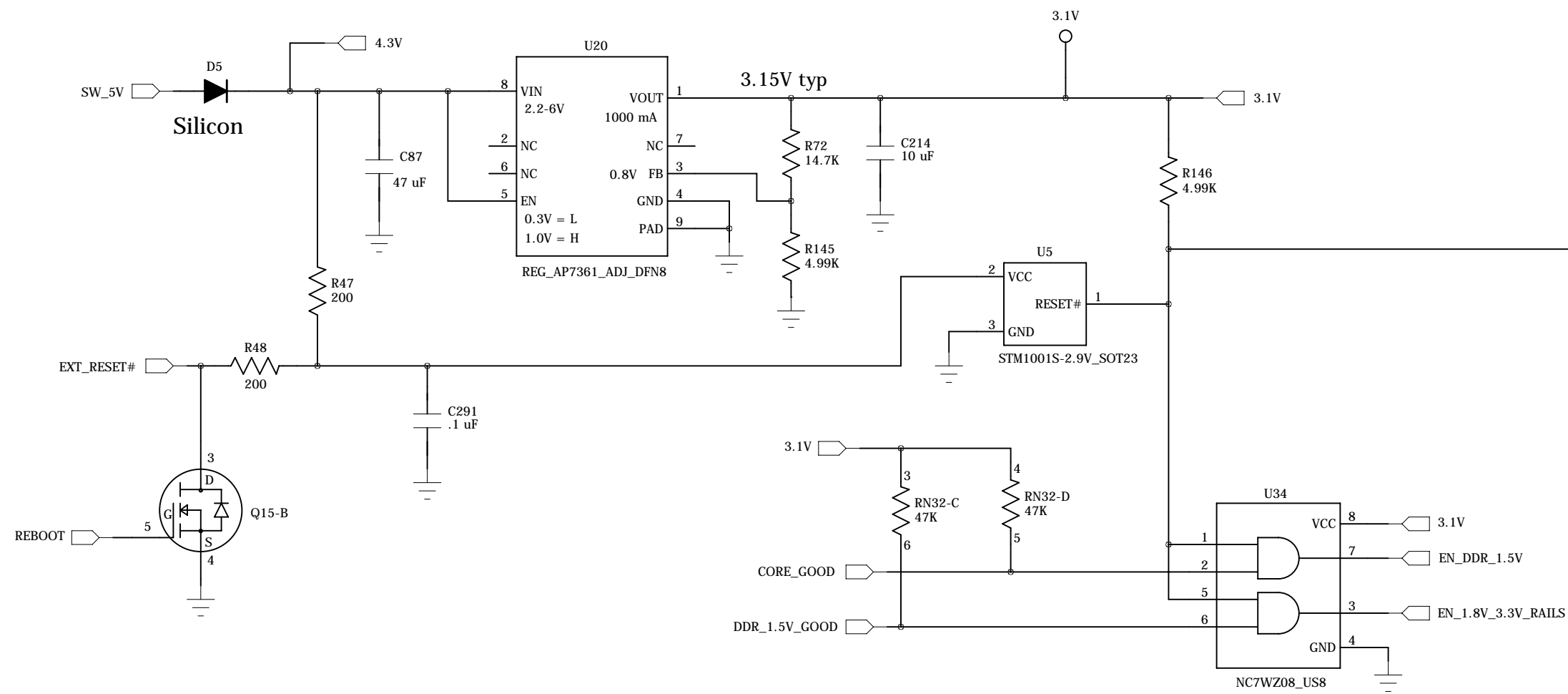


# EIM

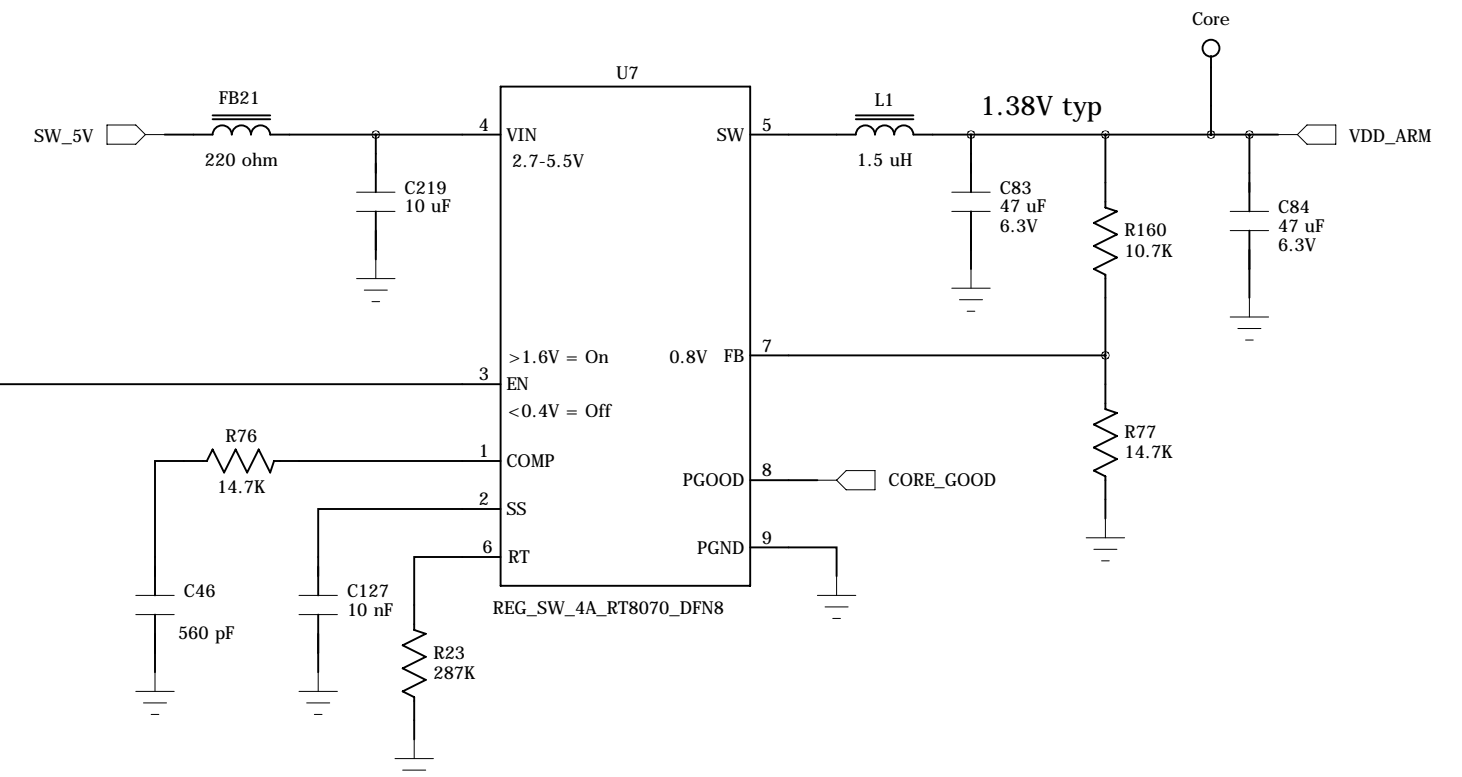


# Power Supplies

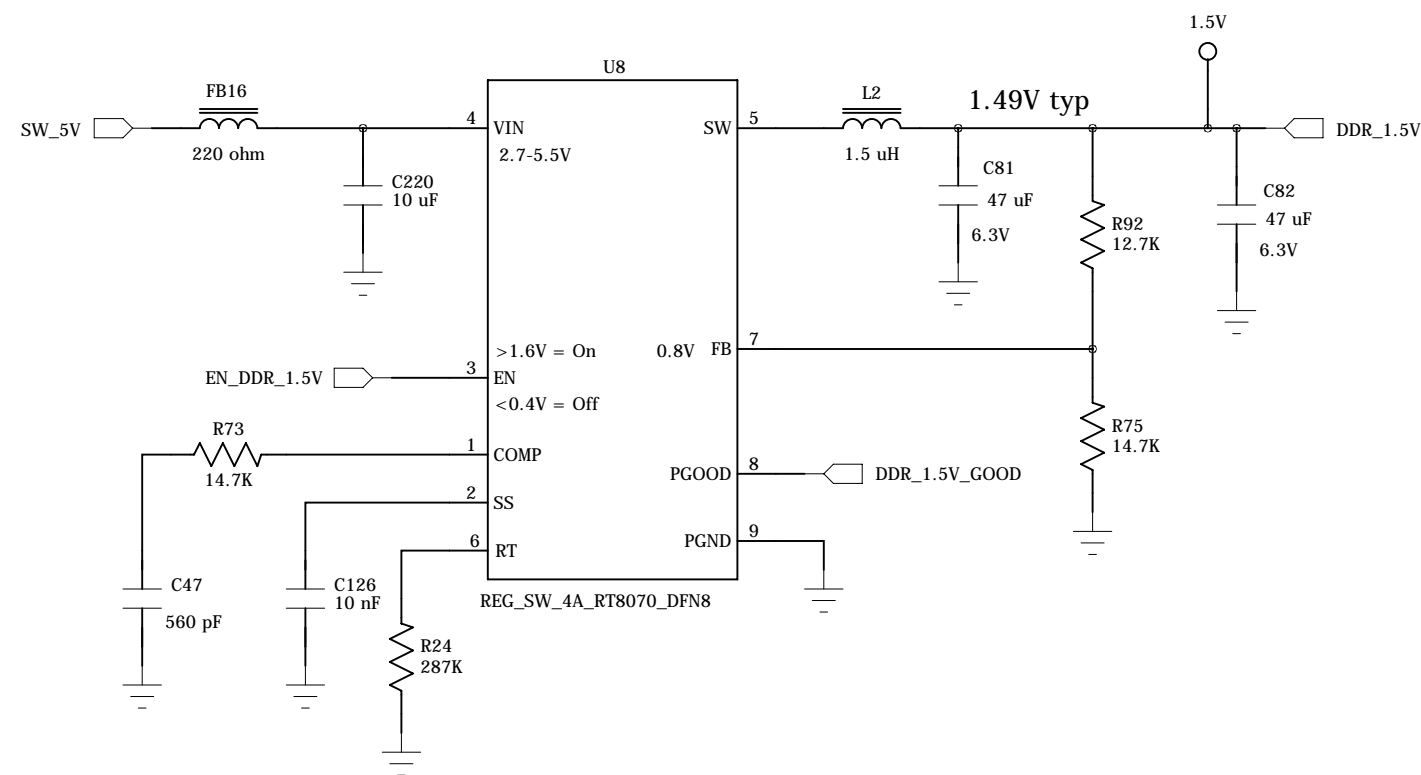
## Linear 3.1V Reg. #1



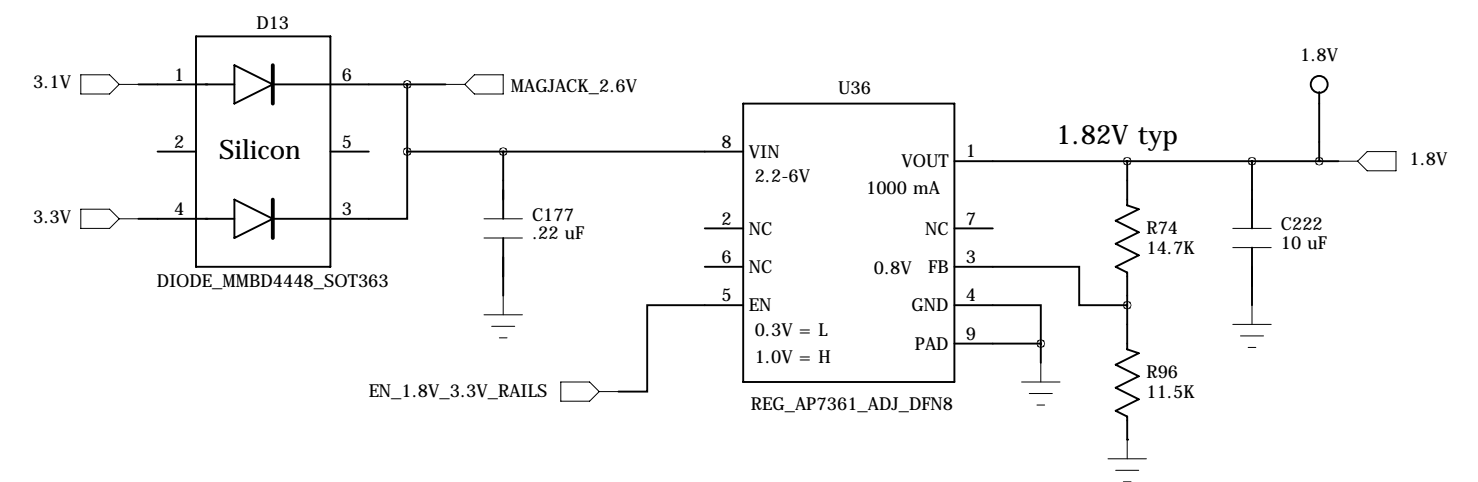
## ARM Core Rail #2



## DDR3 Reg. #3



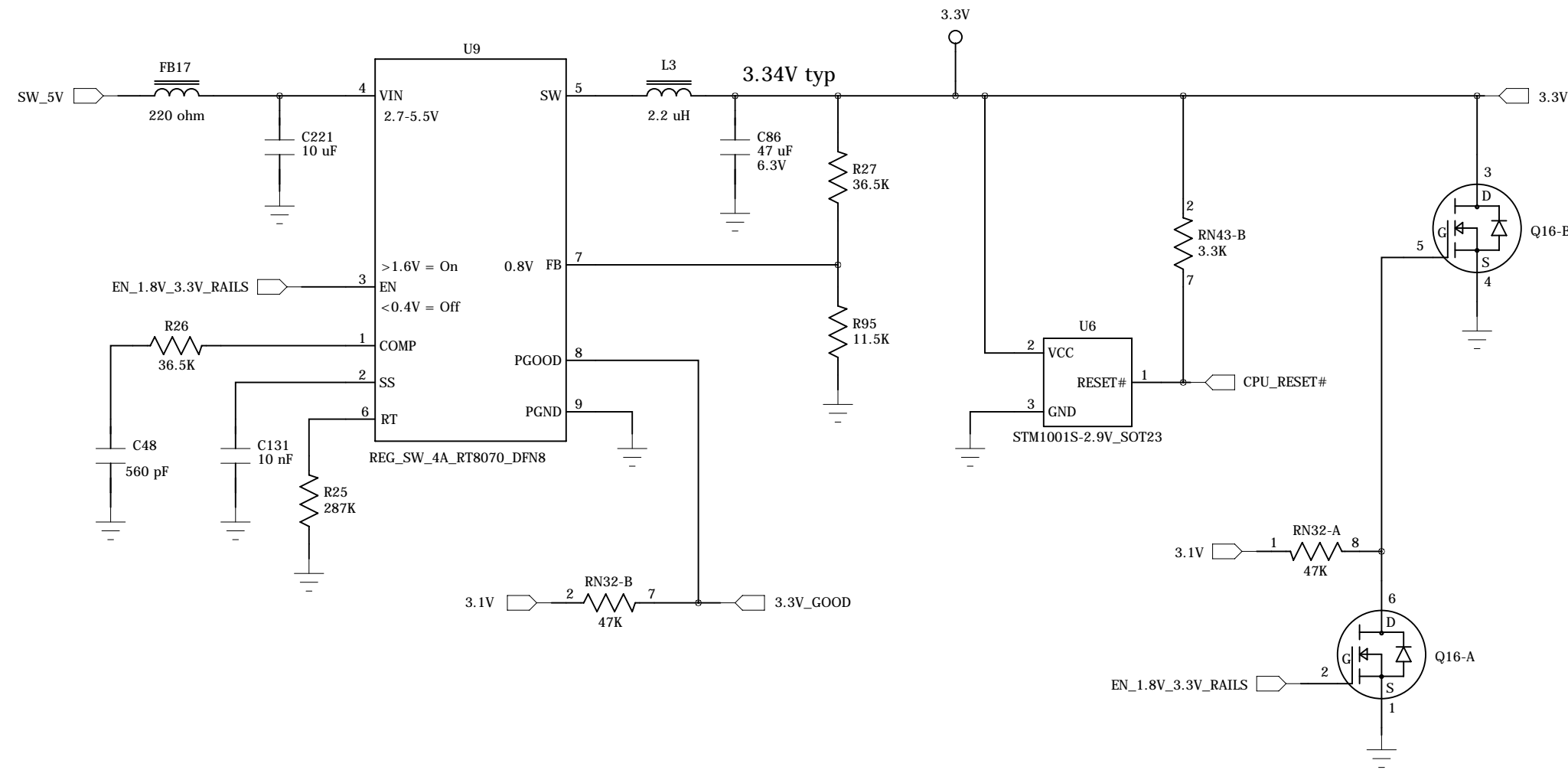
## Linear 1.8V Reg. #4



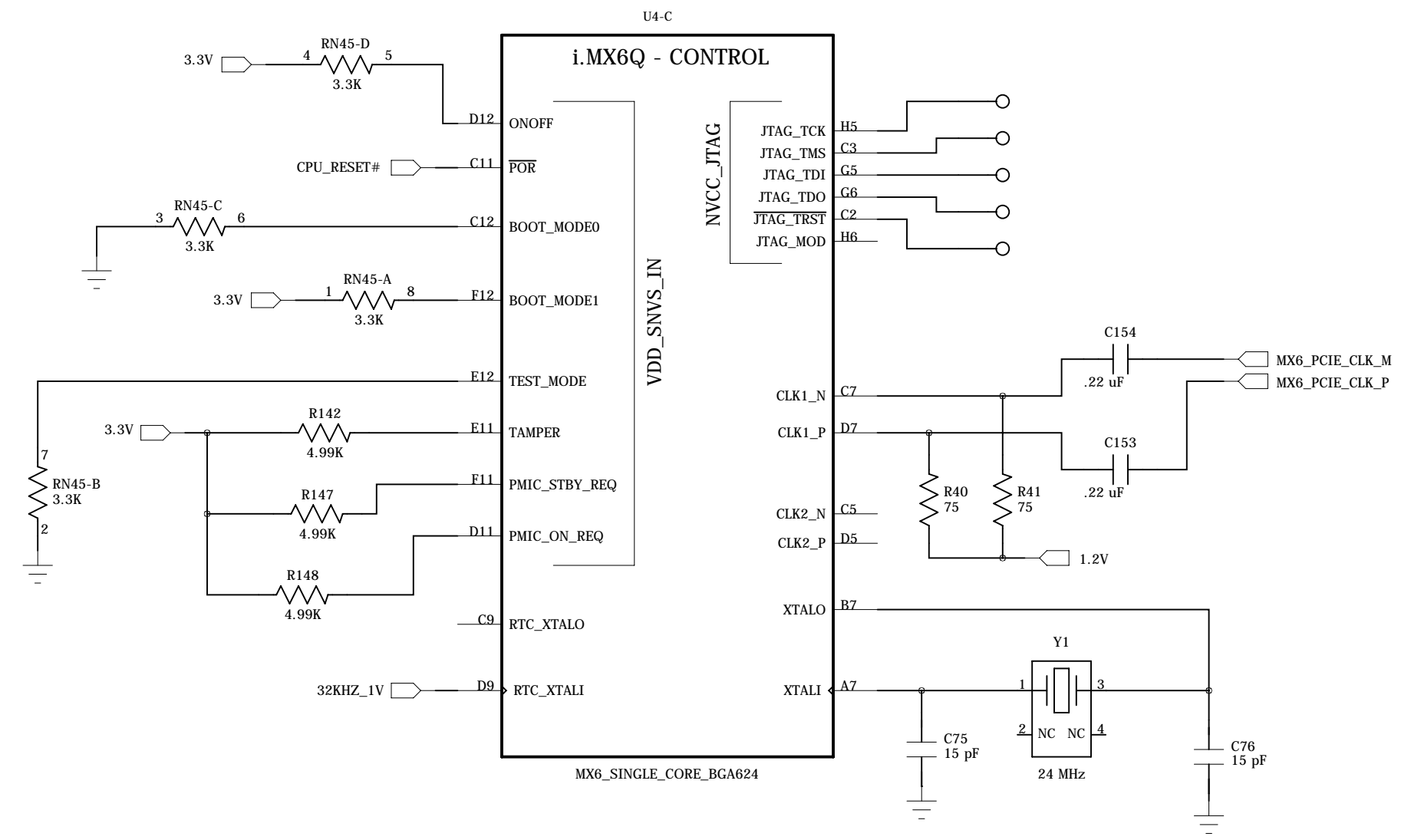
For Eth PHY and WiFi/Bluetooth



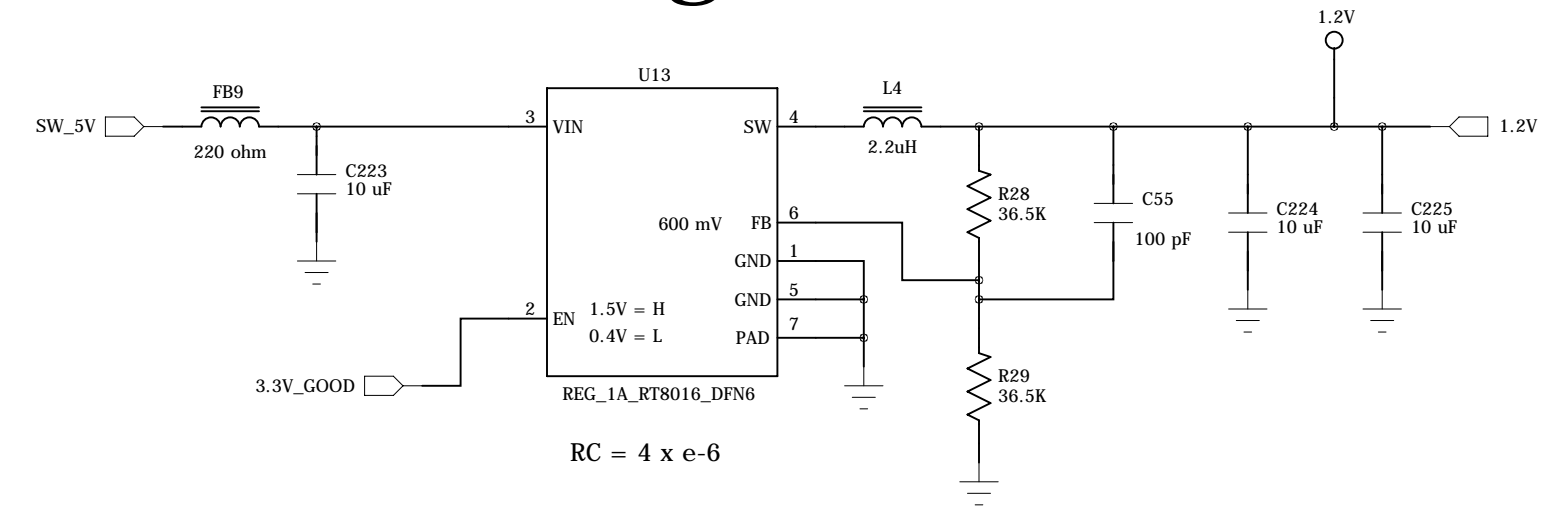
# 3.3V Reg. #5



# CPU Control



# 1.2V Reg. #6

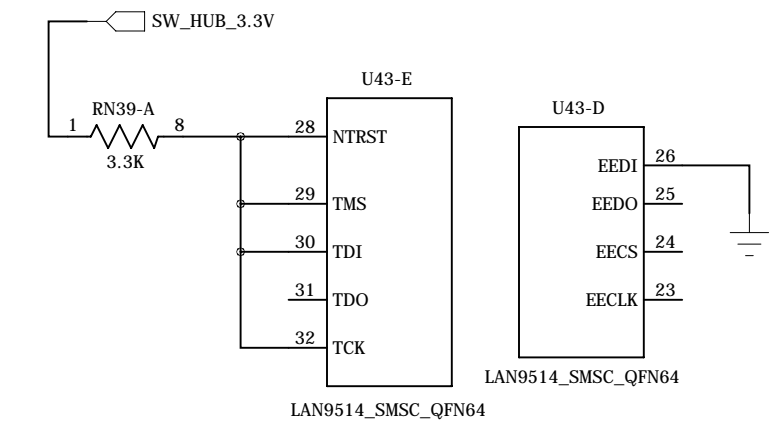
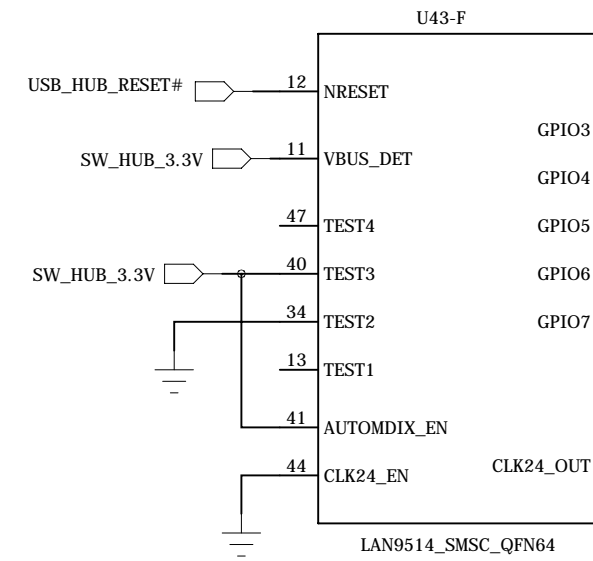
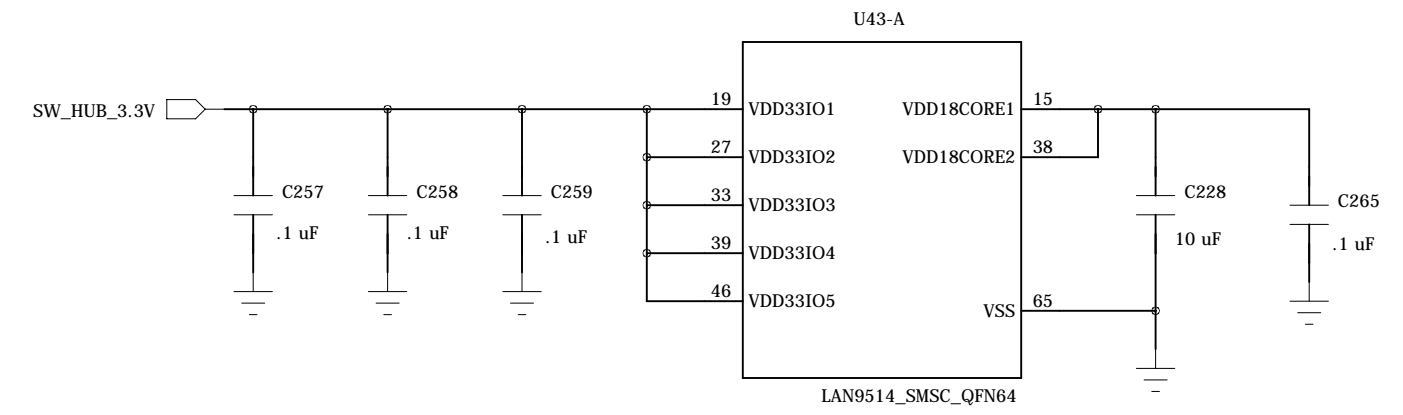
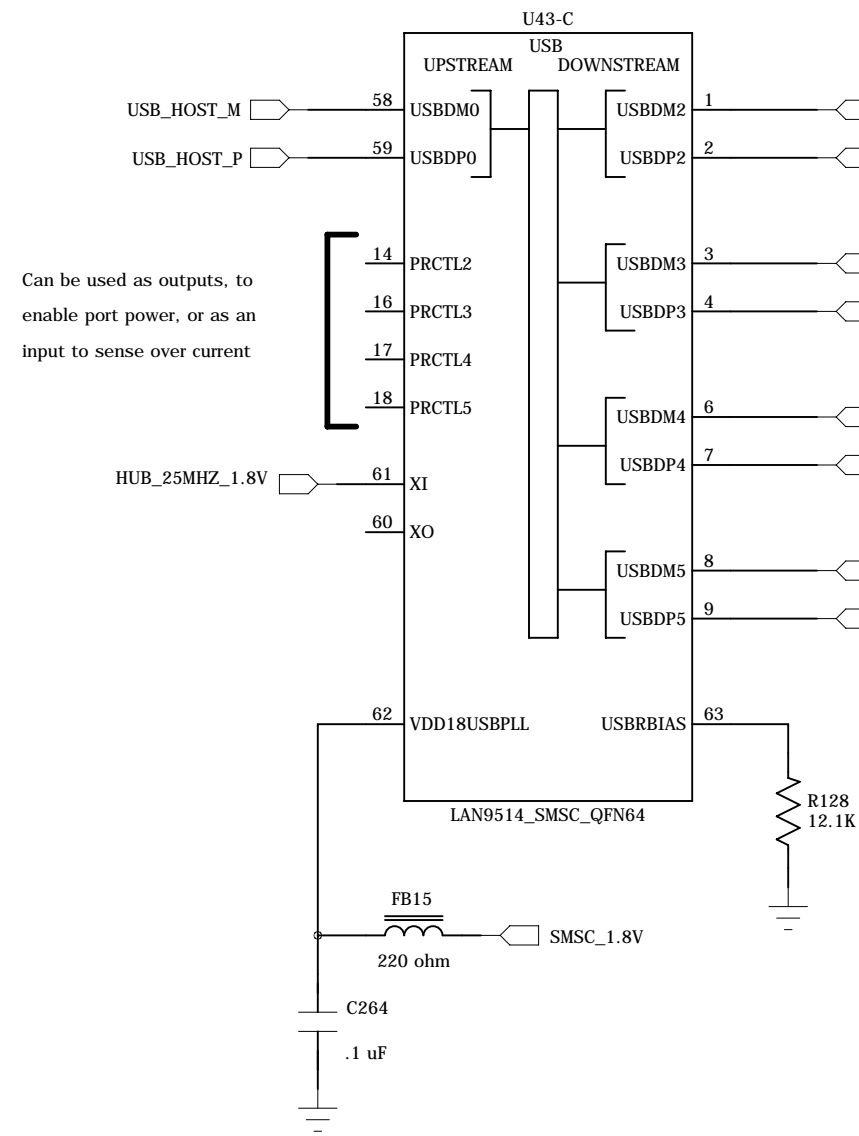


For Eth. PHY Core and CPU

# 2nd Ethernet Port

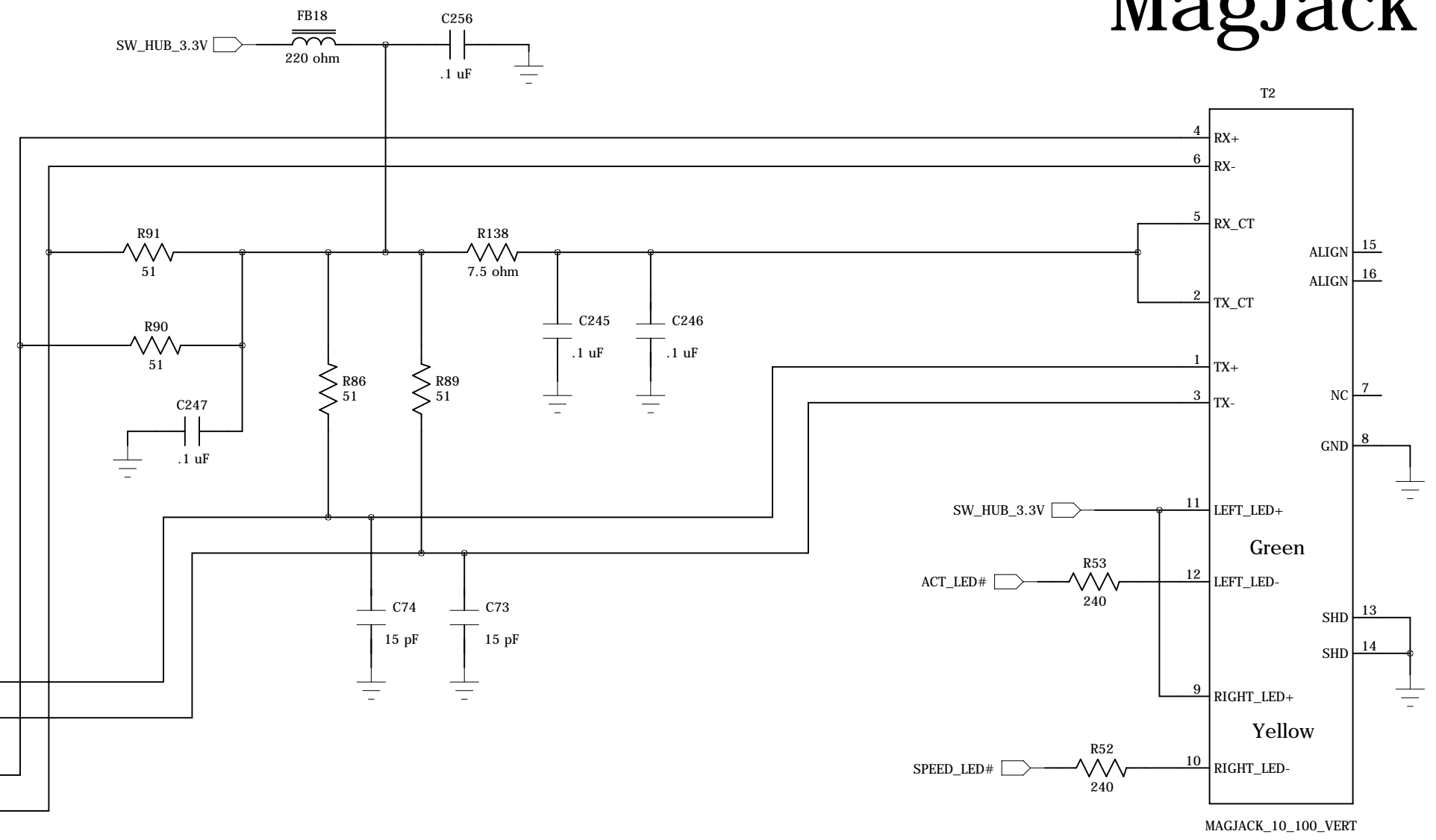
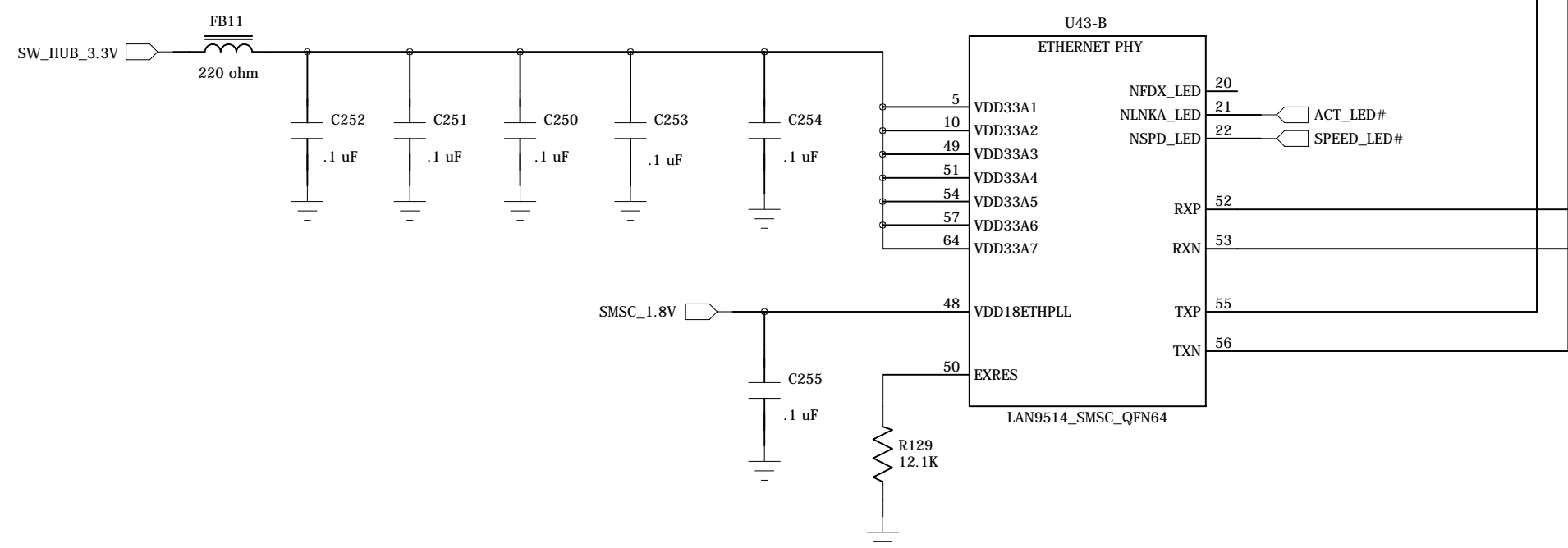
Typical 3.3V current  
with all ports active  
is 288 mA (950 mw)

## SMSC USB Hub



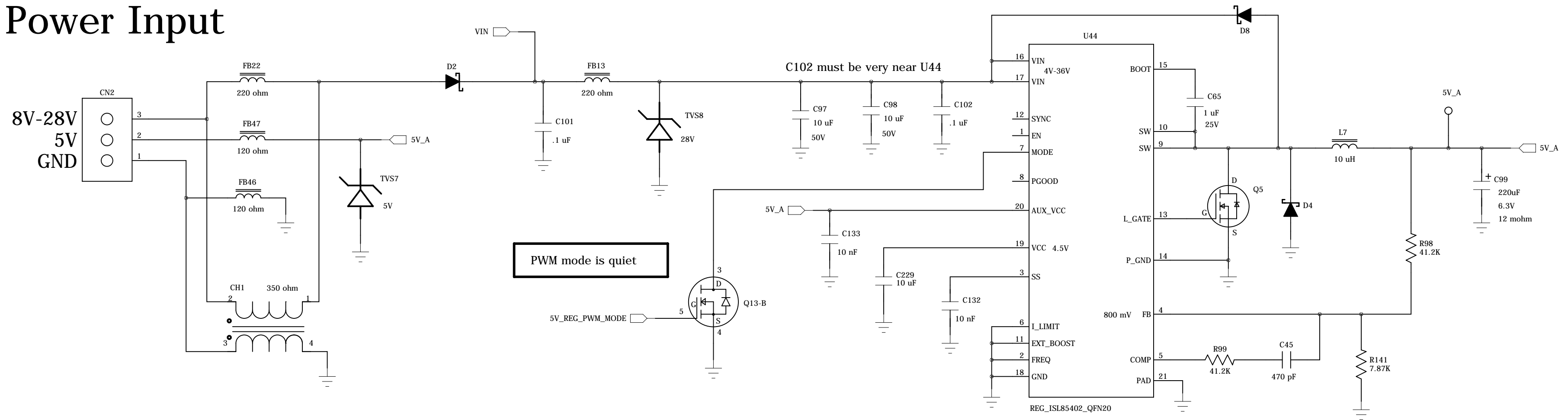
## Vert. MagJack

## SMSC Ethernet Port



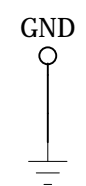
# 5V Power Supply (2500 mA)

## Power Input

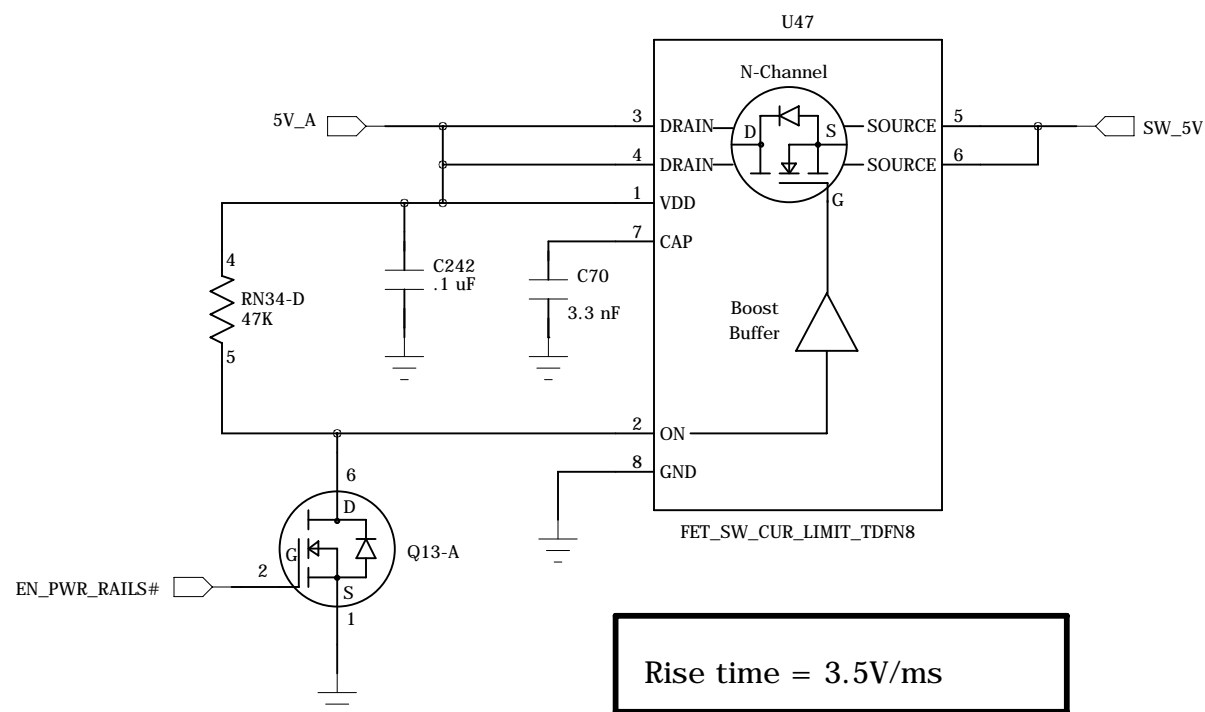


PWM mode is quiet

.063 hole

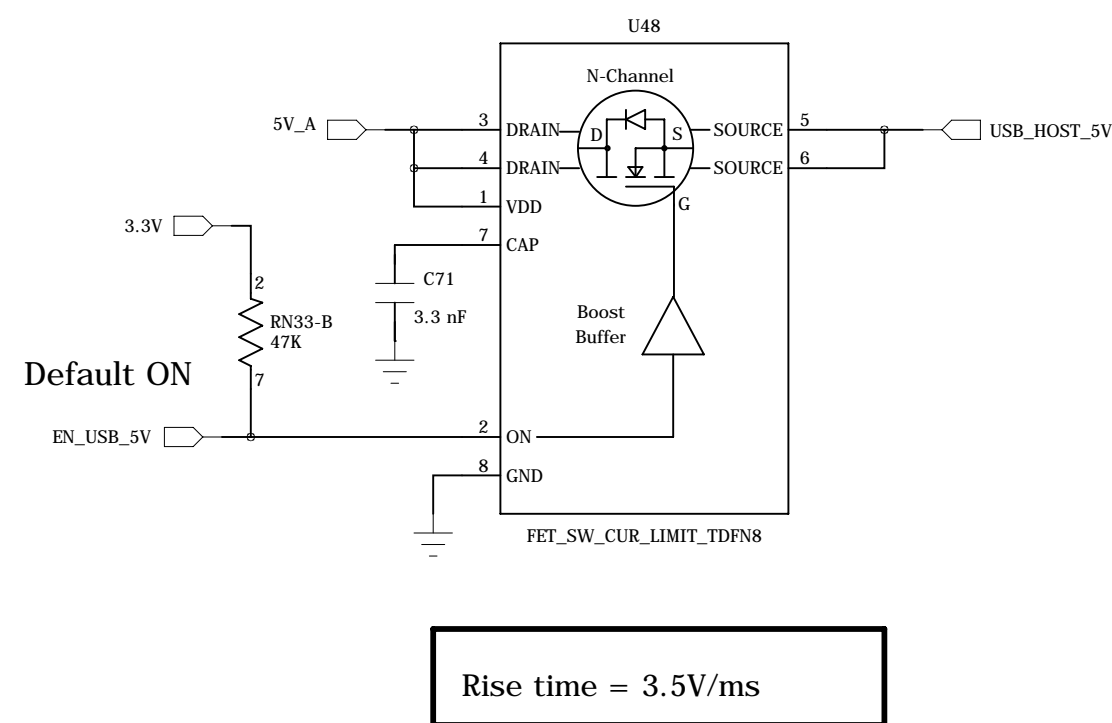


## Main 5V Power Sw.



Rise time = 3.5V/ms

## USB Sw. 5V



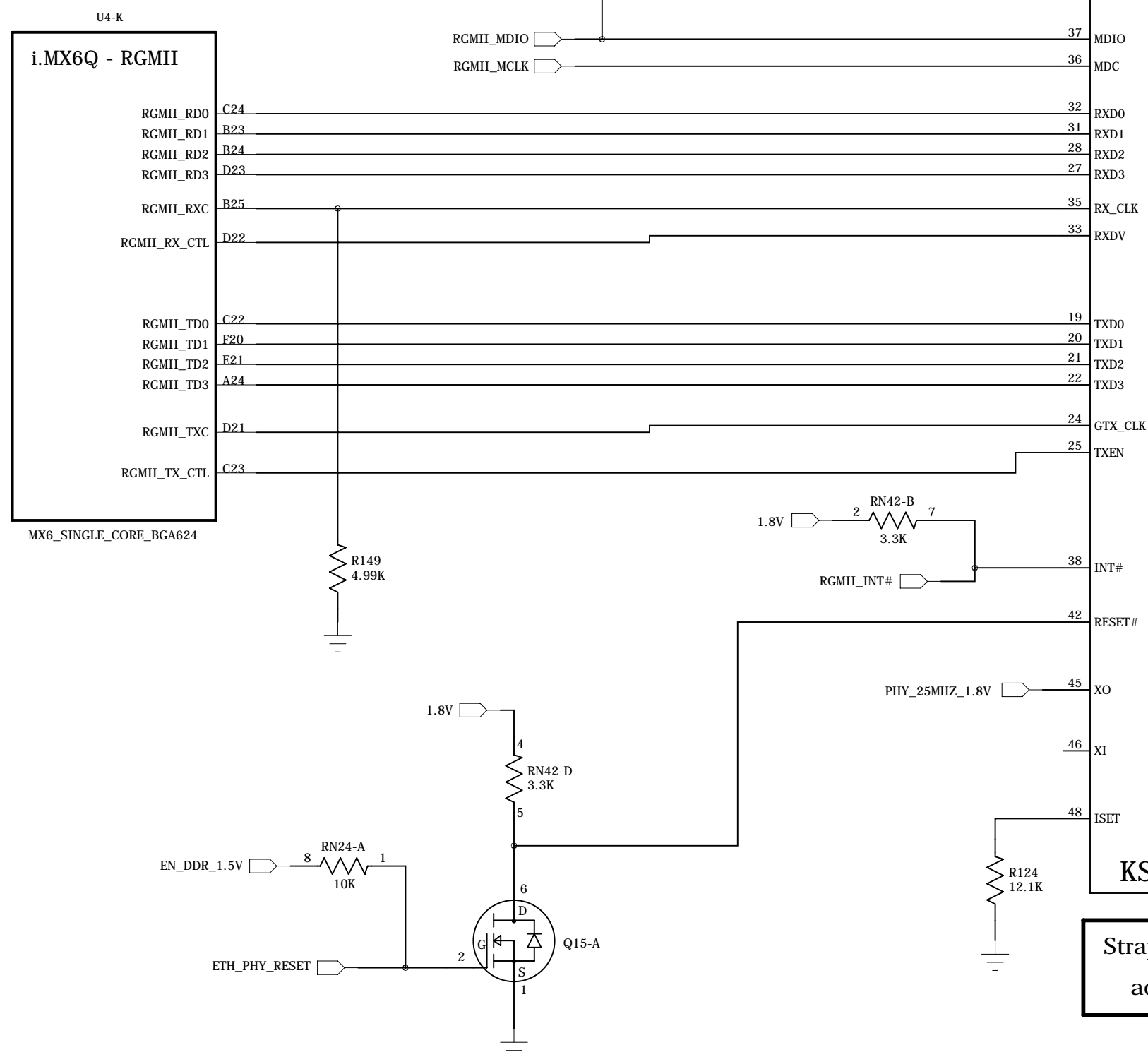
Rise time = 3.5V/ms

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# 10/100/1000 Ethernet PHY

## ETH PHY

### CPU ETH

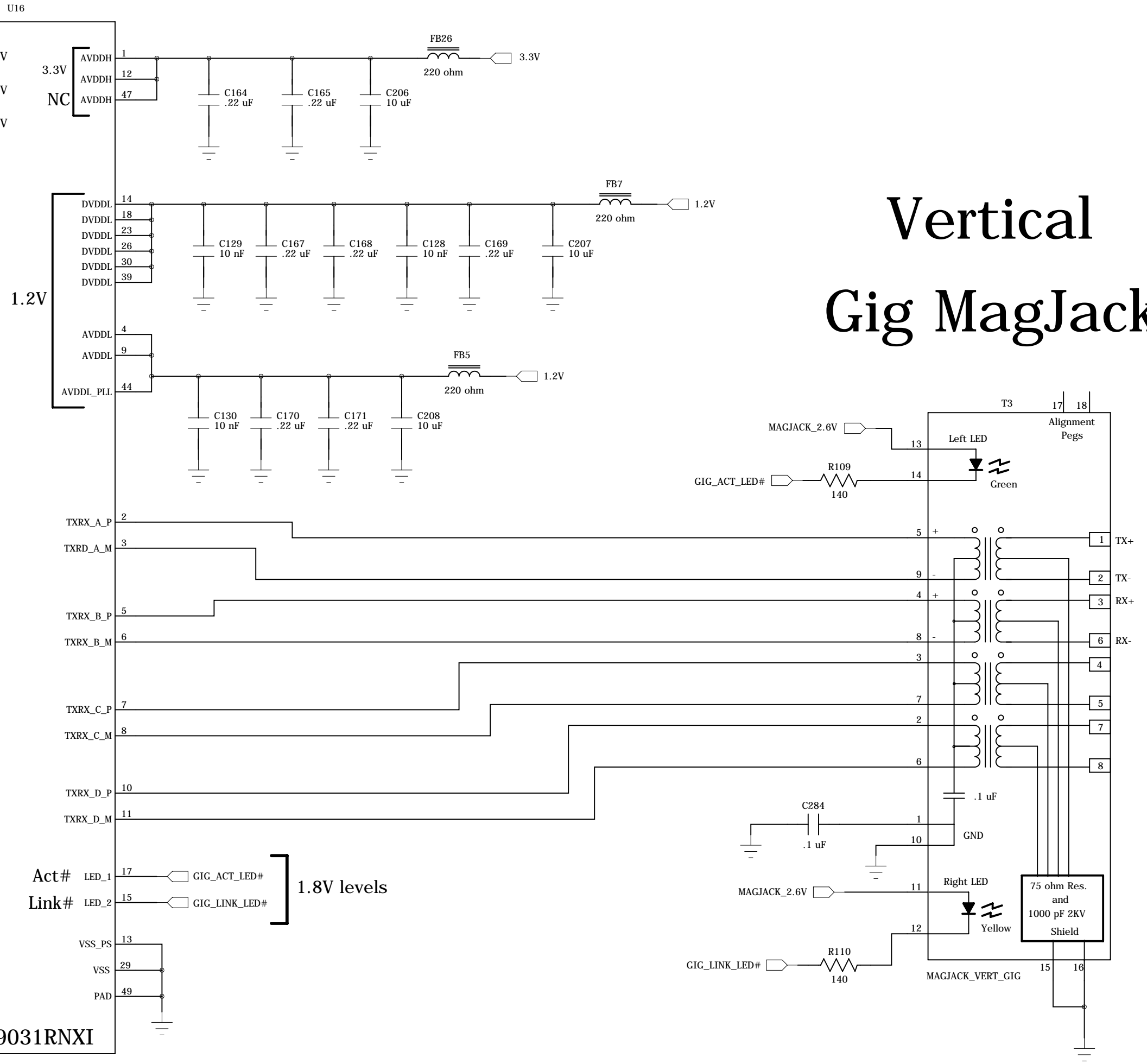


Strapped for PHY address = 3

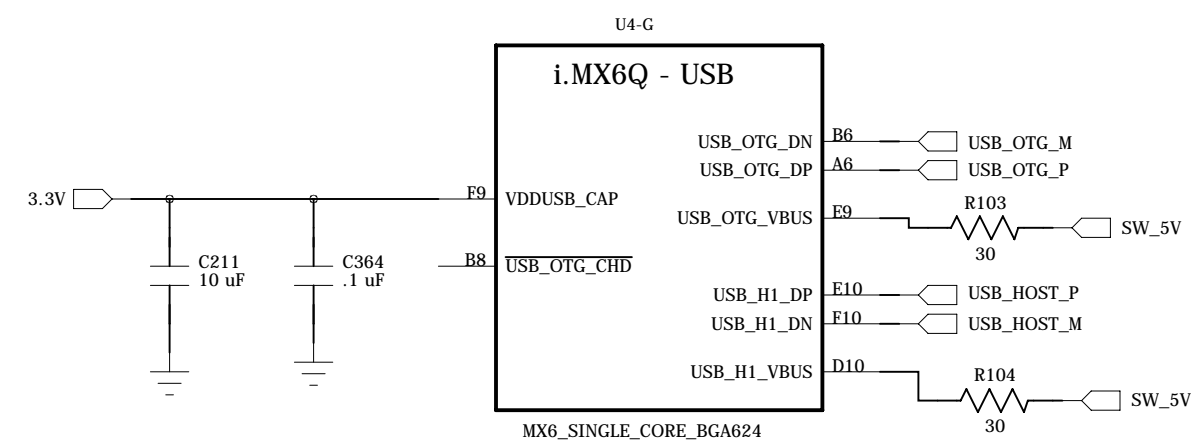
KSZ9031RNXI

Act# LED\_1 GIG\_ACT\_LED#  
Link# LED\_2 GIG\_LINK\_LED# } 1.8V levels

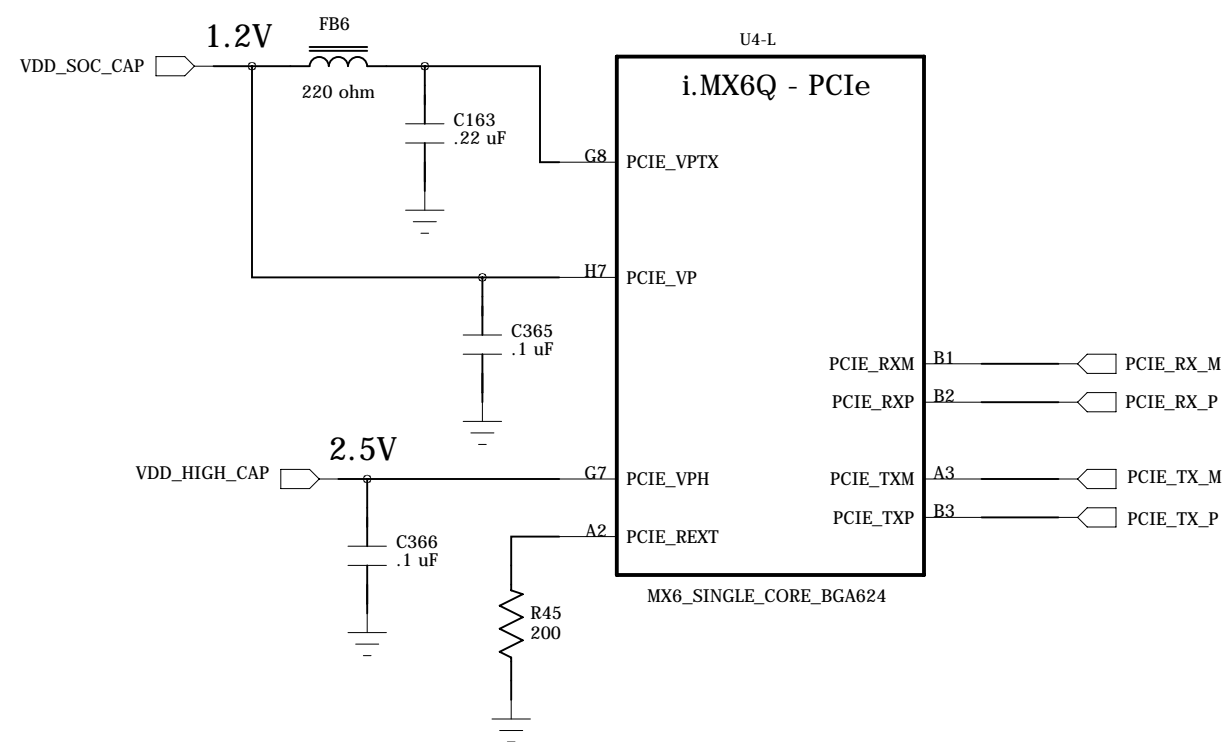
### Vertical Gig MagJack



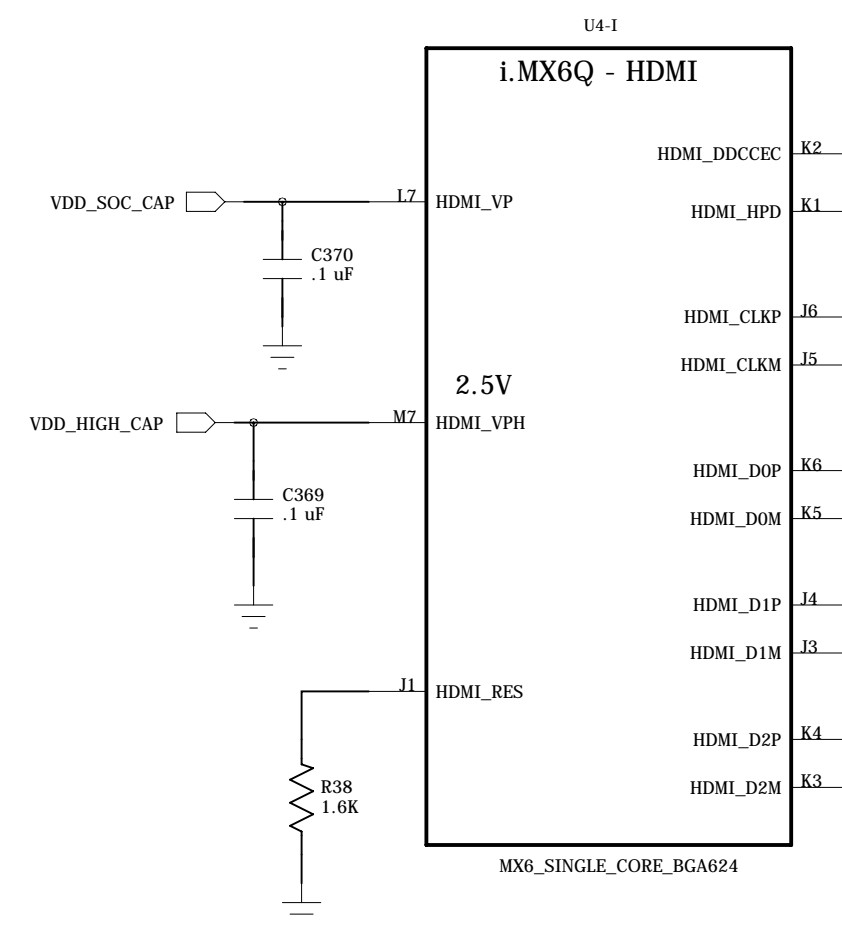
# CPU USB



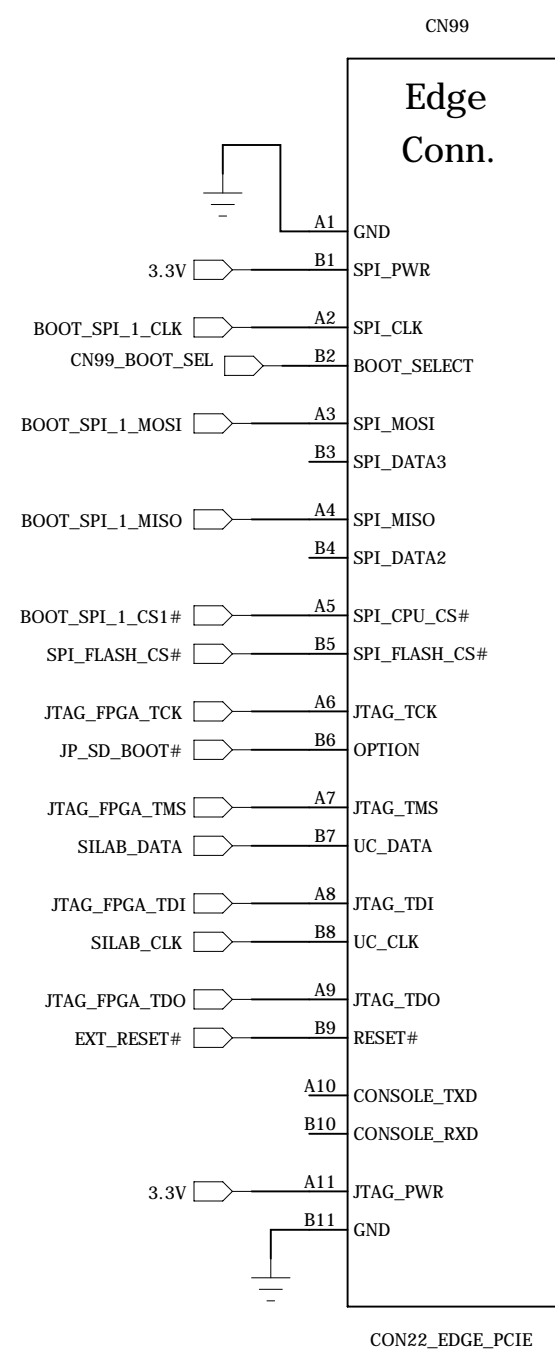
# CPU PCIe



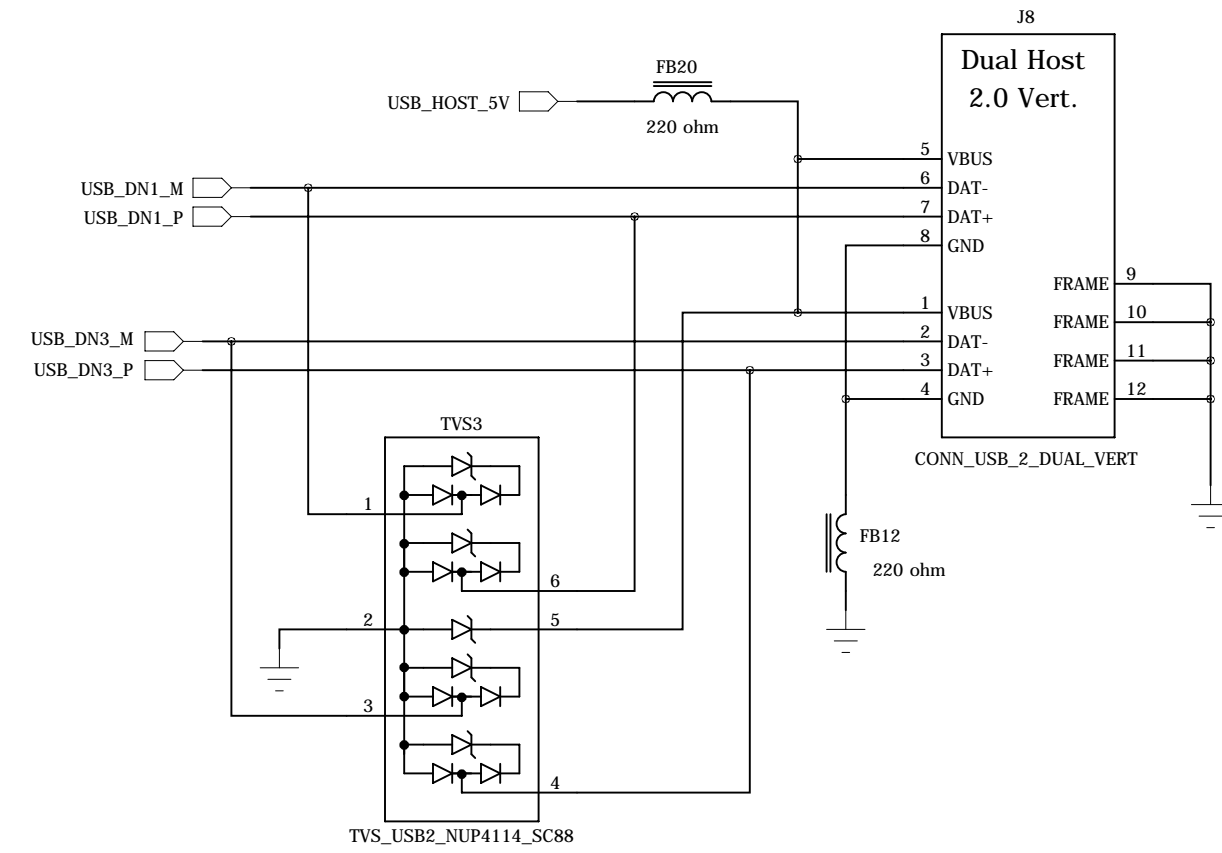
# CPU HDMI



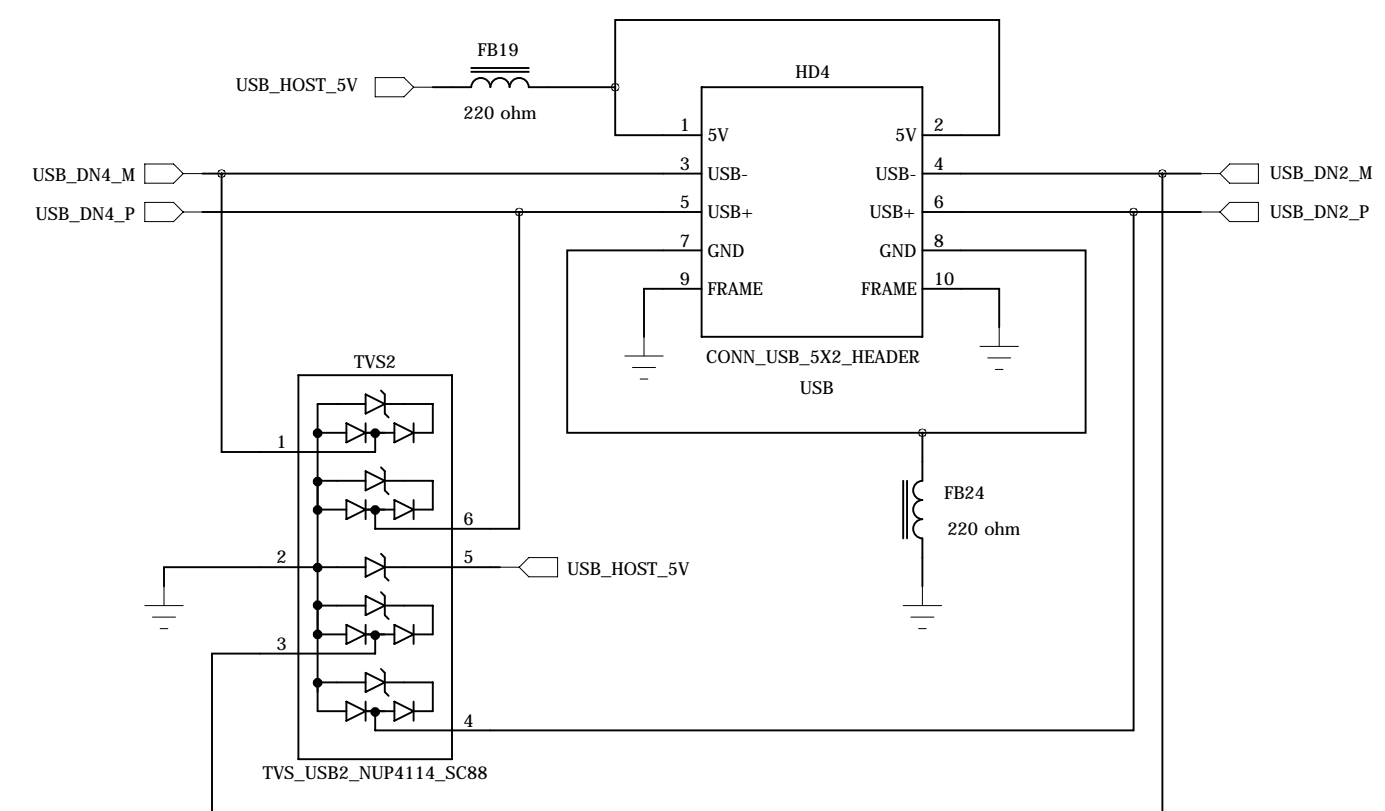
# CN99 Programmer Edge Conn.



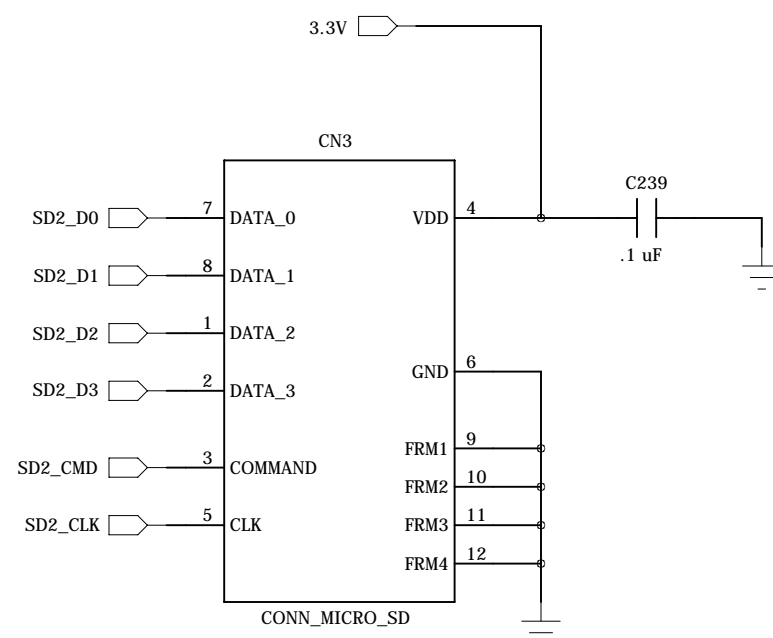
# USB Host Vert. Ports



# 2x Internal USB Headers

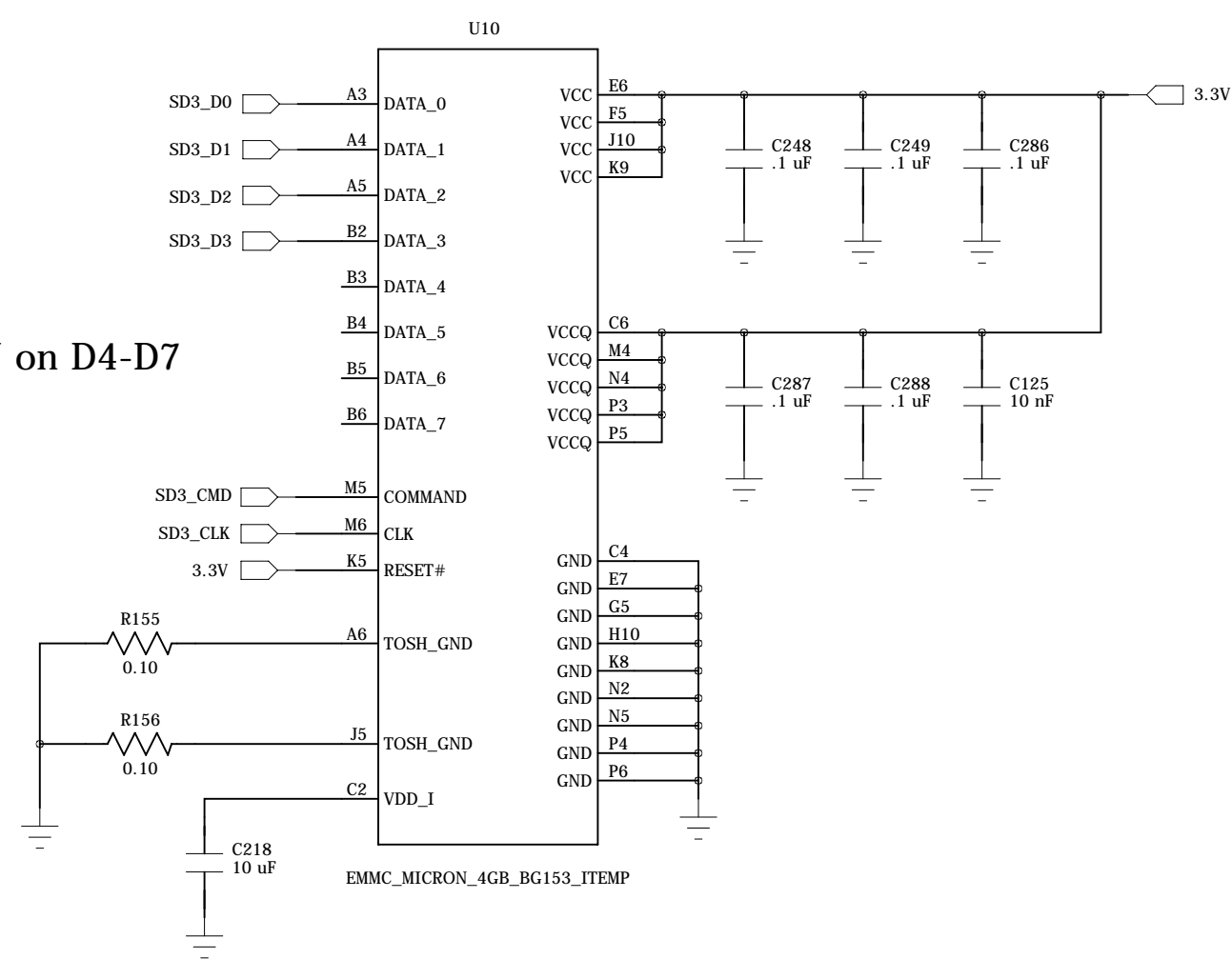


# Micro SD Card Socket

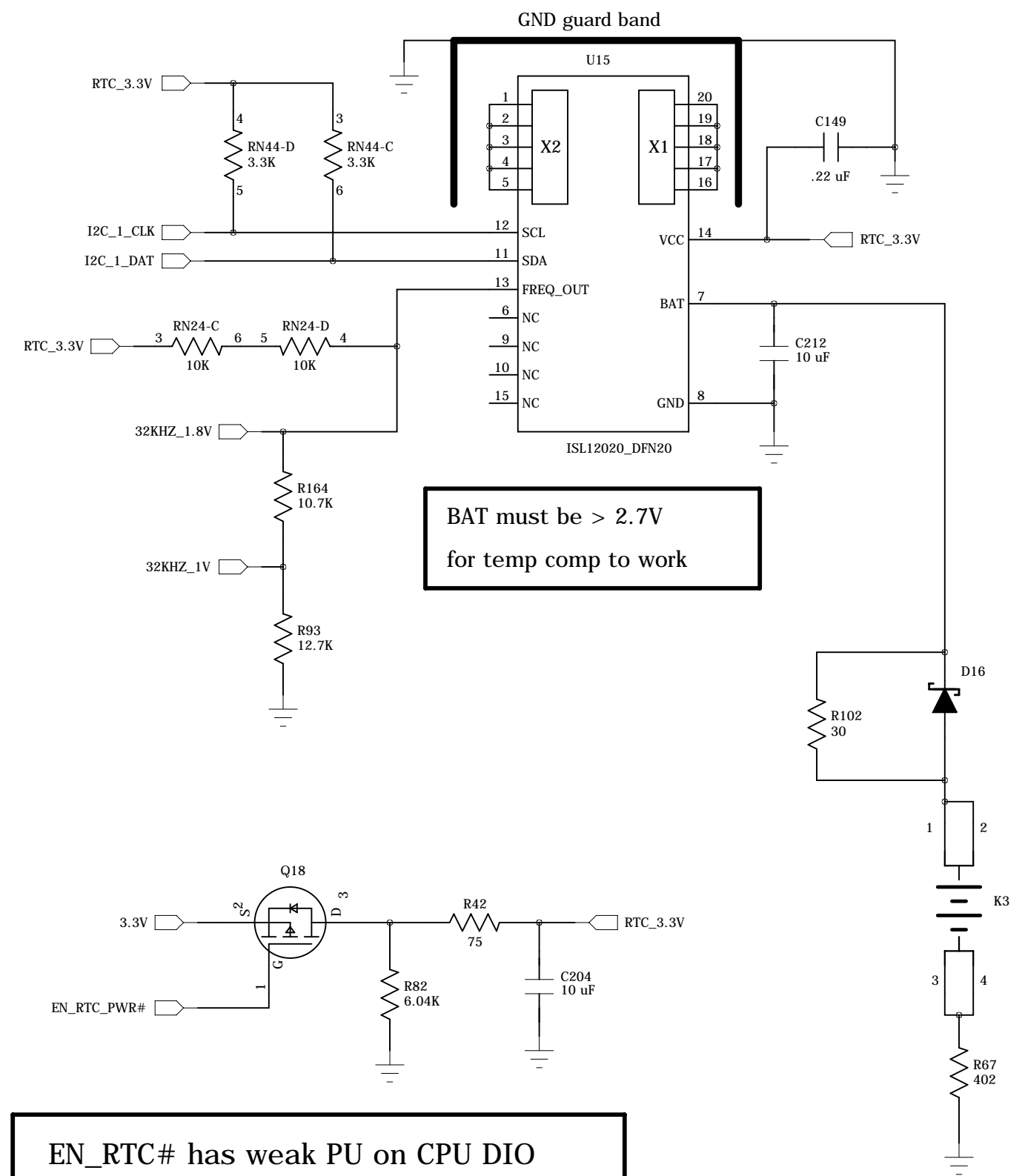


# eMMC 4GB

Internal PU on D4-D7



# Precision RTC and Temp. Sensor



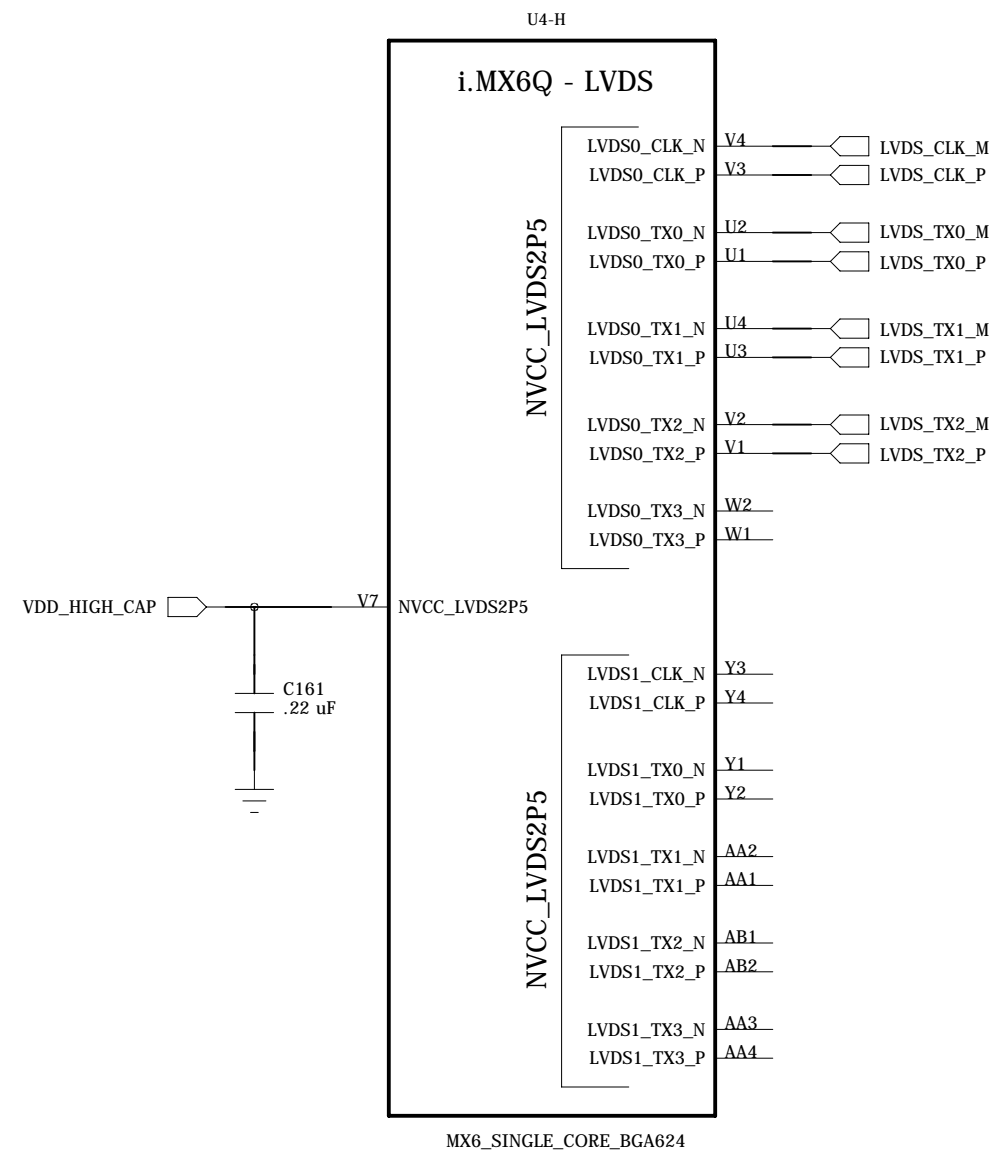
BAT must be > 2.7V  
for temp comp to work

EN\_RTC# has weak PU on CPU DIO  
At system power up, FET is off

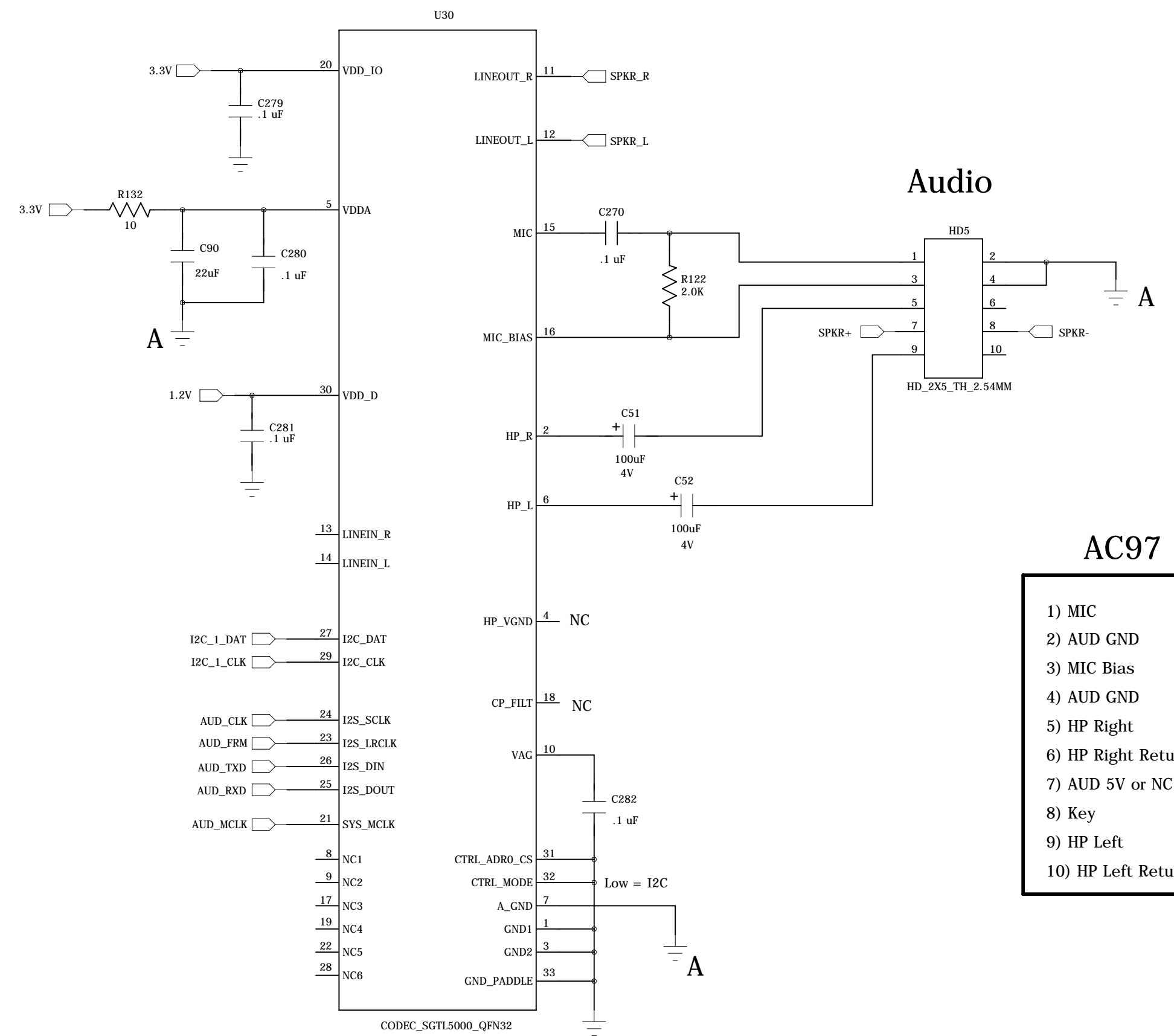




# LVDS

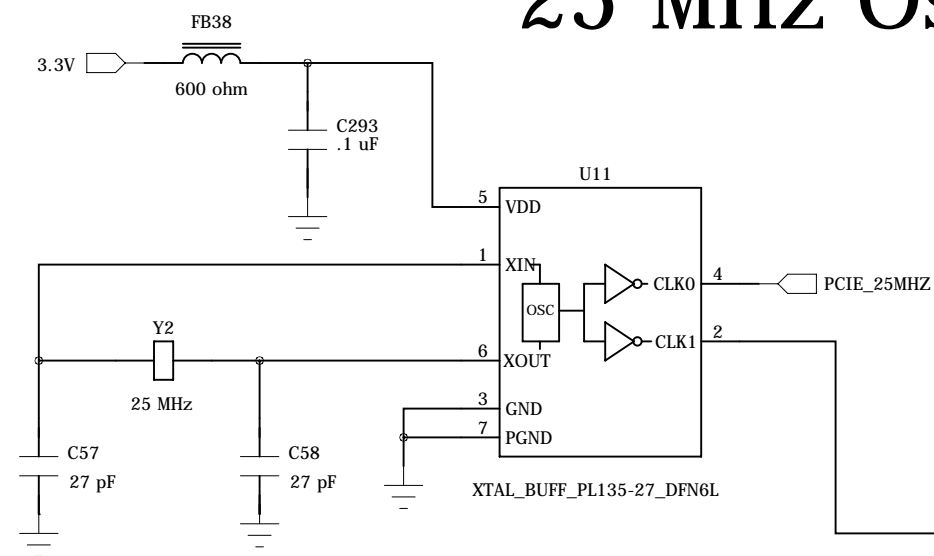


# Audio CODEC

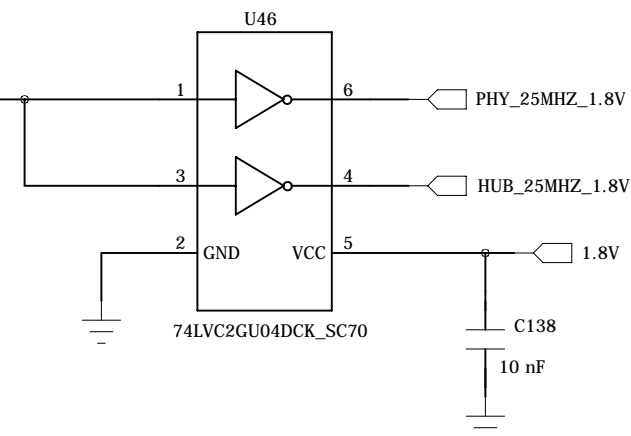


Connect AGND to GND at a single point

# 25 MHz Osc.



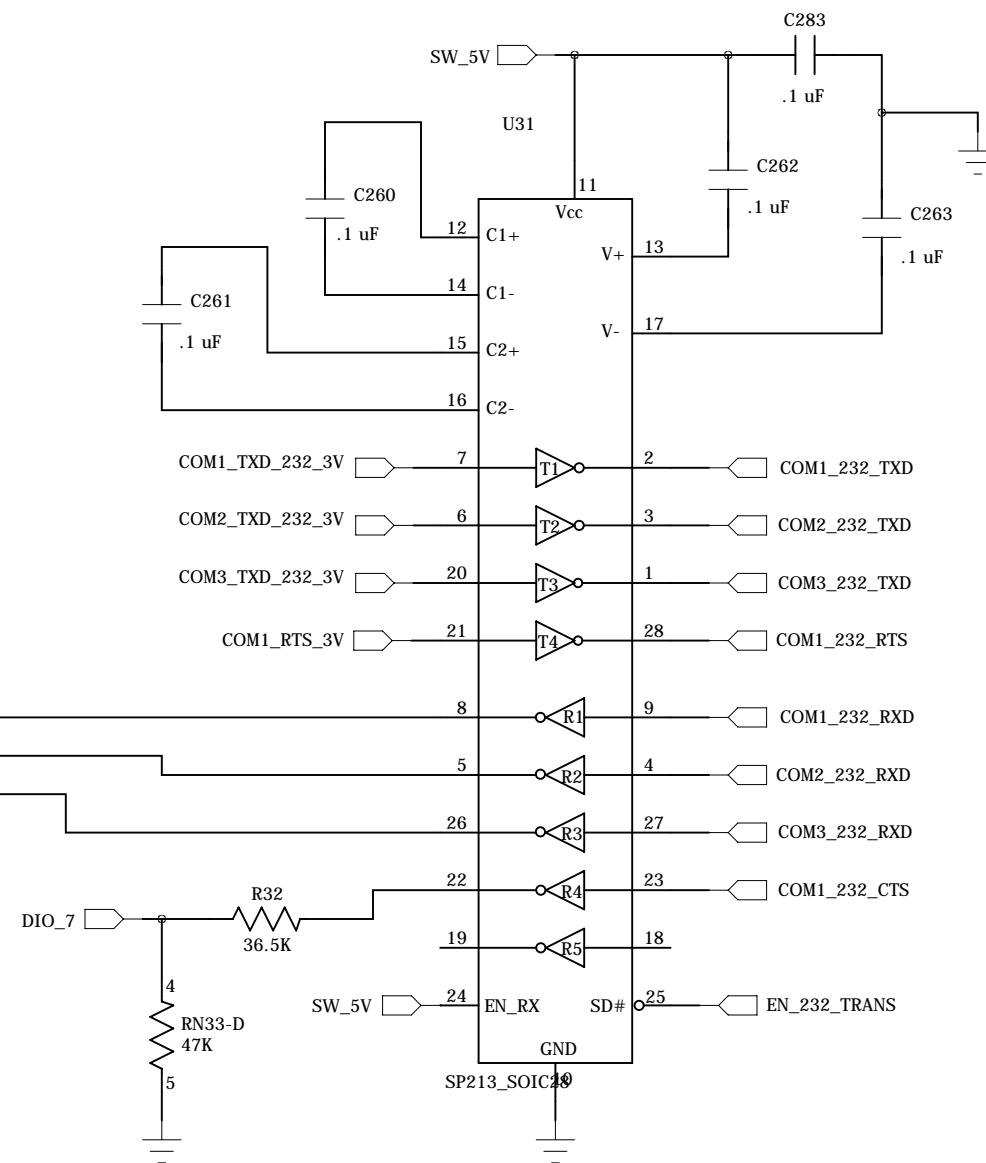
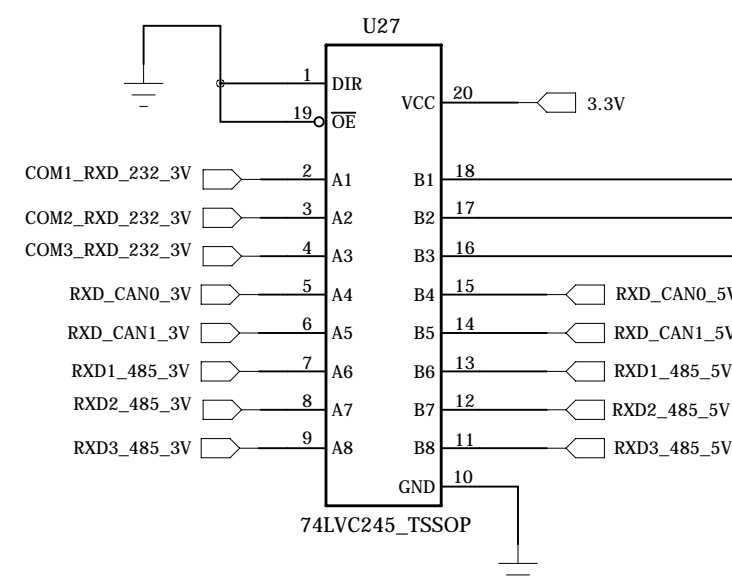
# Level Shifter



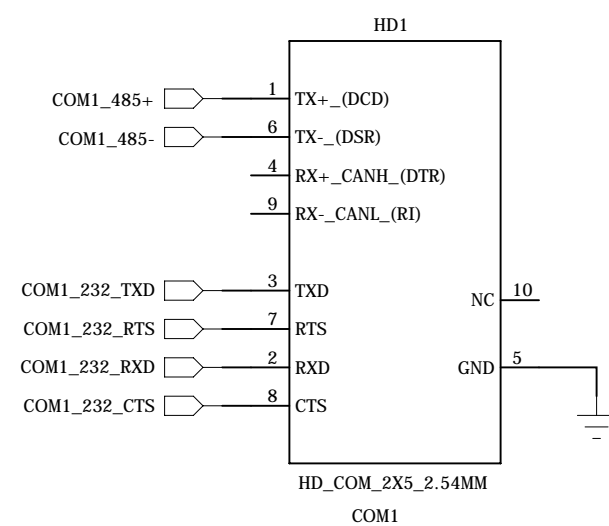
# RS-232 Transceiver and COM Headers

## RS-232 Transceiver

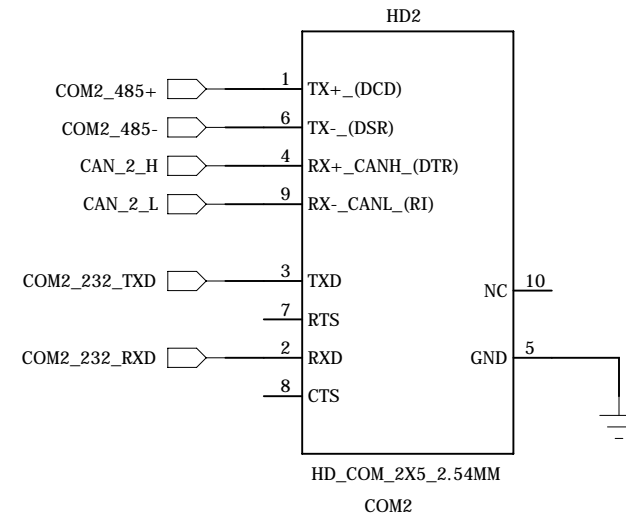
3.3V <-- 5V  
Level shifter



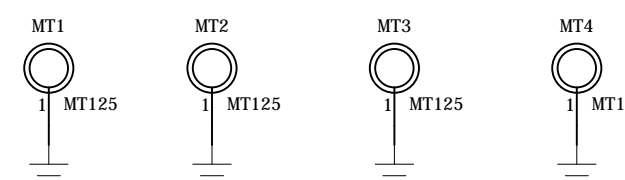
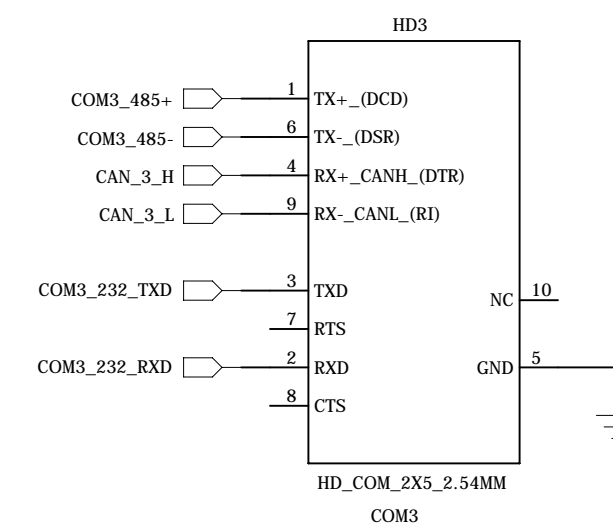
### COM1 Header



### COM2 Header



### COM3 Header

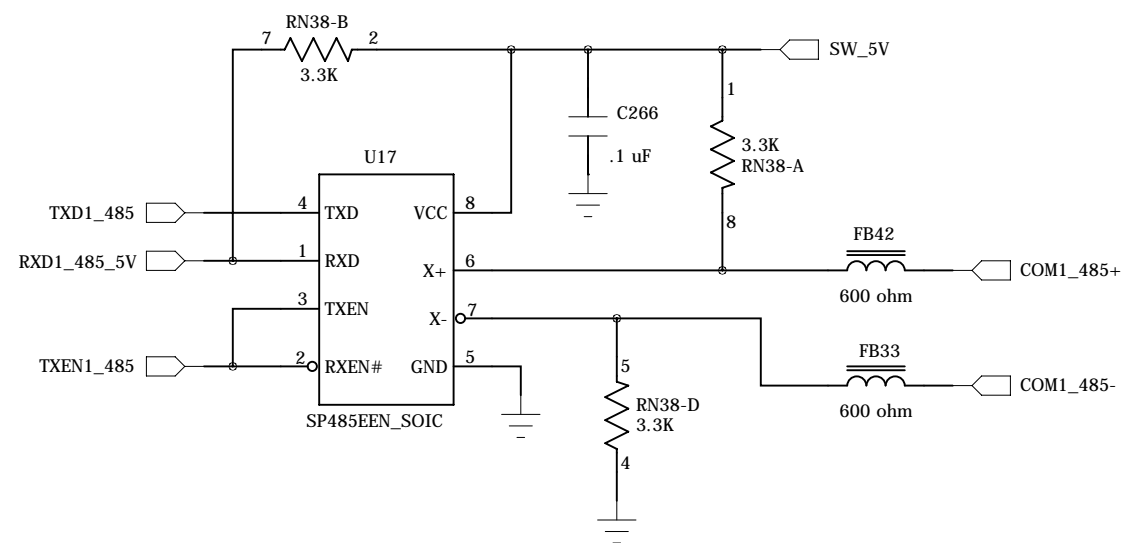


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# RS-485 and CAN Transceivers

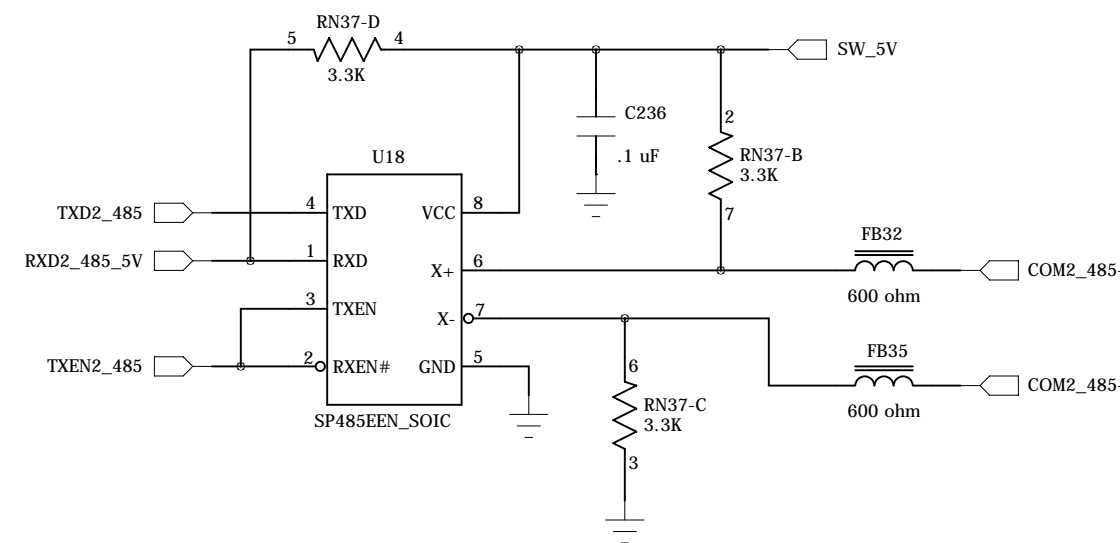
## COM1

### RS-485 Driver



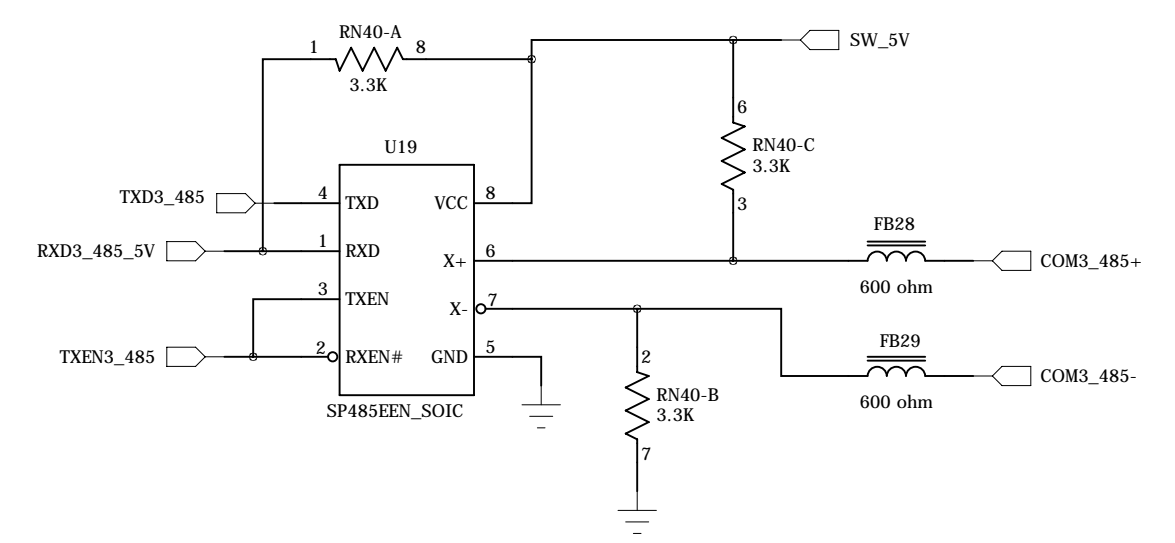
## COM2

### RS-485 Driver



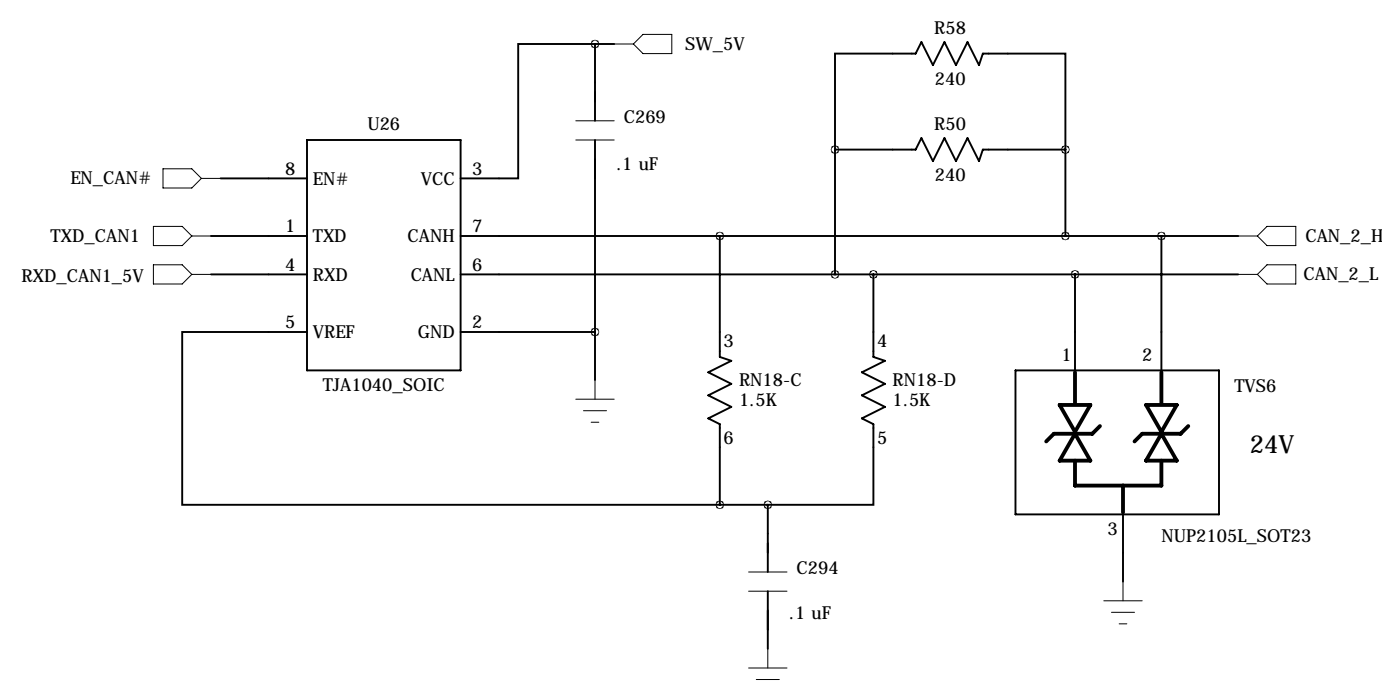
## COM3

### RS-485 Driver



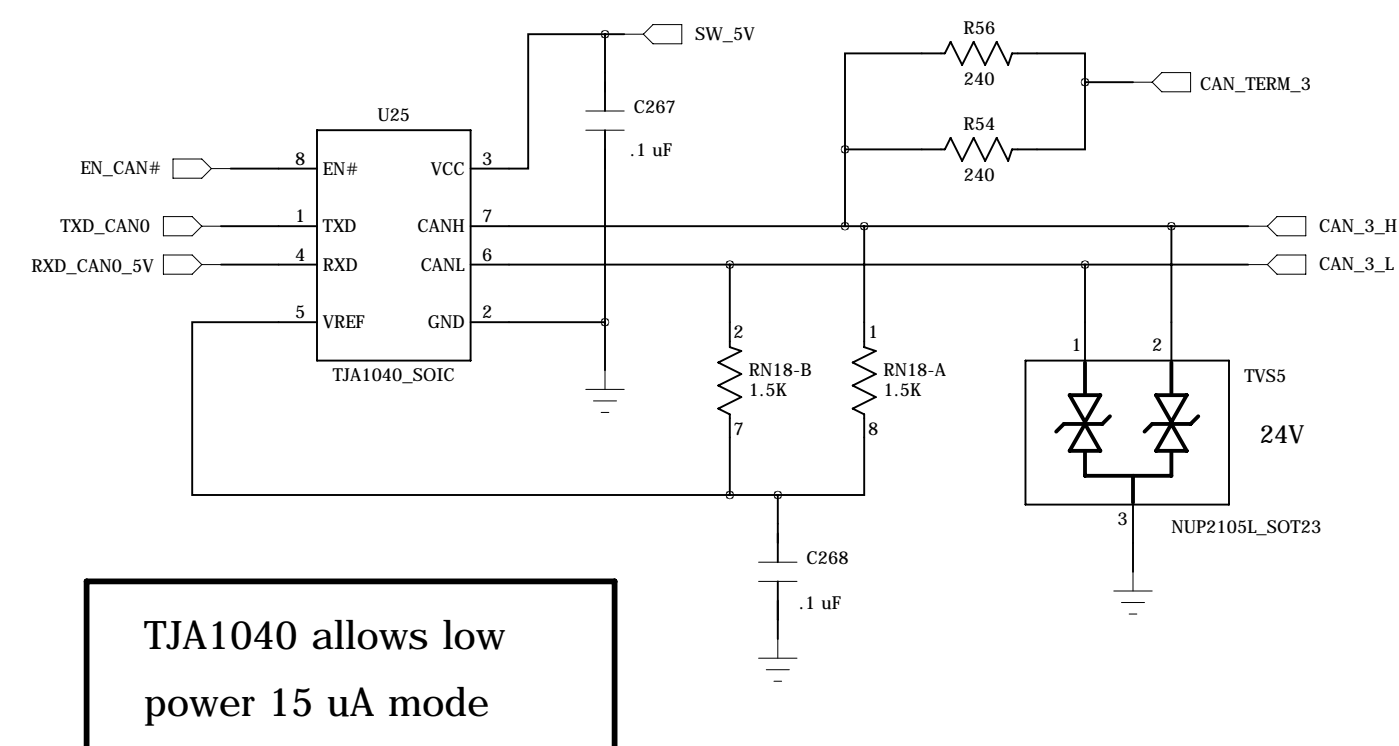
## COM2

### CAN Transceiver



## COM3

### CAN Transceiver



TJA1040 allows low power 15 uA mode

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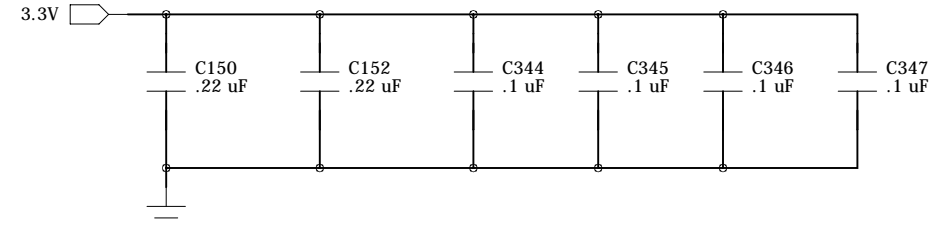
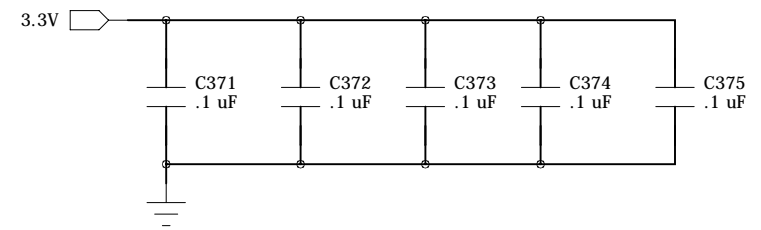
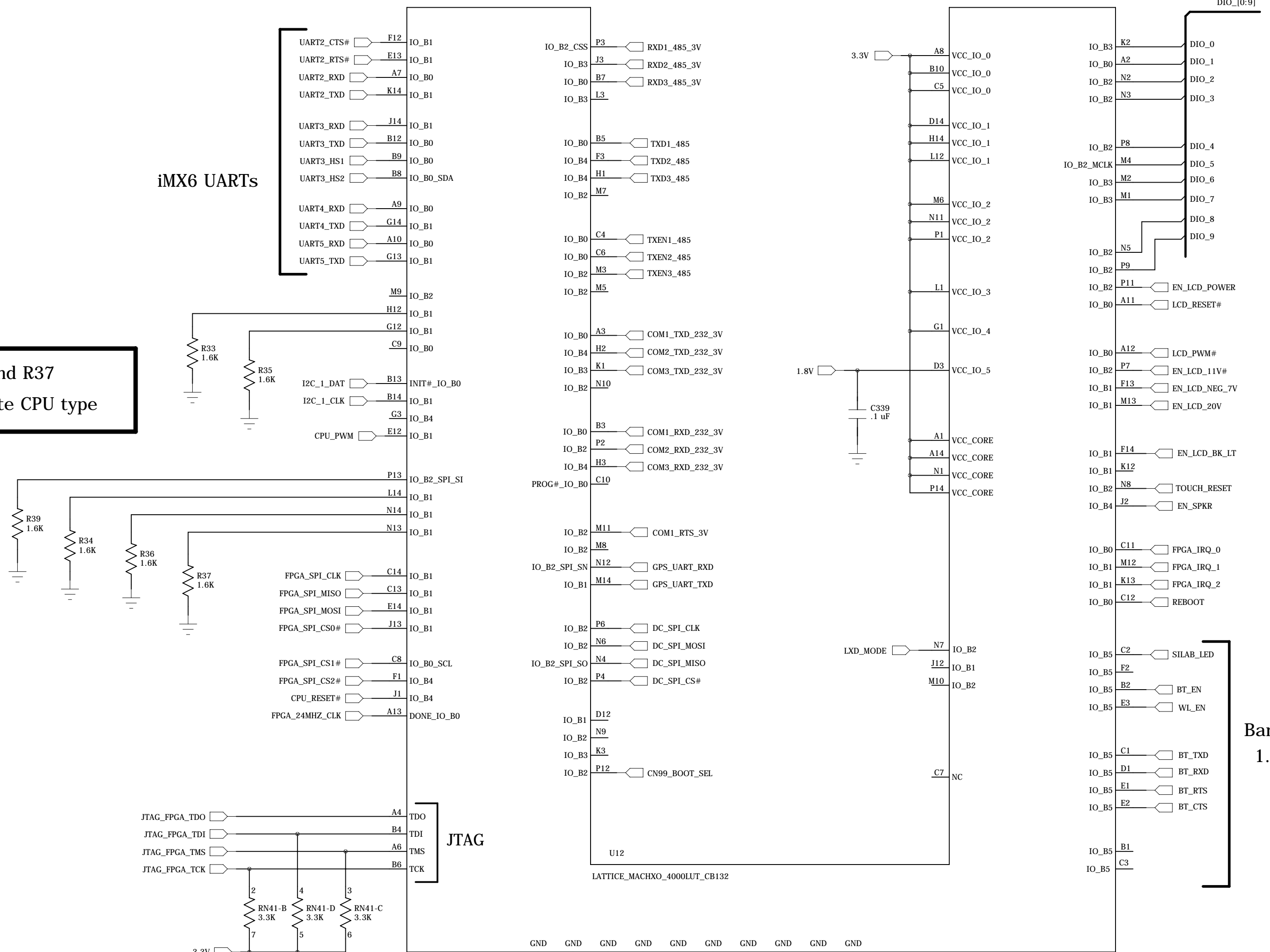
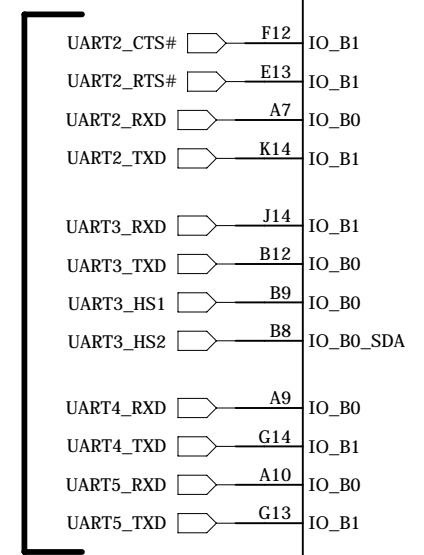
# MACH XO2 FPGA

## FPGA required for:

- Adds two MAX3100 UART via SPI
- Auto-485 for 3 UARTs
- Provides serial port MUXing
- Level shifting for Bluetooth
- Controls LCD power sequencing
- Option strap resistors
- DIO for DC

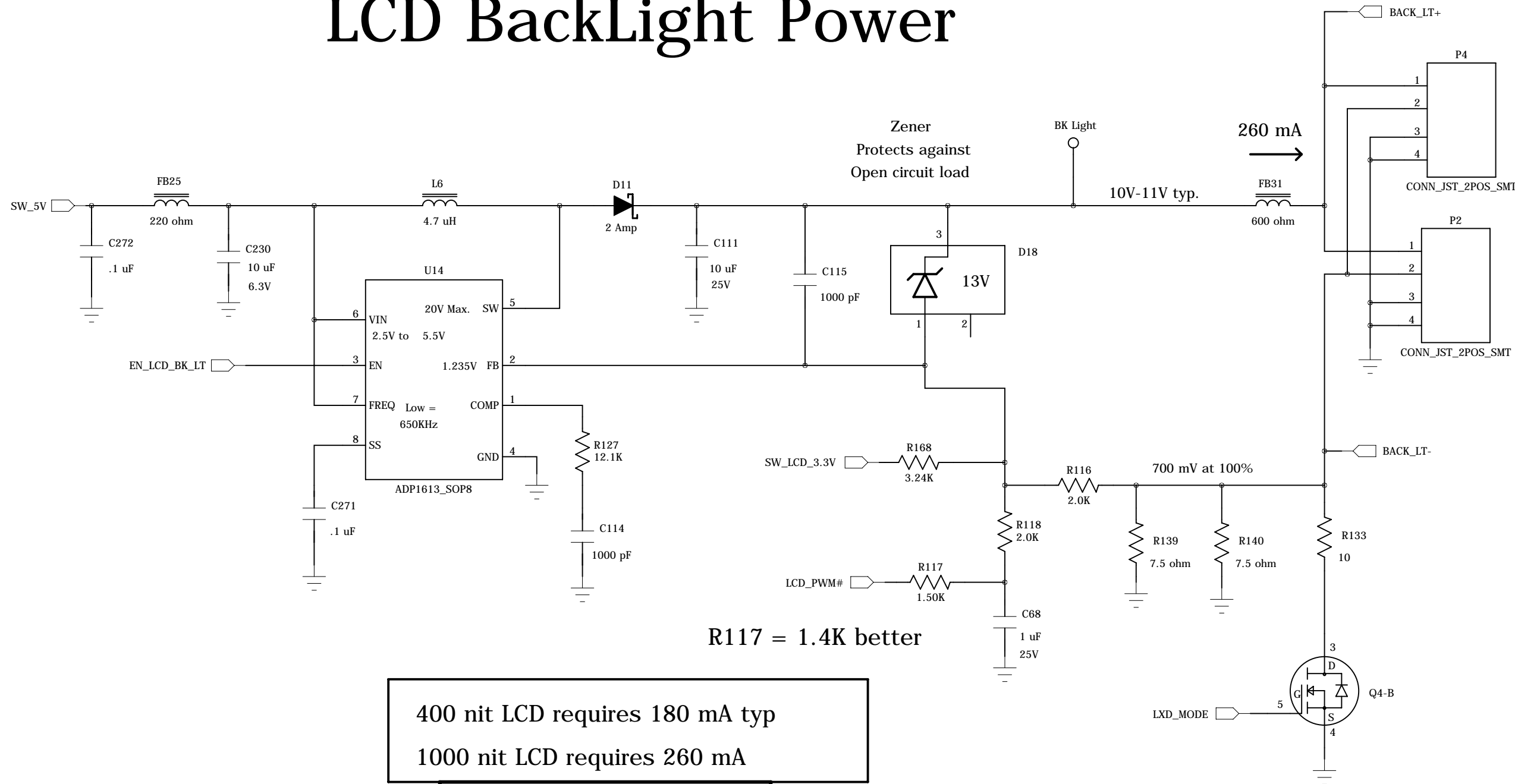
R36 and R37 indicate CPU type

### iMX6 UARTs



Bank 5  
1.8V

# LCD BackLight Power

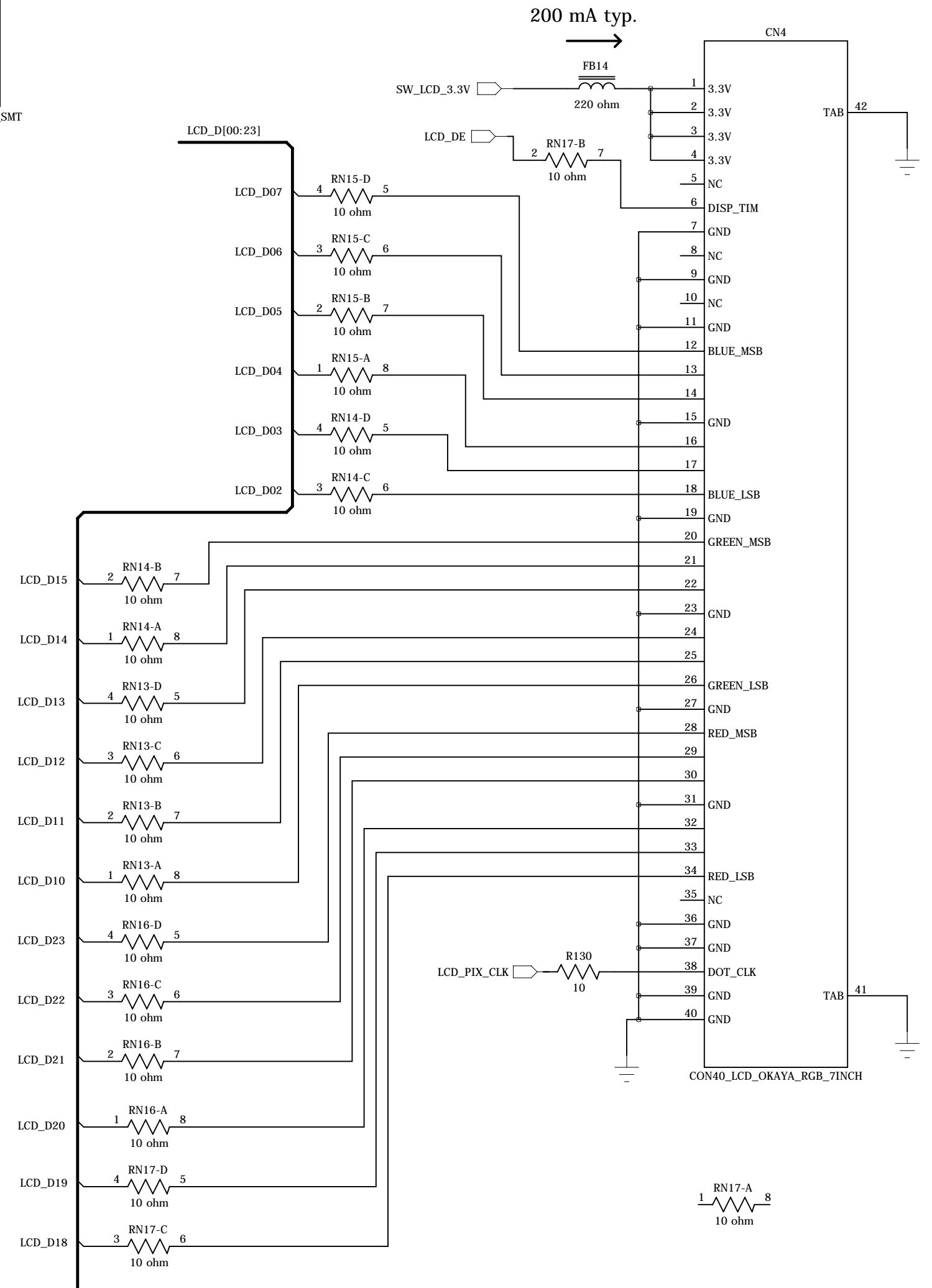


400 nit LCD requires 180 mA typ  
1000 nit LCD requires 260 mA

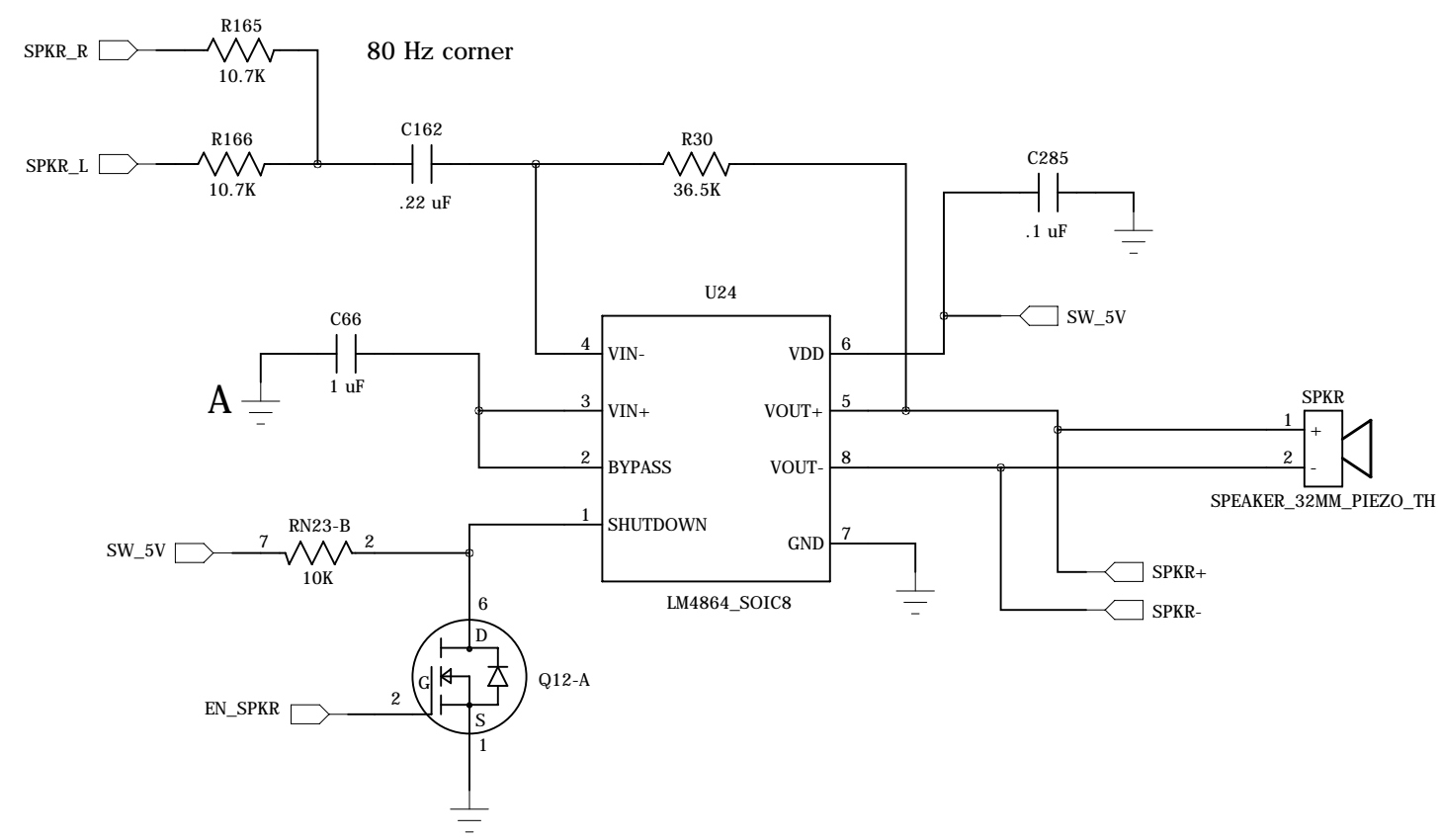
Q4-A ON = 260 mA

R117 = 1.4K better

# Okaya LCD Conn.

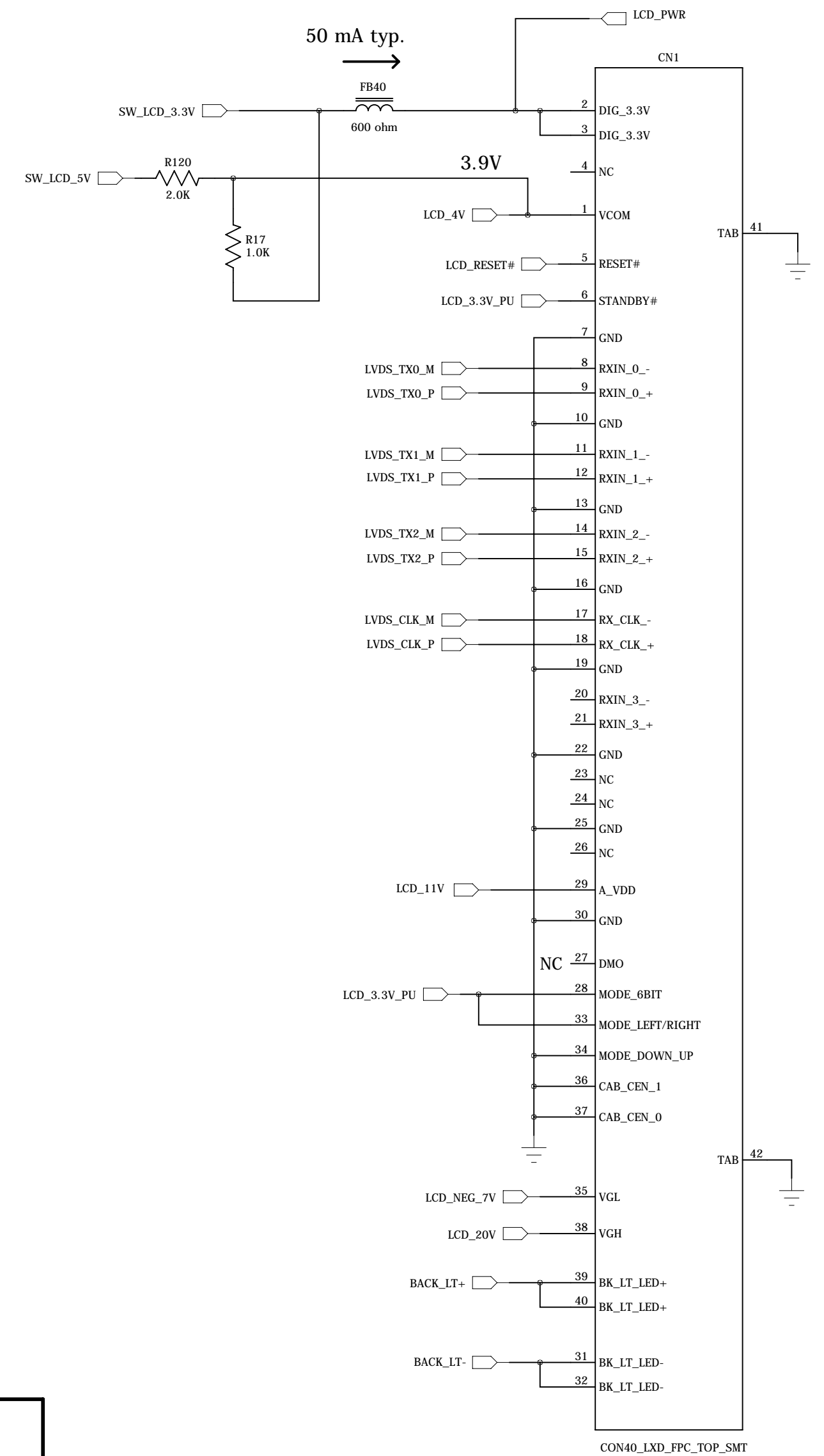


# Speaker Amp

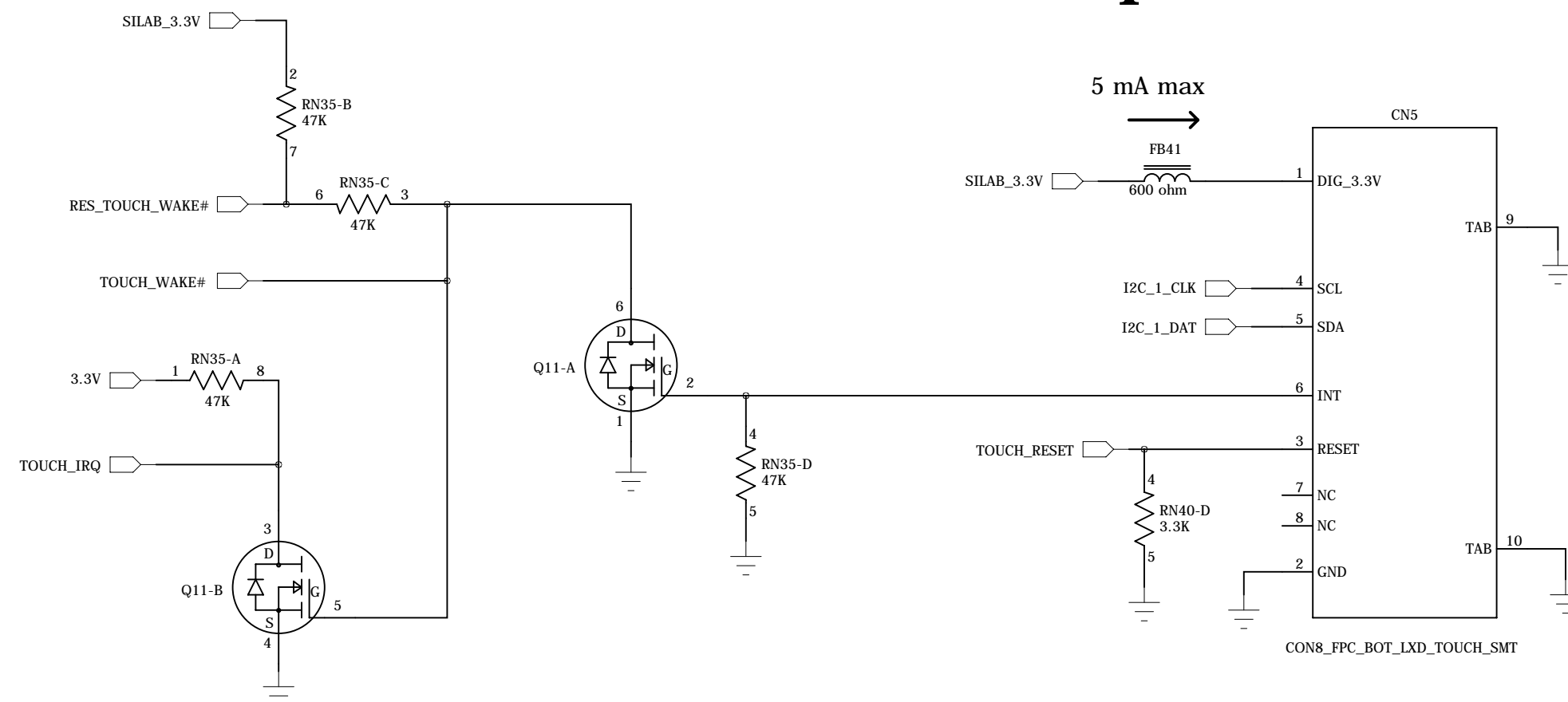


# LVDS LCD Conn. LCD

# LXD LCD Conn.



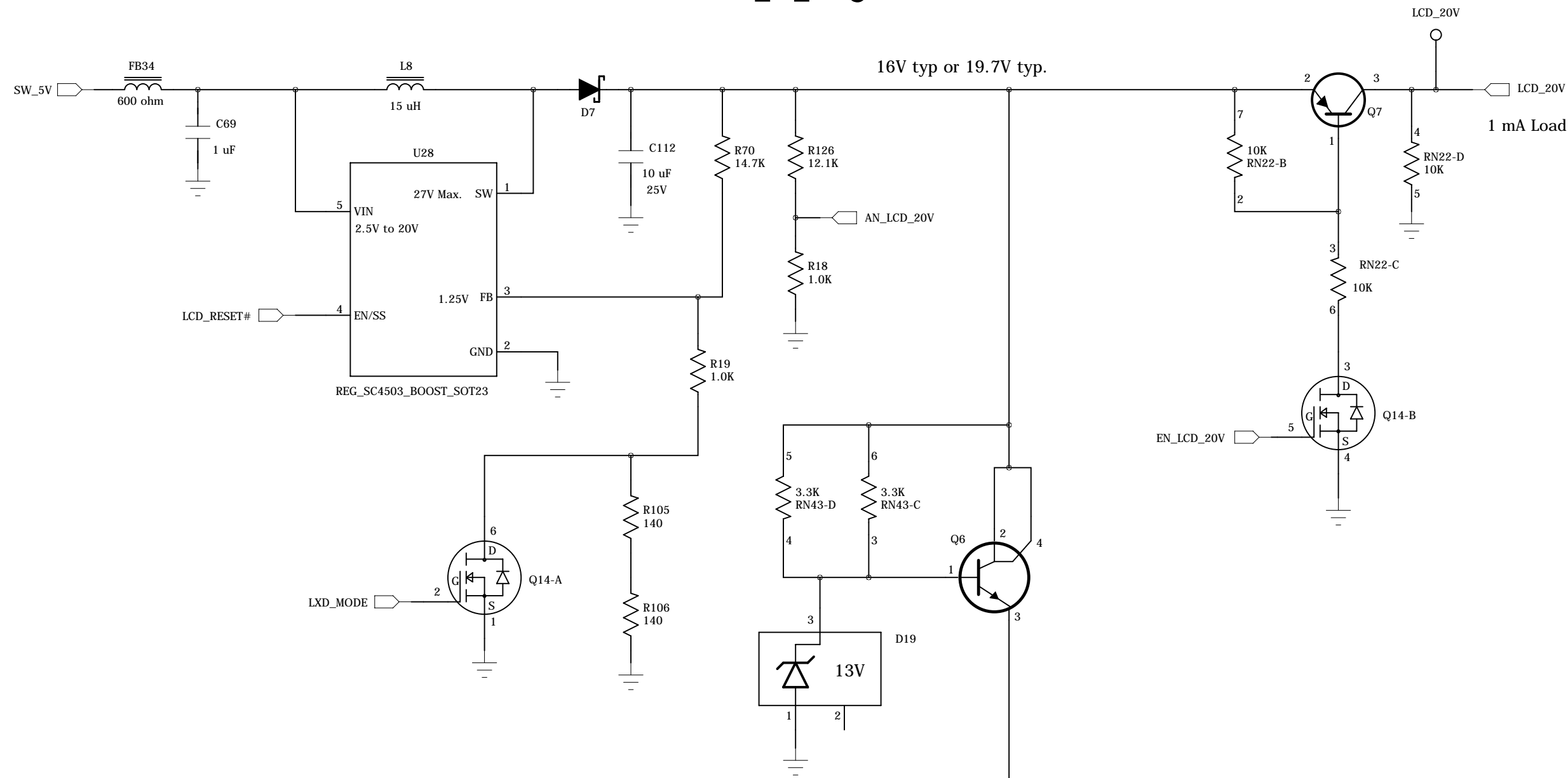
# LXD Cap. Touch Conn.



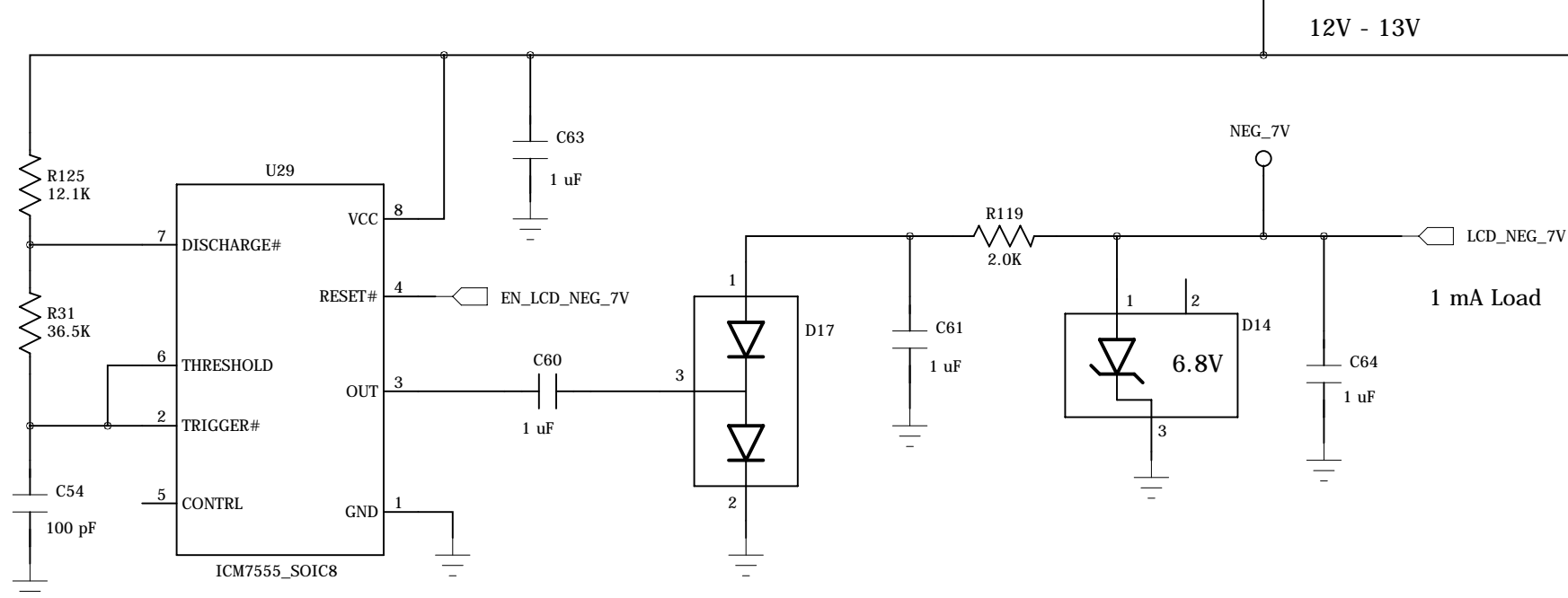
Power with SiLab 3.3V  
so wake up works

# LXD LCD Power Rails

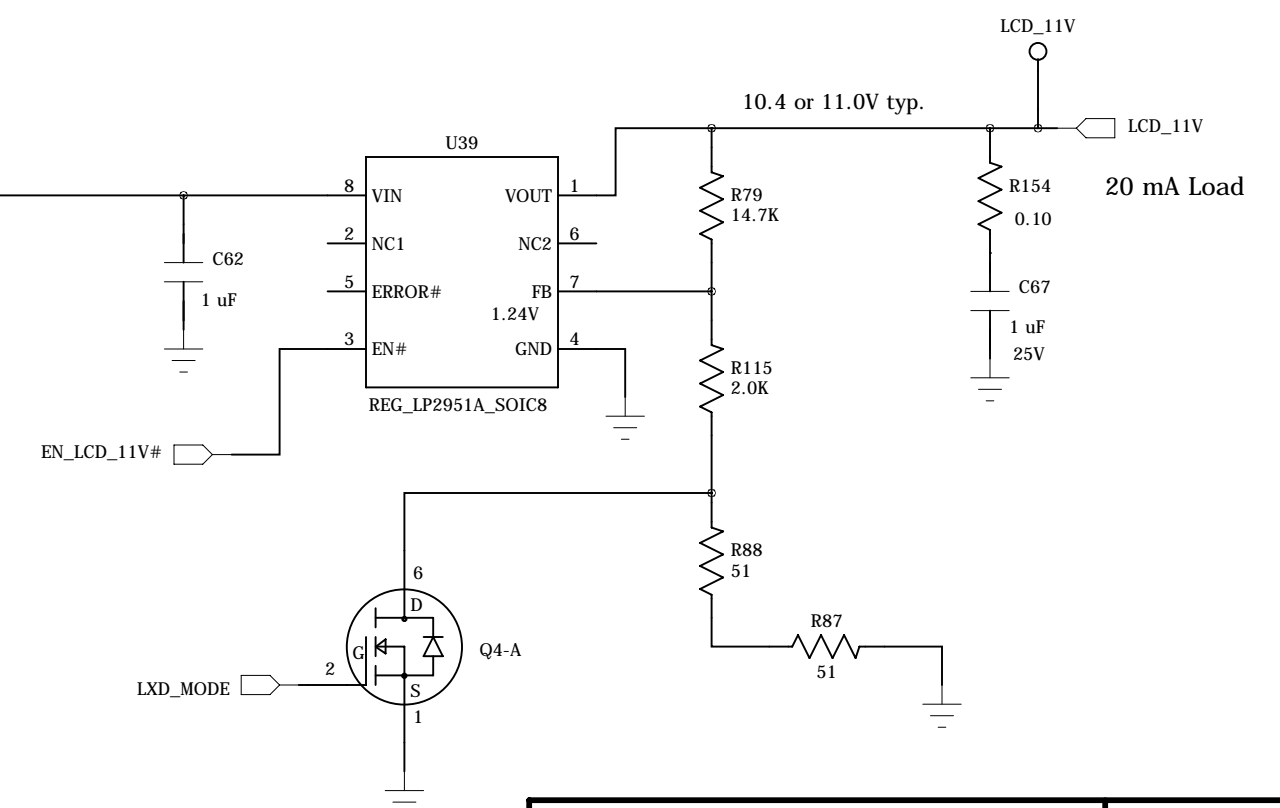
## LCD +20V Power Supply



## LCD Negative 7V Rail



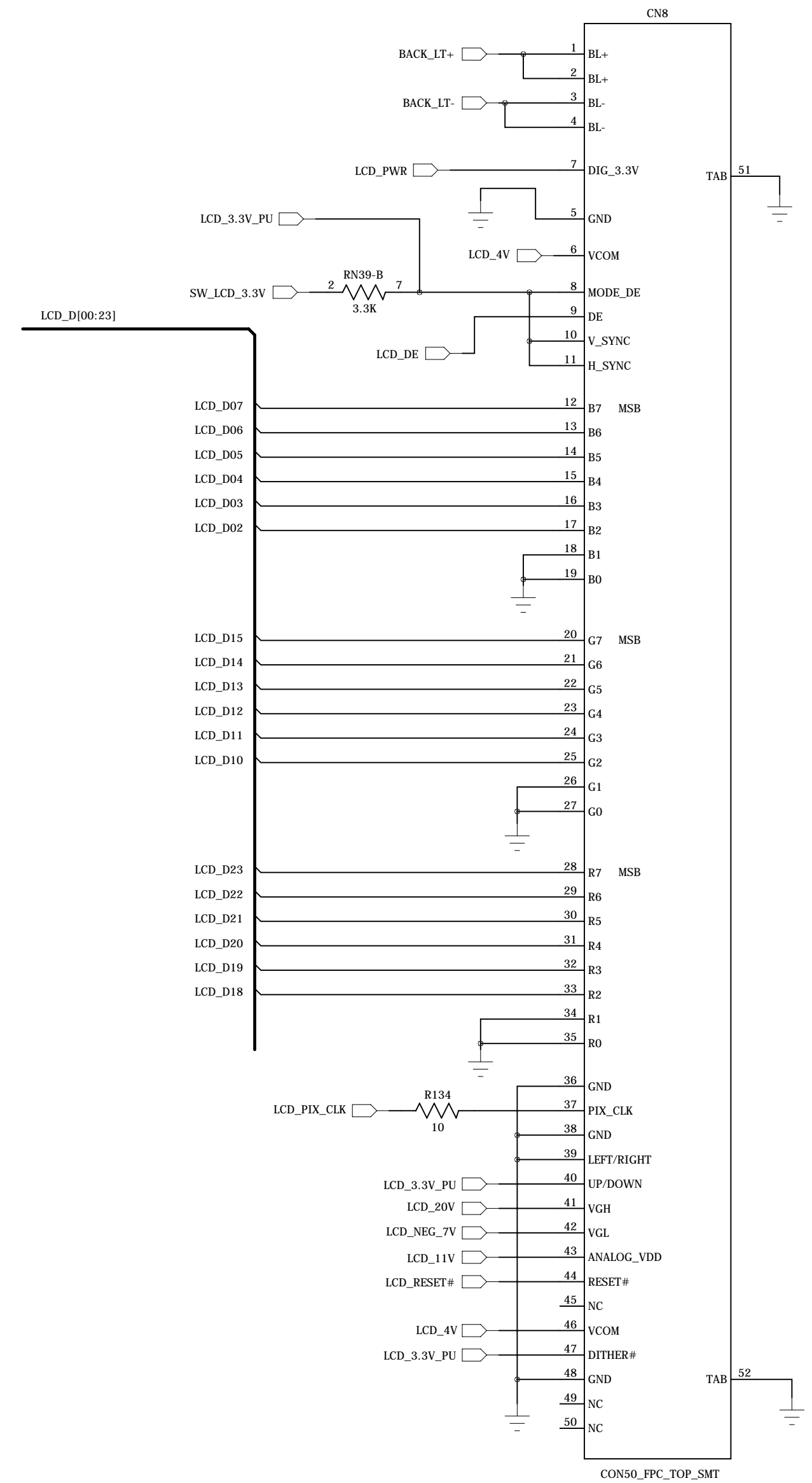
## LCD 11V Power Supply



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# MicroTips

## LCD Conn.



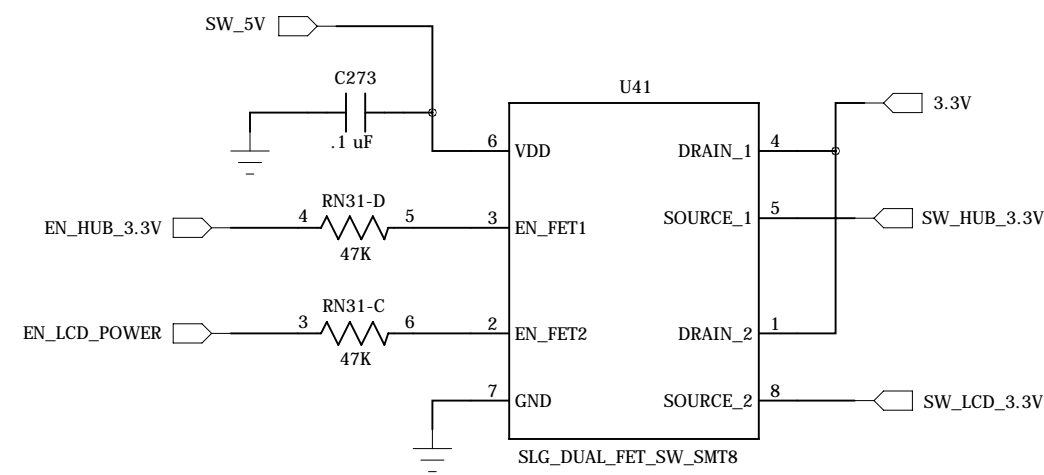
Top Contacts



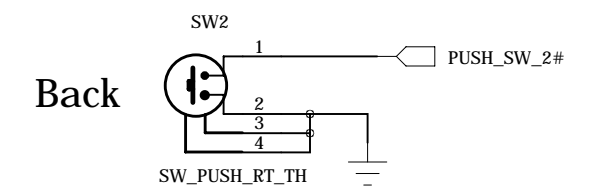
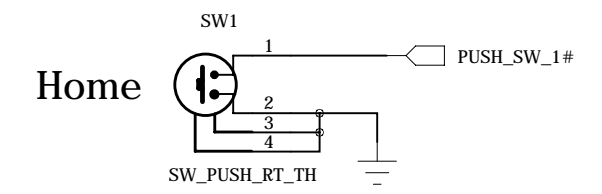
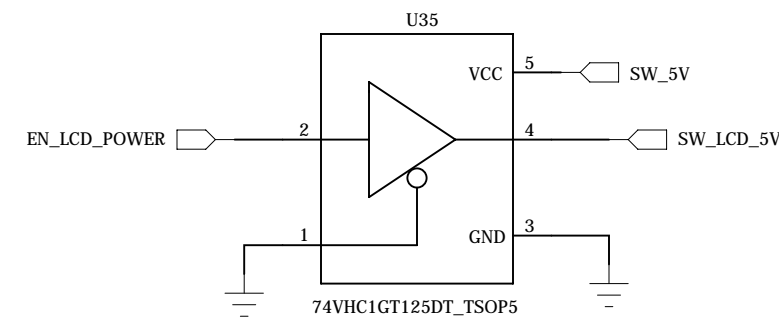
# LCD Res. Touch

# Android Push Switches

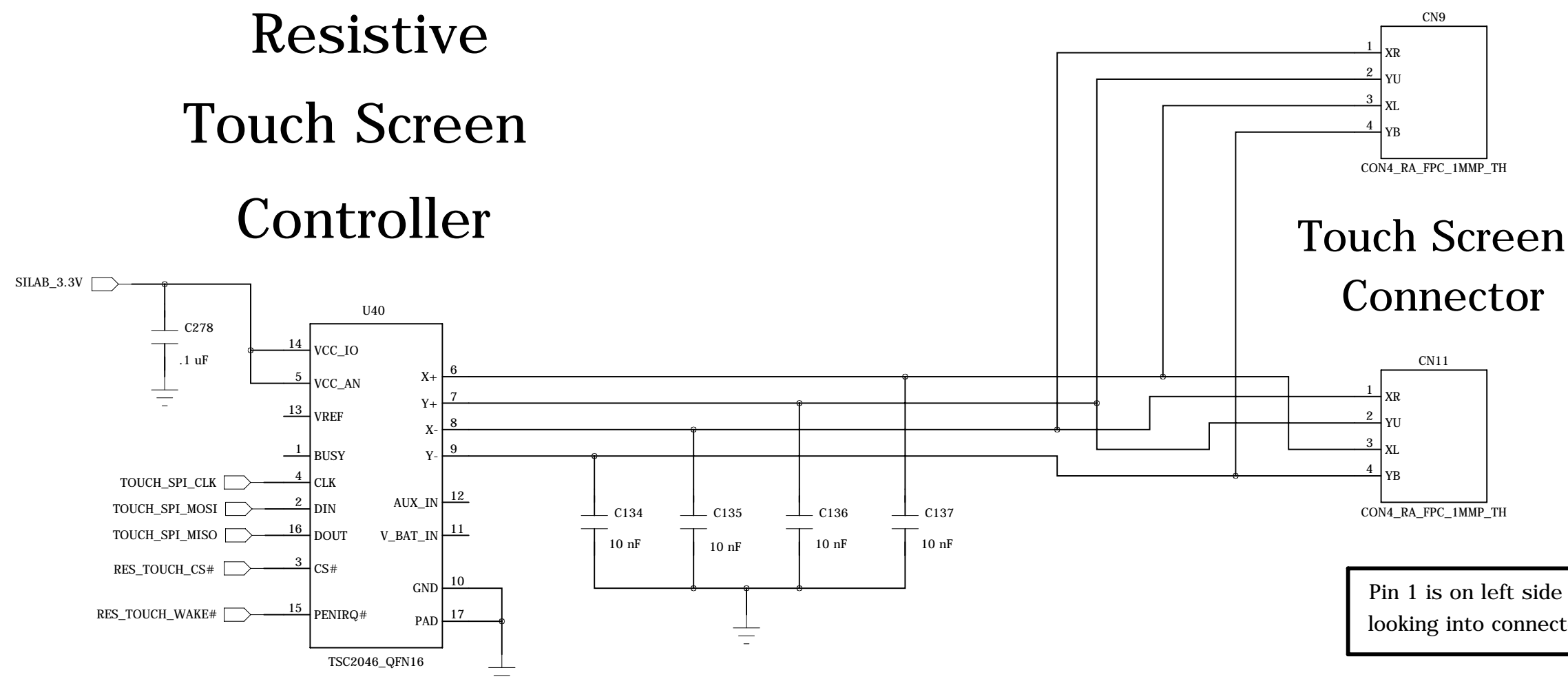
## Hub and LCD Power Switch



Rise time of both outputs measured at ~1V/ms



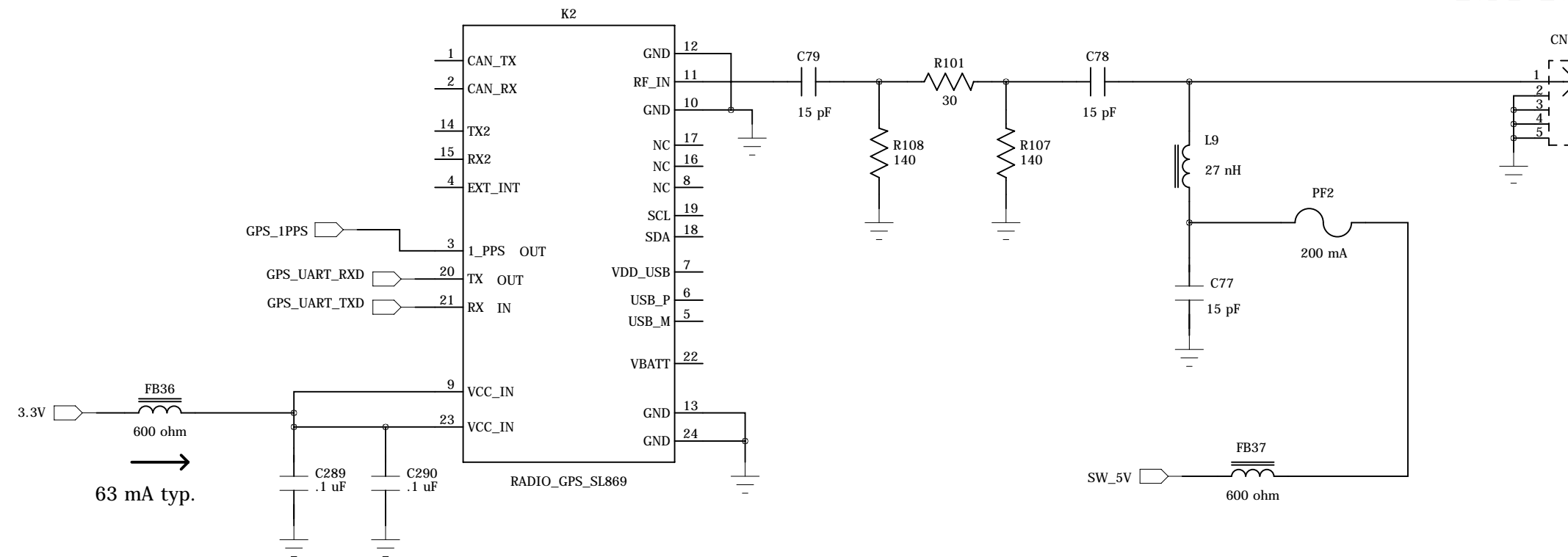
## Resistive Touch Screen Controller



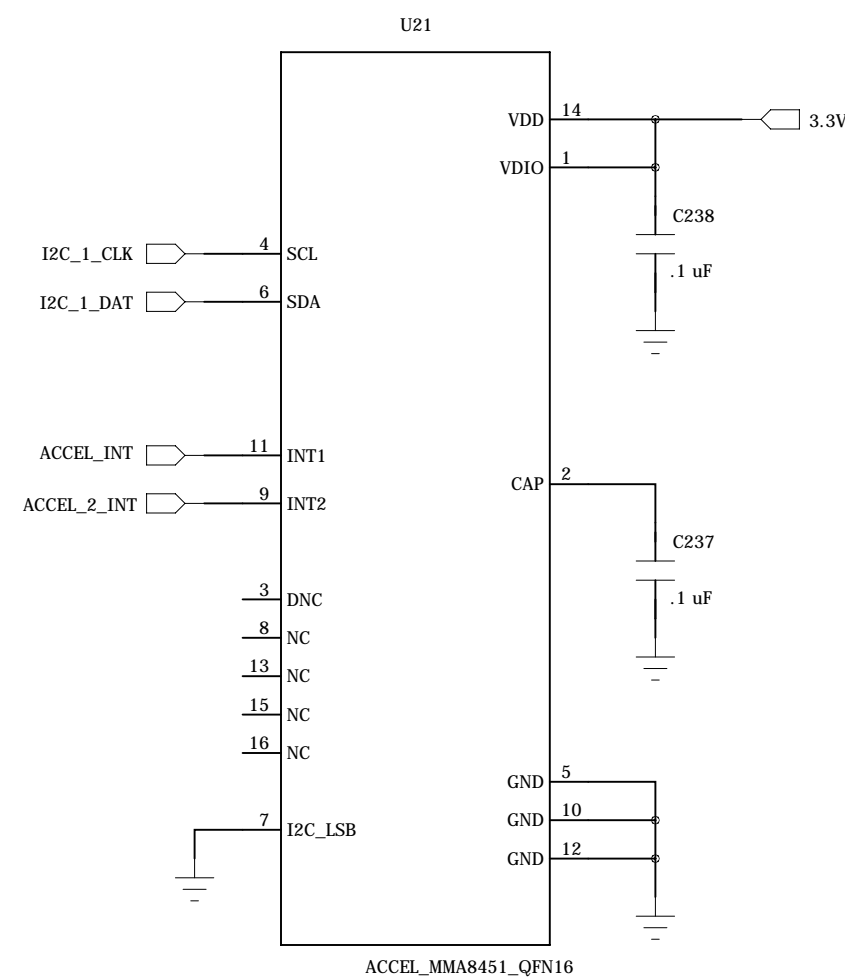
Pin 1 is on left side looking into connector

# Telit SL869 GPS Radio

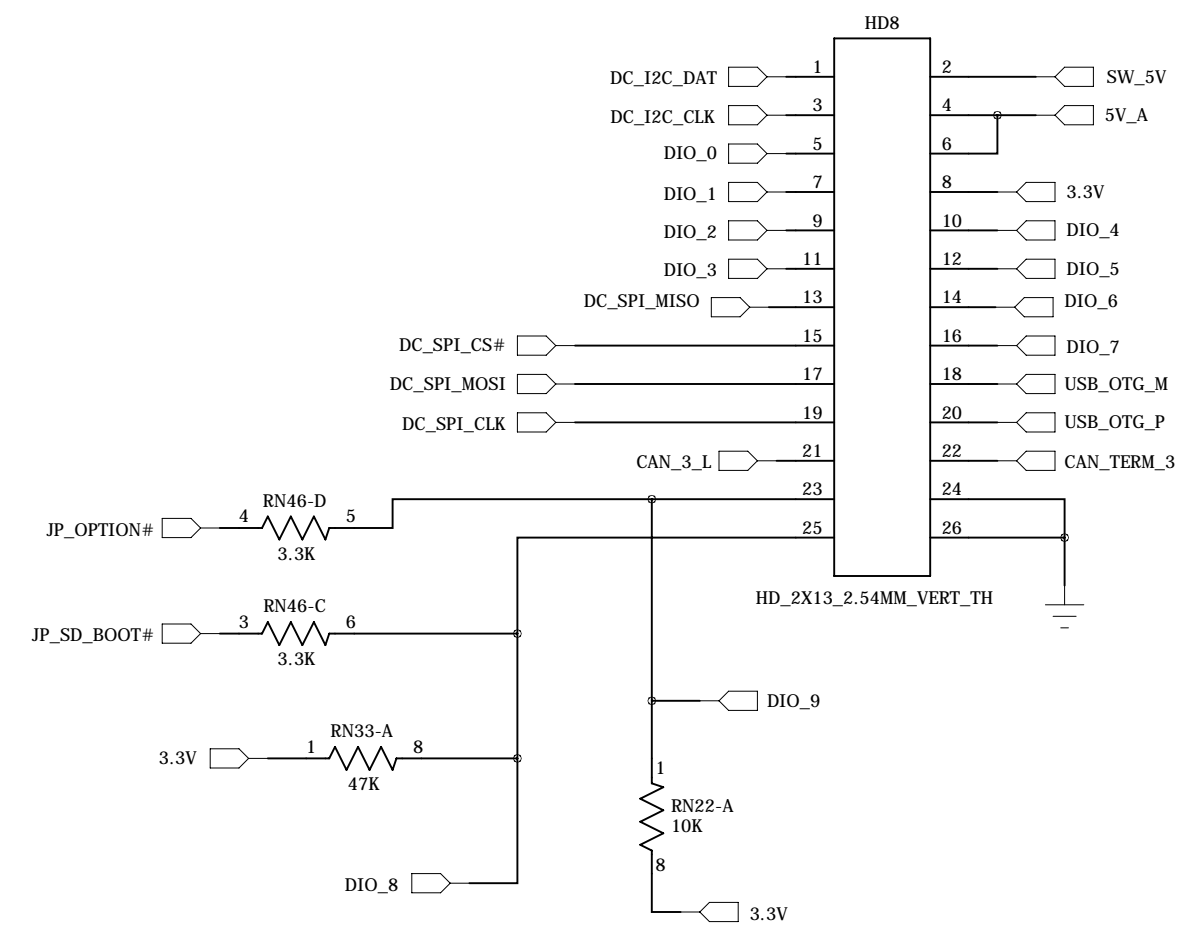
RF Conn.  
RA RMA



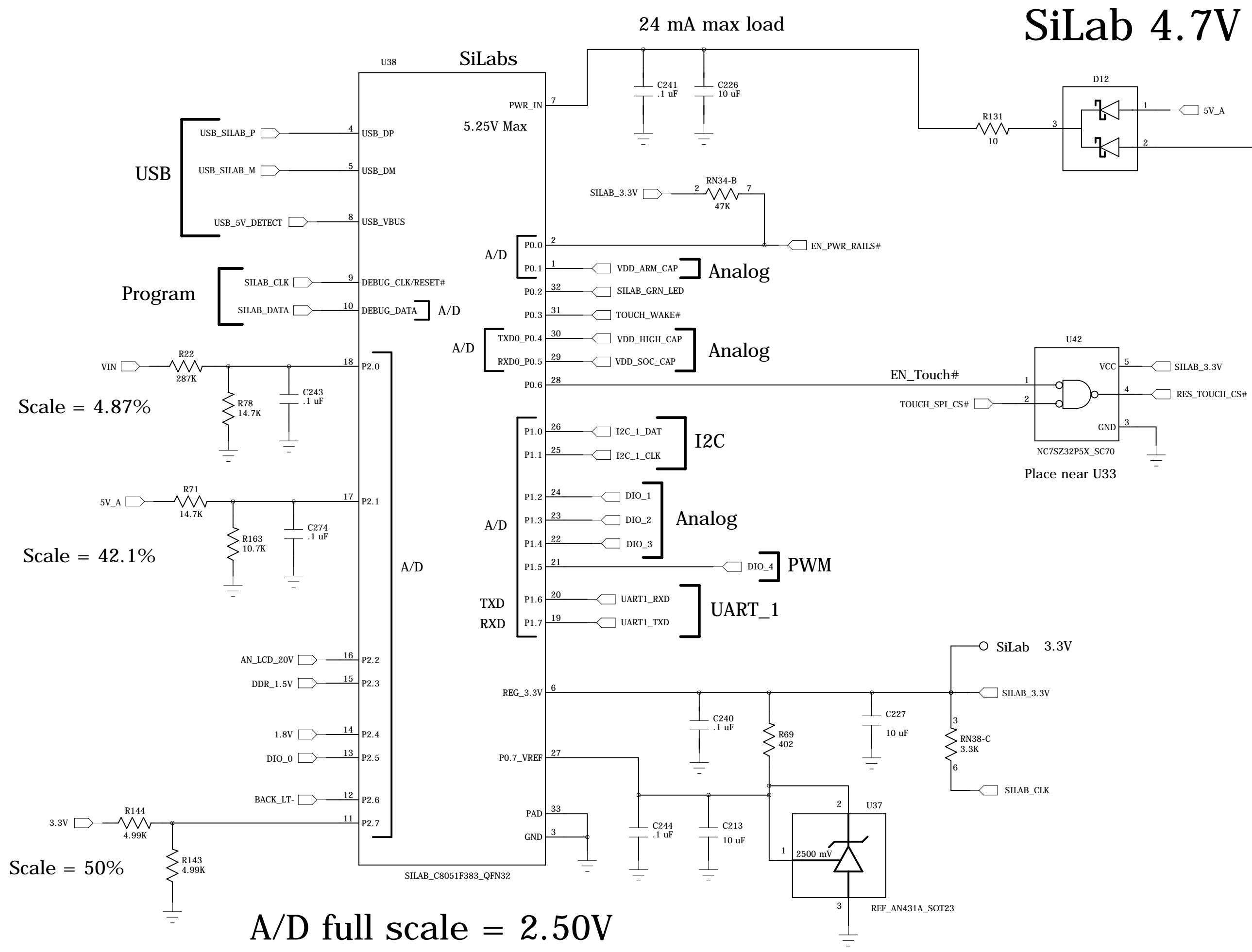
# Accelerometer



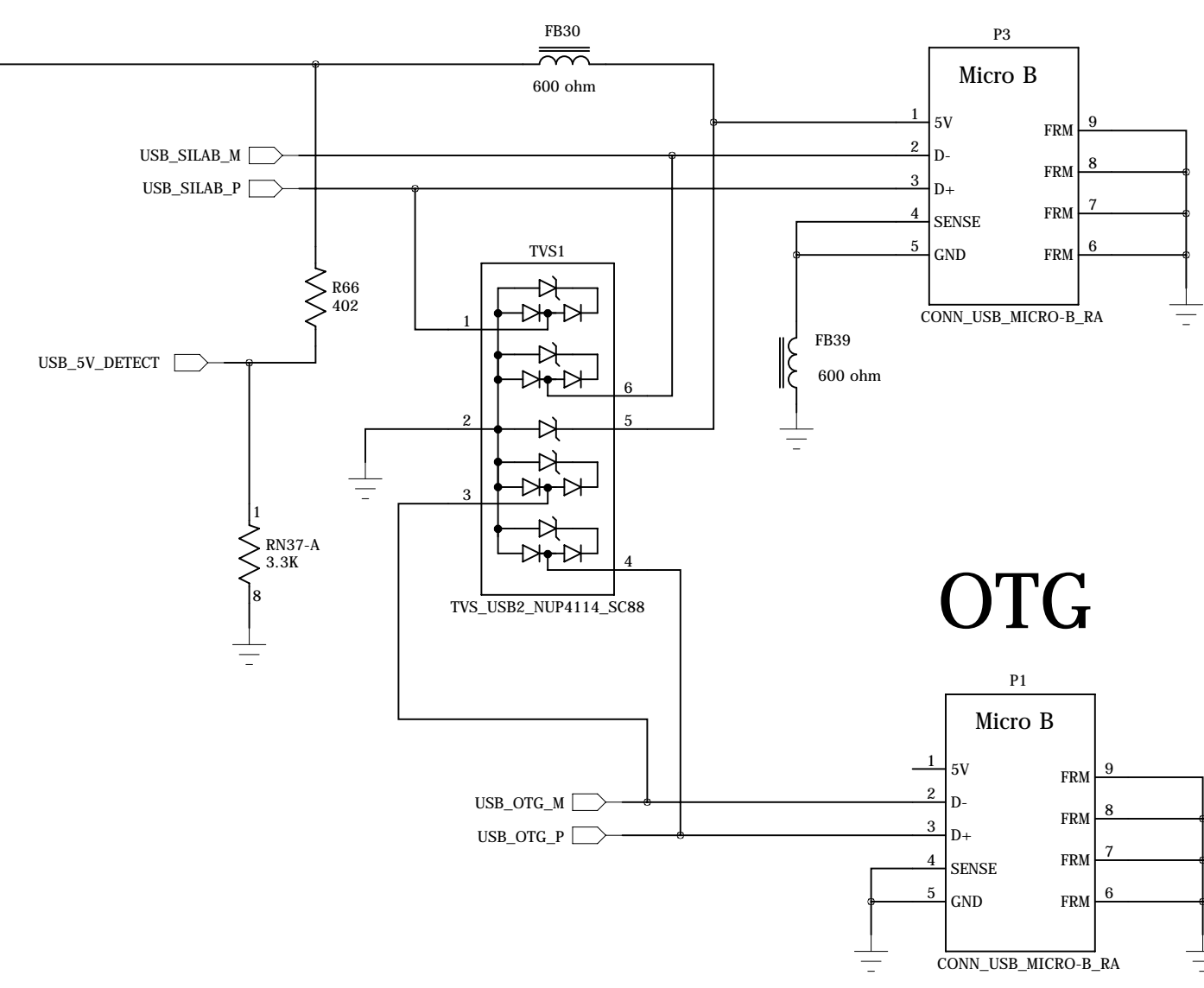
# DIO Port and Jumpers



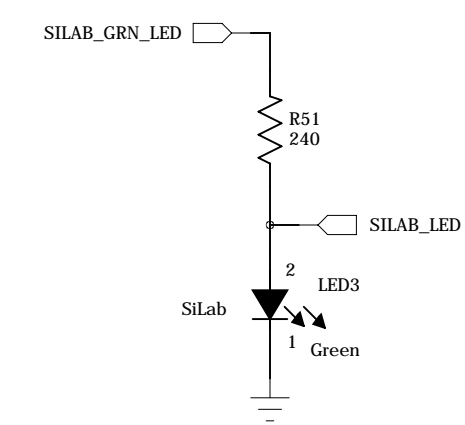
# USB Device Port and Silab uC



## USB Device Port

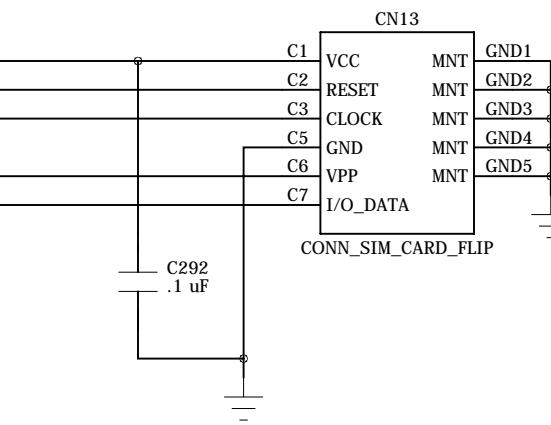
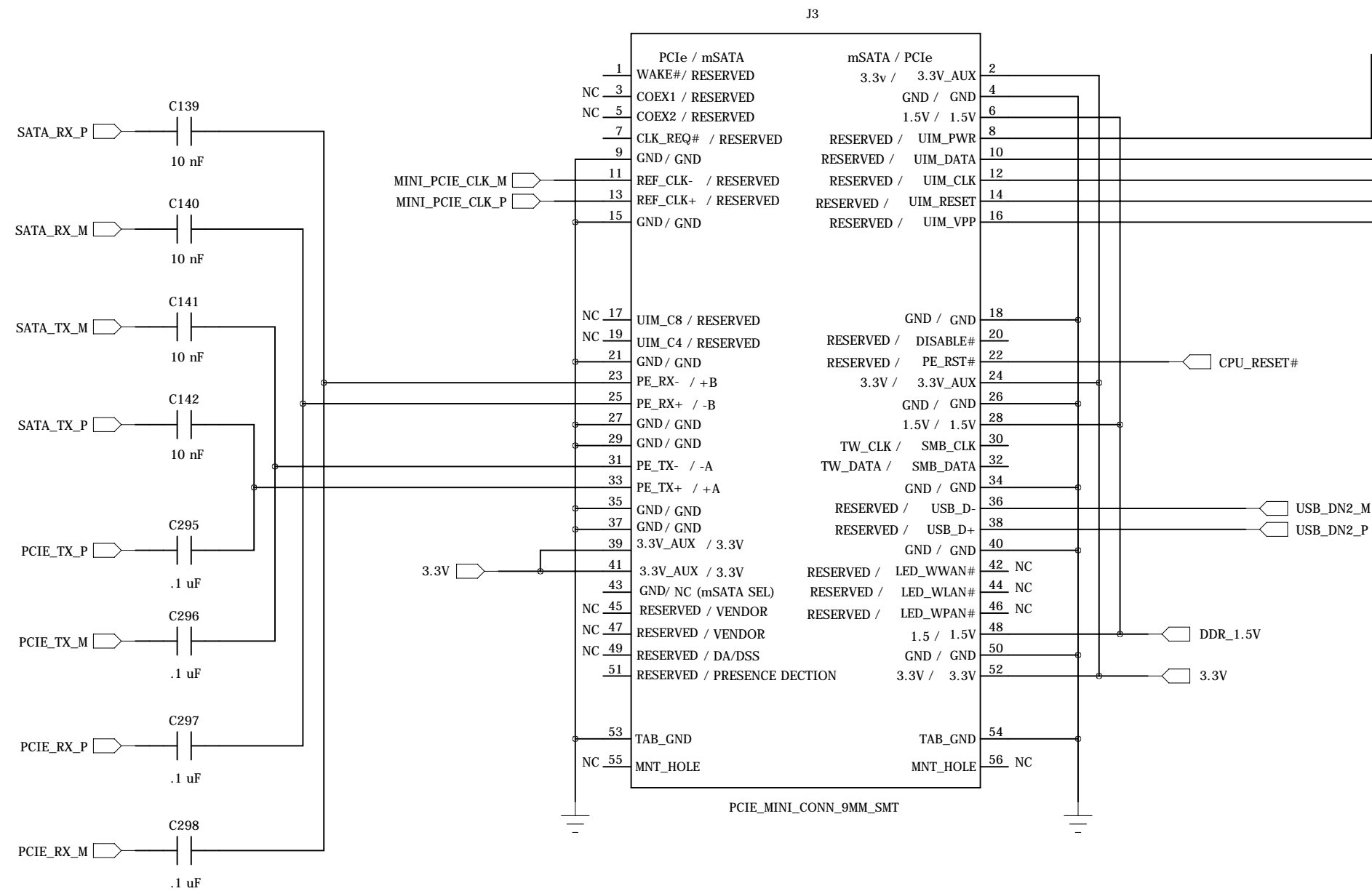


## SiLab LED

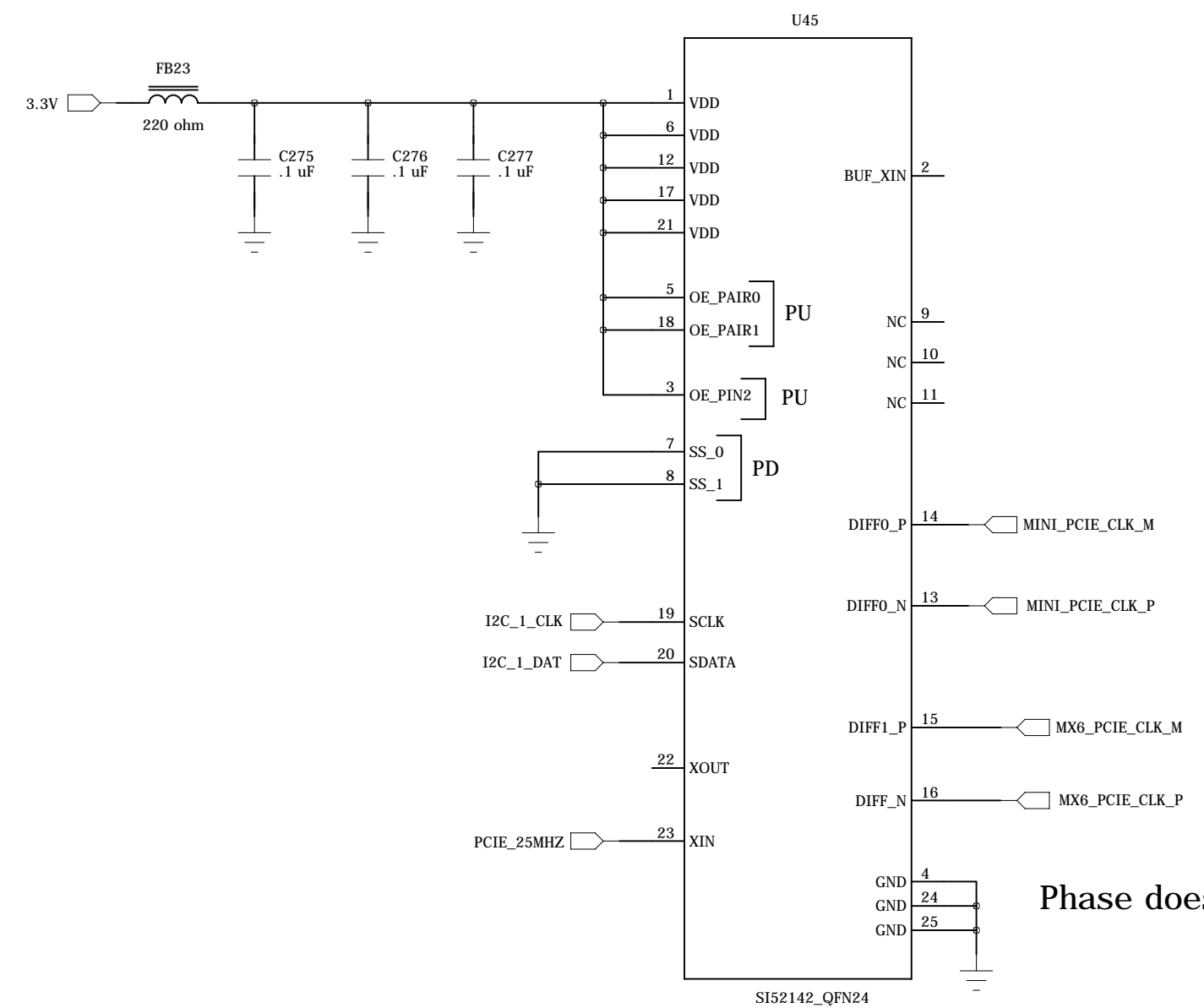


7mm Stack Height  
to center of bd.

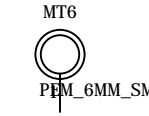
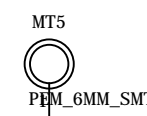
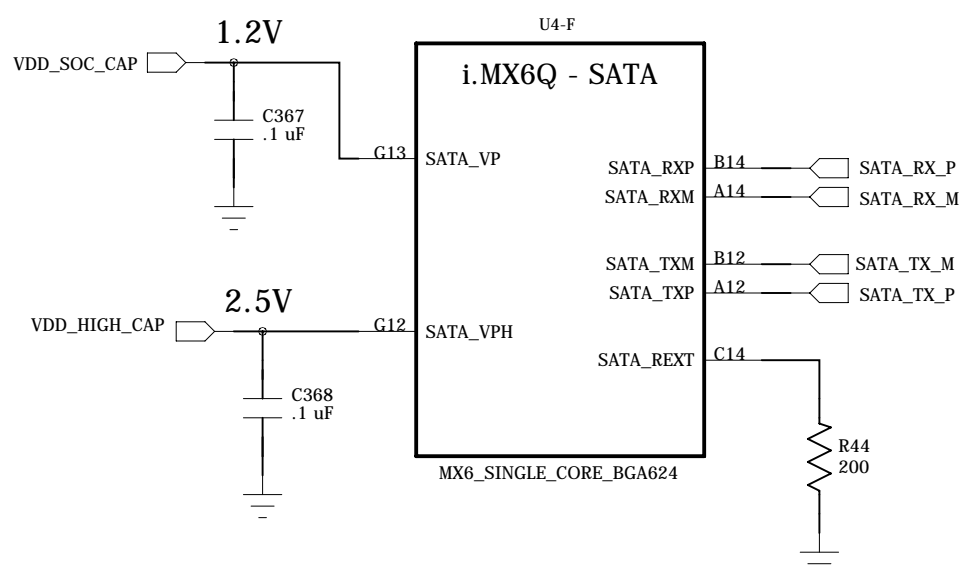
# Mini PCIe SIM Card Connector



## PCIe 100 MHz Clock Generator



## SATA



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