

## Comments:

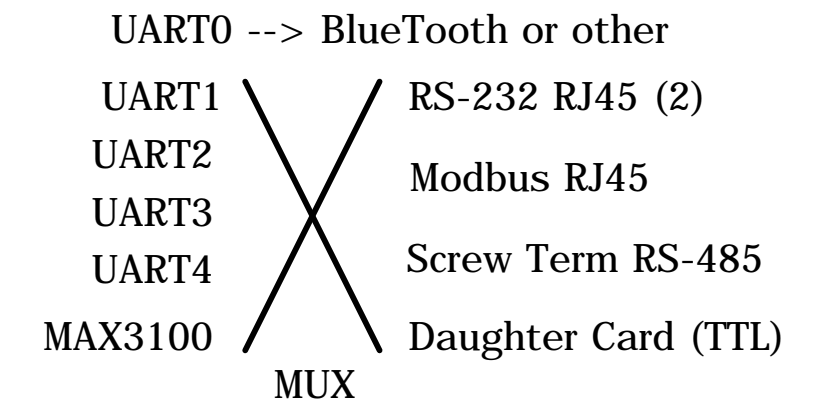
Board can be powered by 8-28 VDC or 24VAC

SiLab uC is powered up first, then  
it controls the MX286 start up

SiLab uC does these functions:

- Controls MX286 power up sequence
- USB Device to Console conversion
- Controls MX286 Sleep mode
- Can read Push Switch for Wake-up
- Measures Analog Power Rails
- Controls SuperCap charging
- Can turn on Blue LED

## Serial Port Usage



All Parts are Industrial Temp

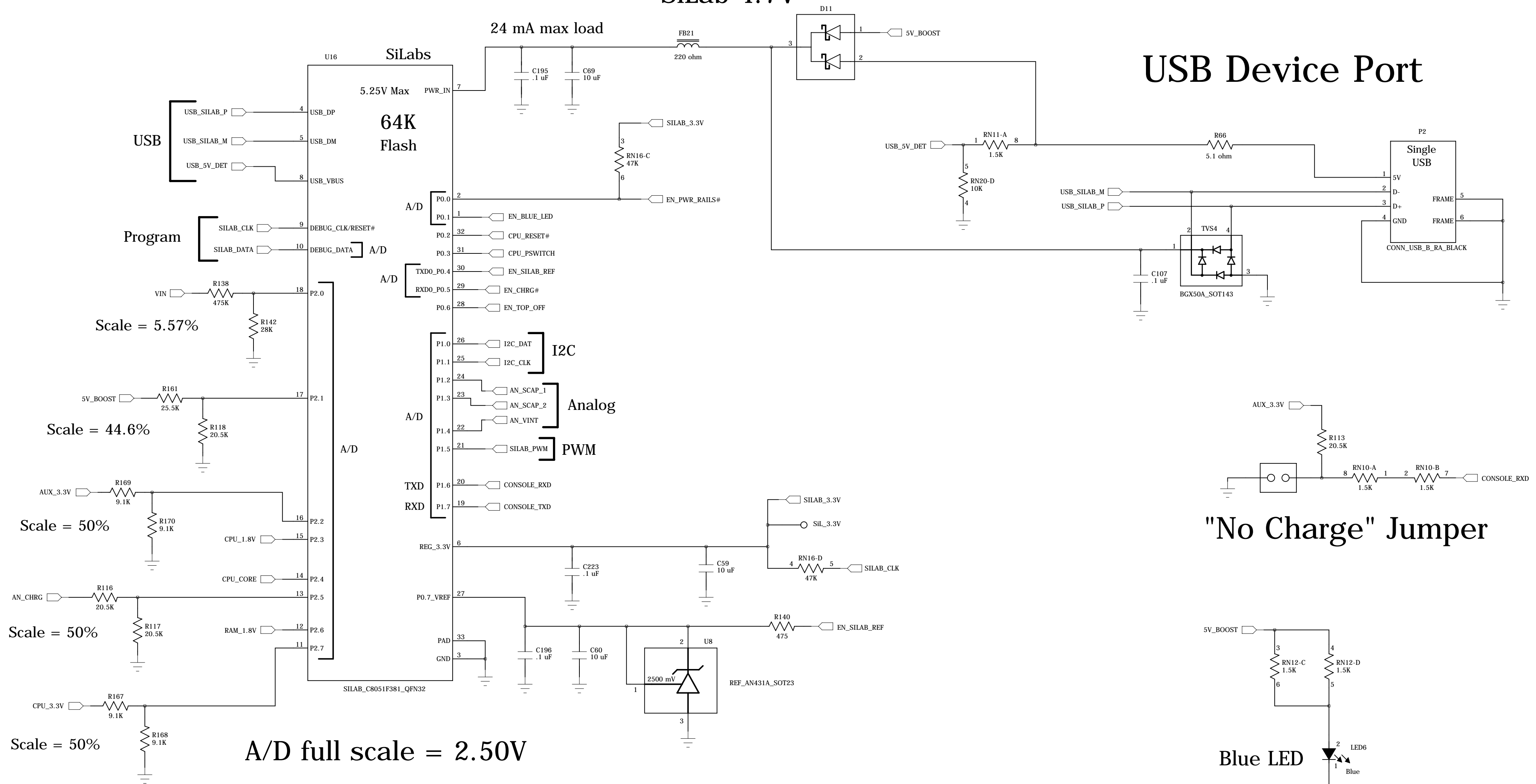
## Rev.B --> C Changes

- 1) SiLab pin 30 now controls current to VREF
- 2) Added Jumper for disabling SuperCap charging
- 3) TVS4 clamp voltage changed - to avoid false  
USB 5V Detection
- 4) Changed SPI Flash to 2MB size
- 5) Changed SiLab uC to 64K Flash version
- 6) Moved SD card socket to get more antenna room
- 7) Added FB8 and 9 to allow Ubiquiti WiFi power
- 8) Added R129 and 133 for Quickloadz special

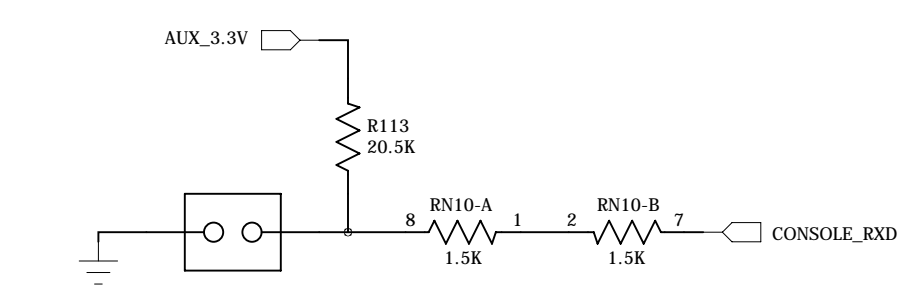
|                              |                   |               |
|------------------------------|-------------------|---------------|
| Technologic Systems          | Date Nov. 7, 2015 |               |
| Title: TS-7680 Documentation |                   |               |
| Rev: C                       | Designer          | Sheet 1 of 20 |

# USB Device Port and SiLab uC

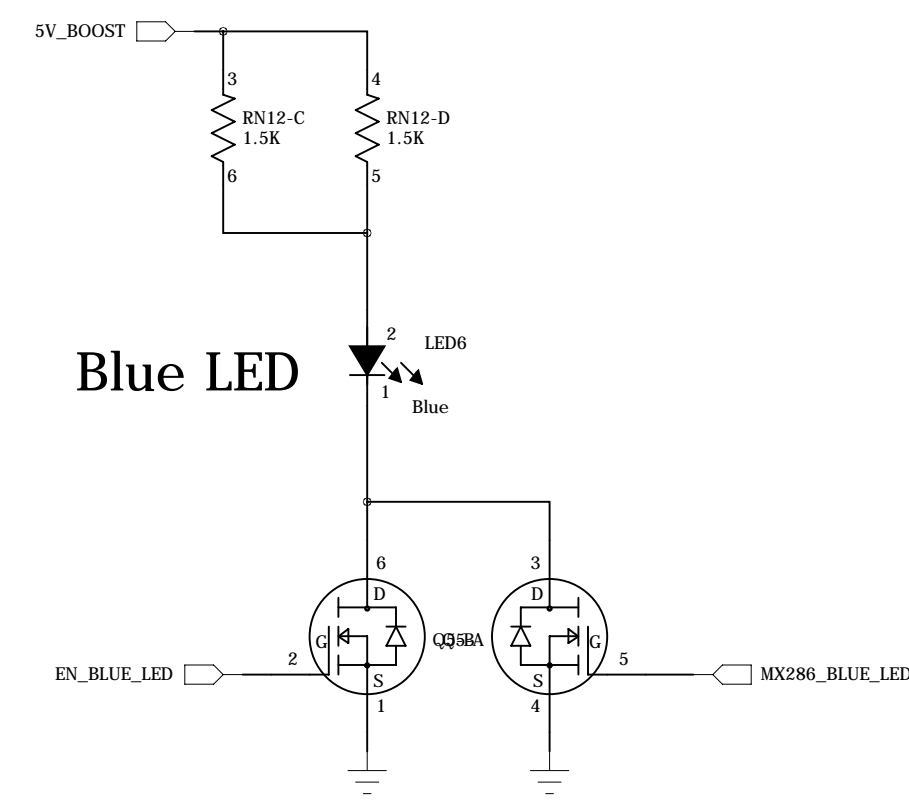
SiLab 4.7V



## USB Device Port

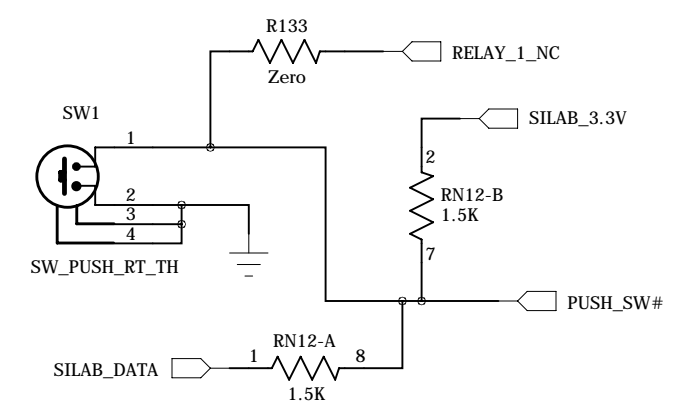


## "No Charge" Jumper



## Blue LED

## Push Switch



A/D full scale = 2.50V

Scale = 5.57%

Scale = 44.6%

Scale = 50%

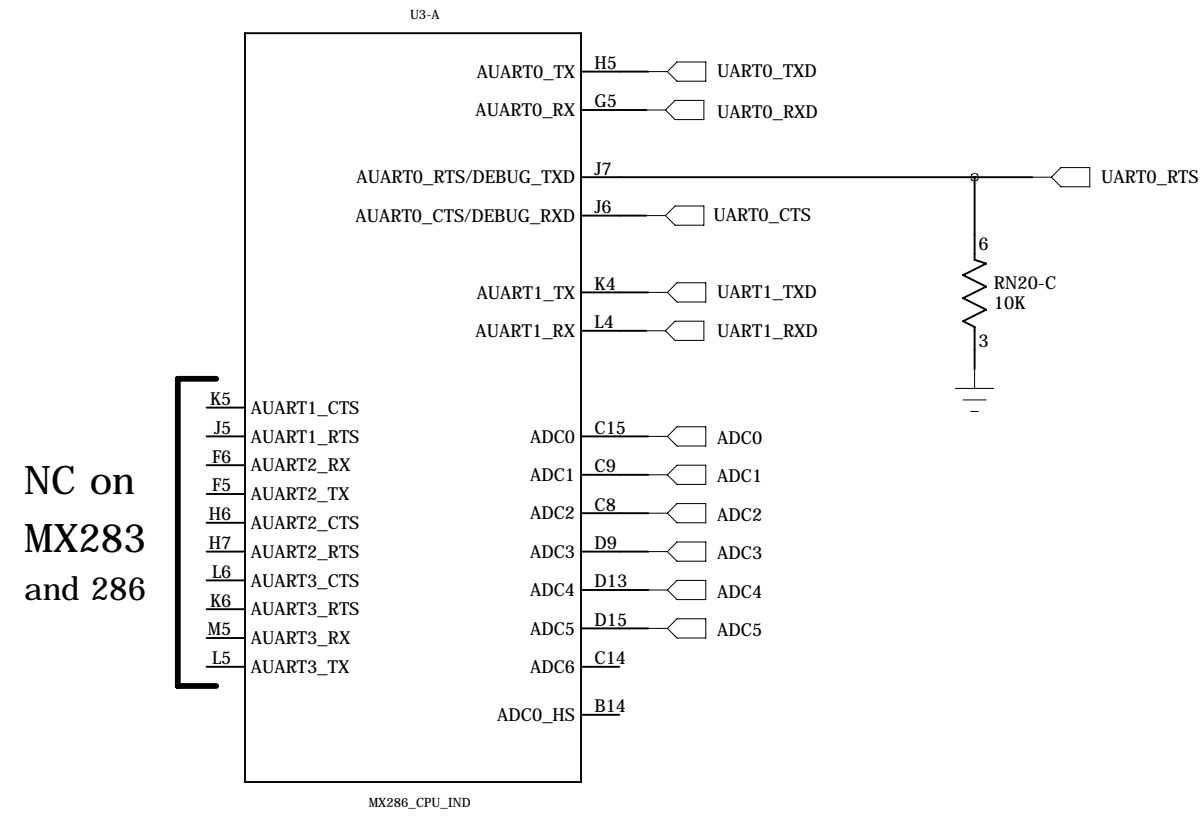
Scale = 50%

Scale = 50%

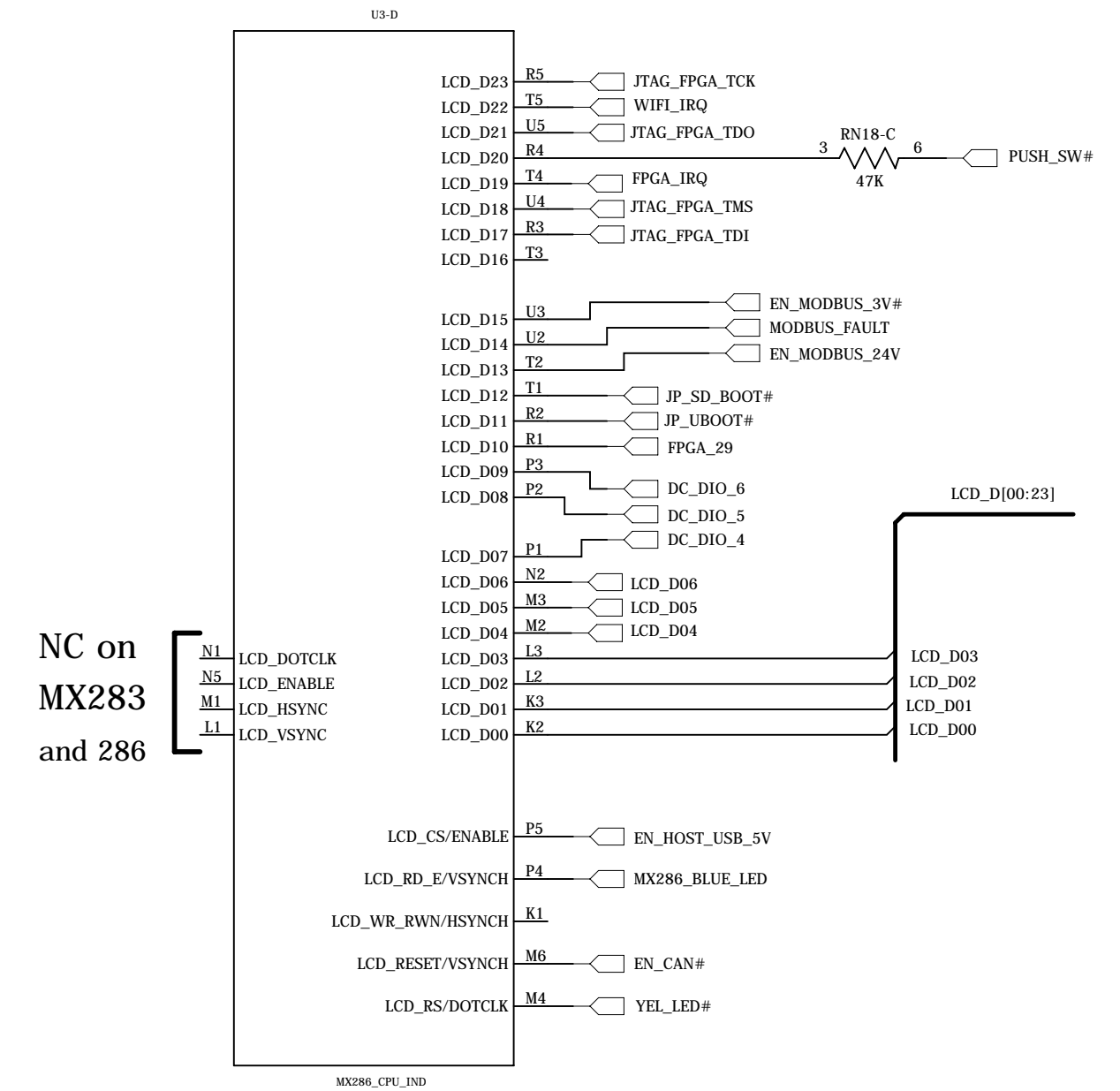
|   |                   |
|---|-------------------|
| Technologic Systems                         | Date Nov. 7, 2015 |
| Title: TS-7680 SiLab uC and USB Device port |                   |
| Rev: C                                      | Designer          |
| Sheet 2 of 20                               |                   |

# MX286 ARM9 CPU

## UARTs, ADC

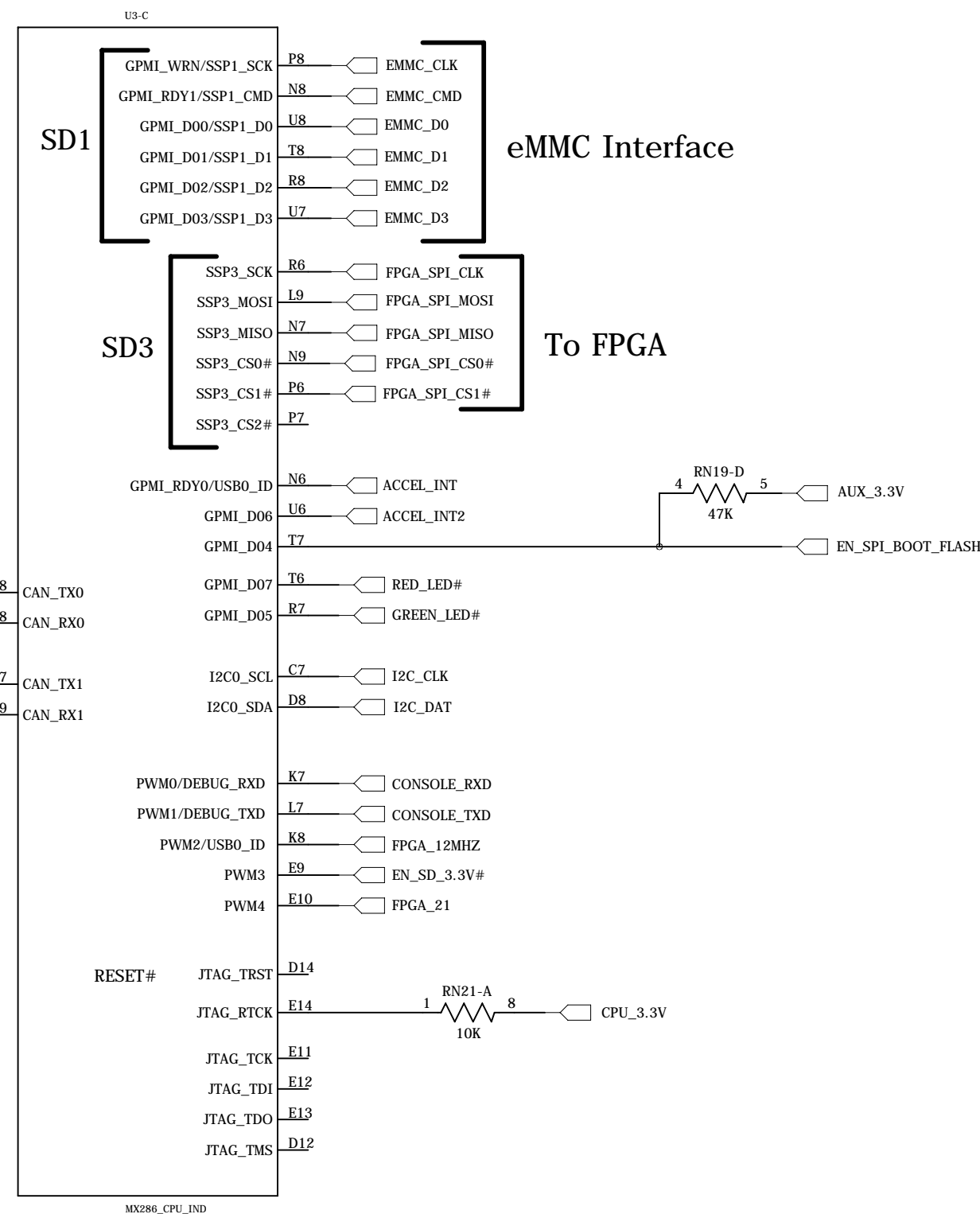
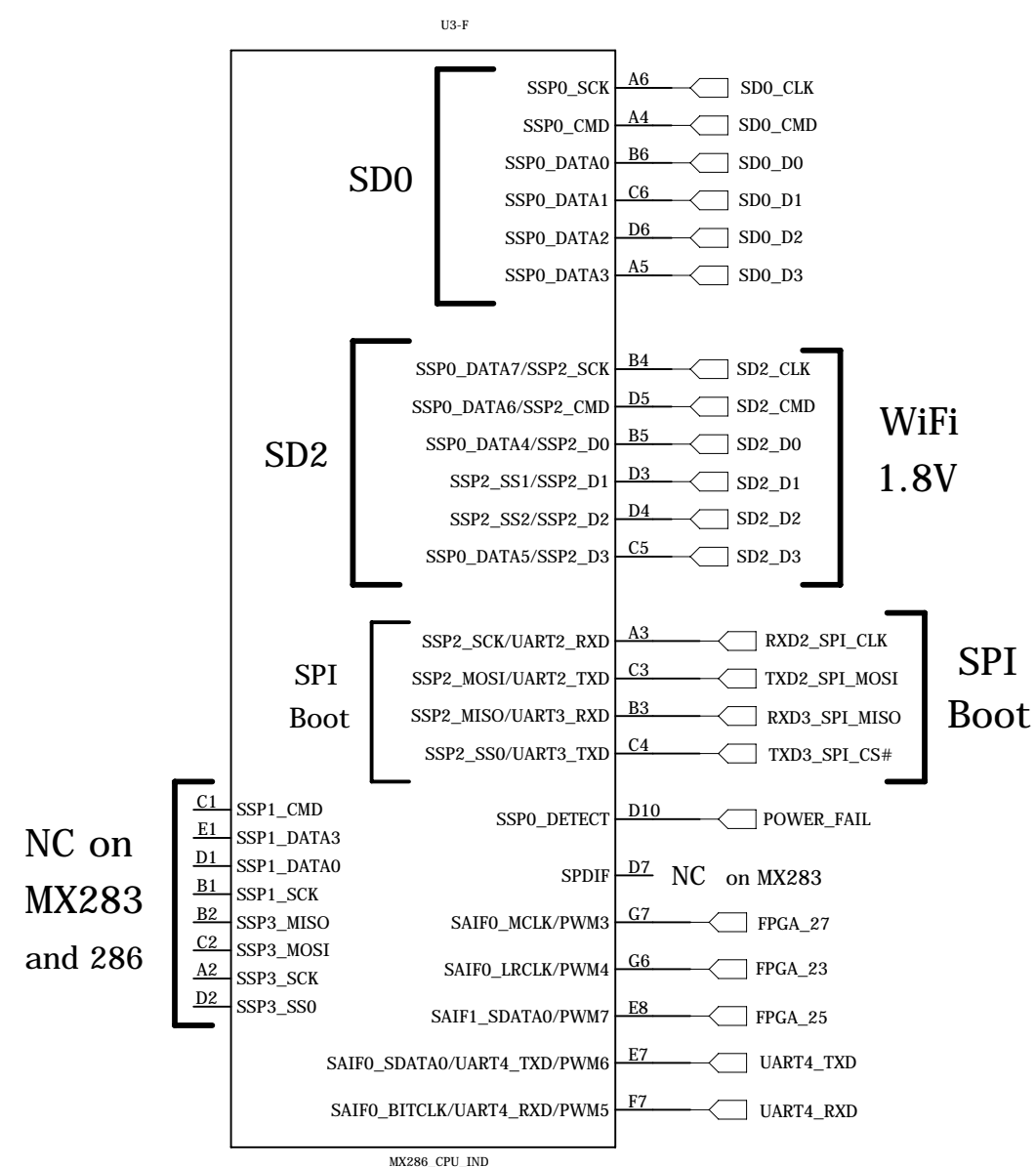


## LCD



## NAND, PWM JTAG, I2C

## SD Card SPI Boot

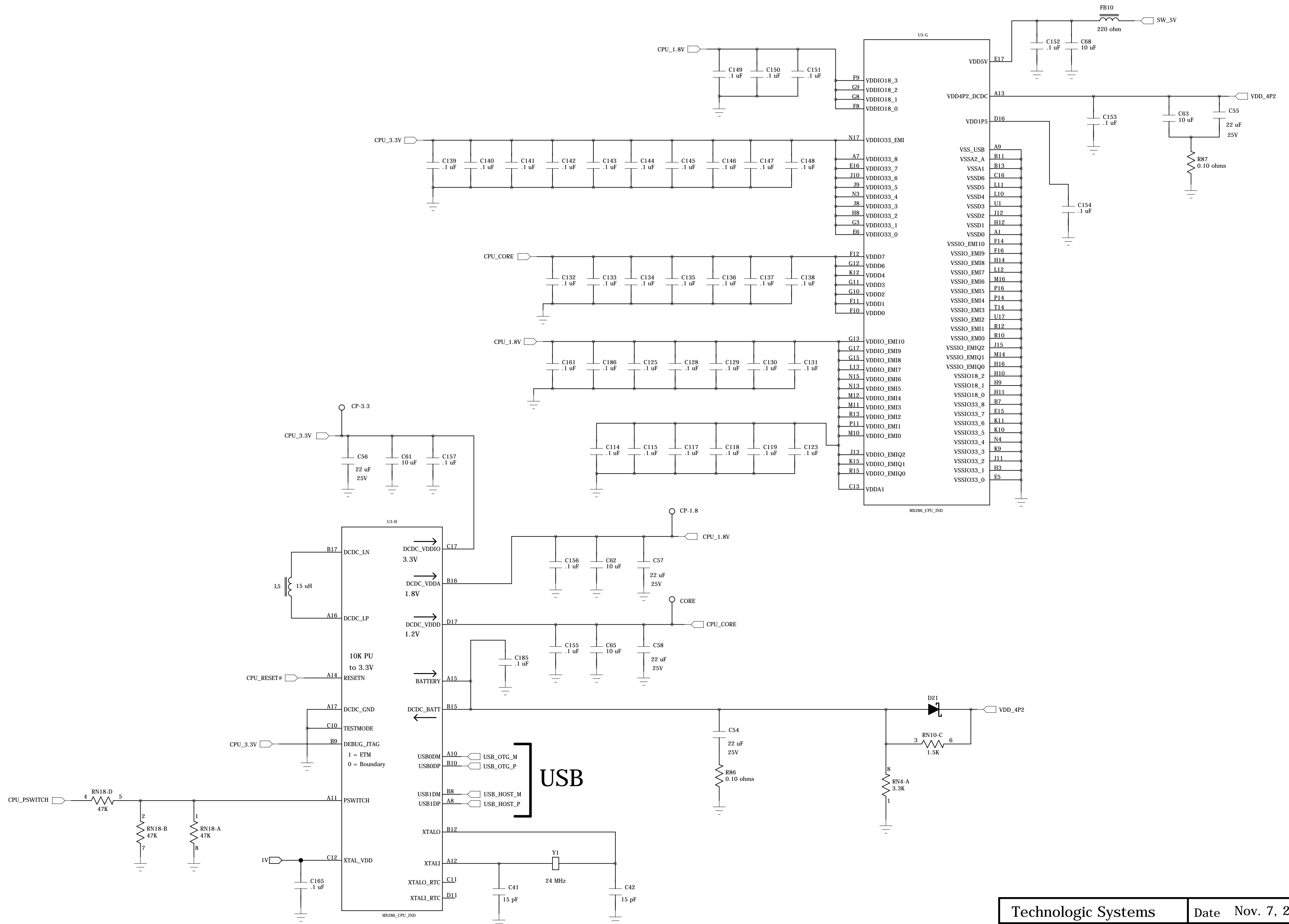


EN\_SPI\_BOOT\_FLASH is set low by CPU after done booting from SPI

Then SPI signals are changed to UART2 and UART3 functions

All JTAG have 47K internal PU except RTCK

|                          |                   |
|--------------------------|-------------------|
| Technologic Systems      | Date Nov. 7, 2015 |
| Title: TS-7680 MX286 CPU |                   |
| Rev: C                   | Designer          |
| Sheet 3 of 20            |                   |

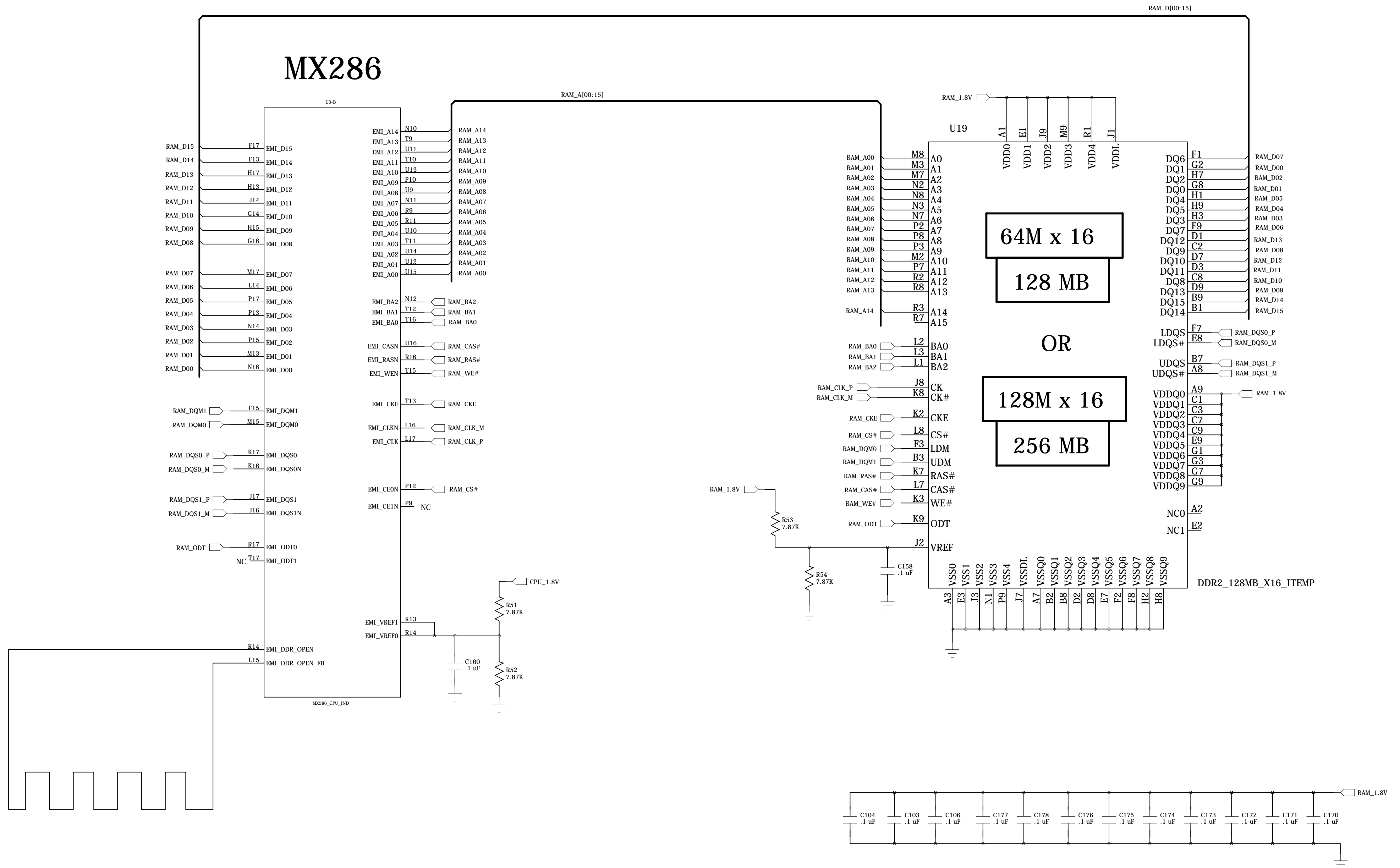


**USB**

PSWITCH can be driven to 3.3V if a series 10K res is used

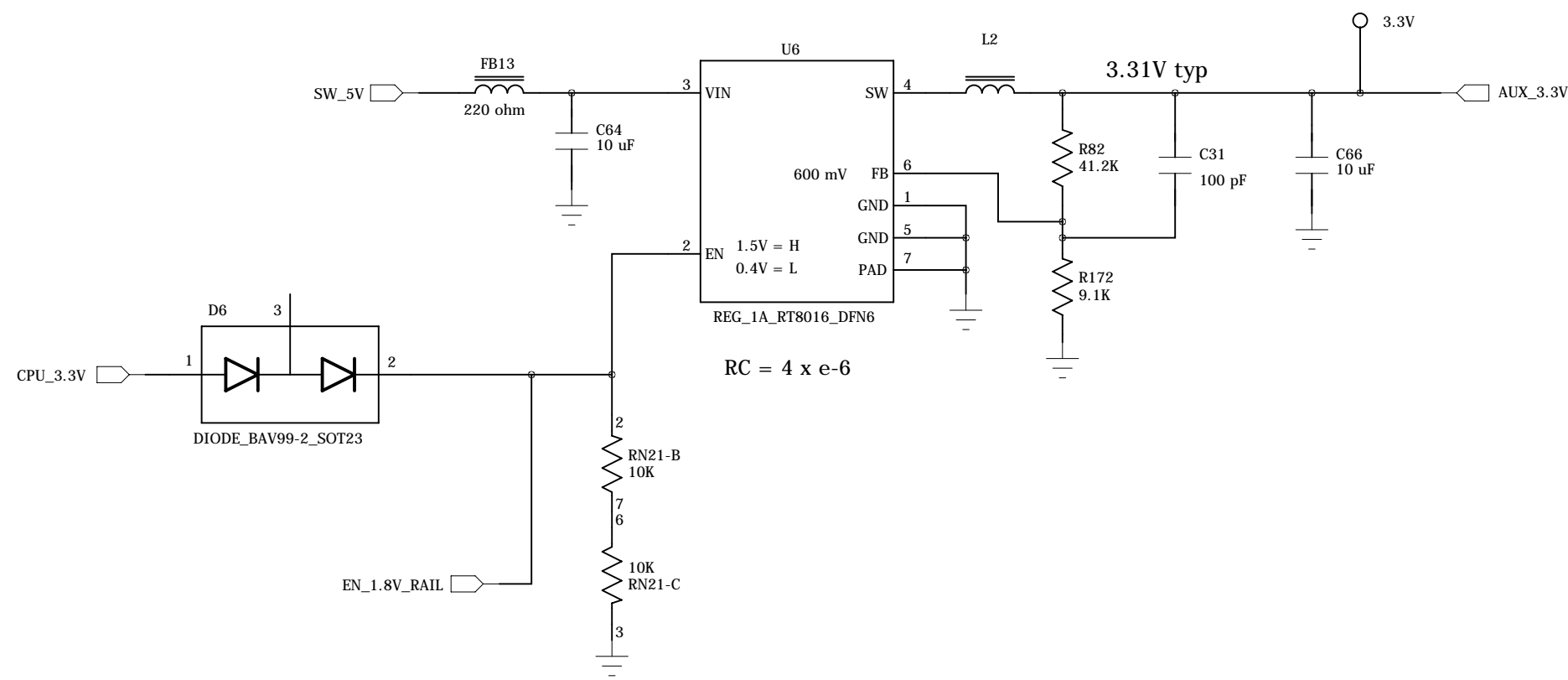
|                                |                   |
|--------------------------------|-------------------|
| Technologic Systems            | Date Nov. 7, 2015 |
| Title: TS-7680 MX286 CPU Power |                   |
| Rev: C                         | Designer          |
| Sheet 4                        | of 20             |

# DDR2 SDRAM (128 or 256 MByte)





# Aux. 3.3V Reg

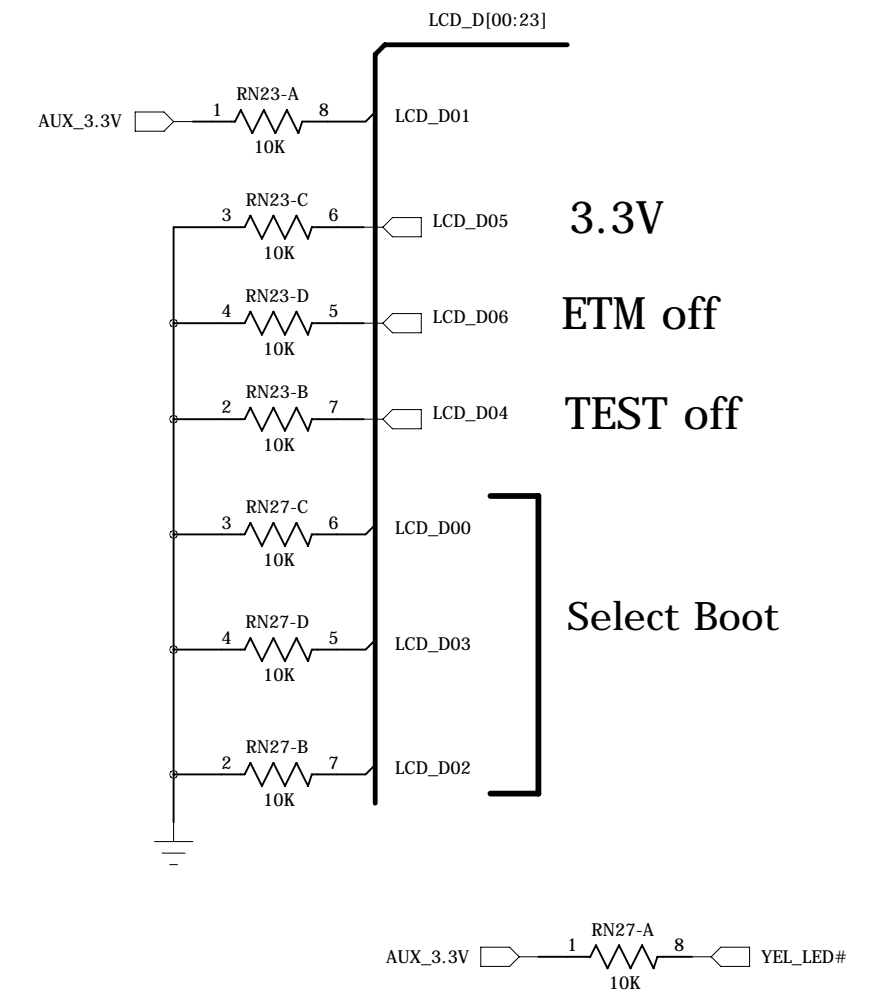


# Boot Strap Bias Res.

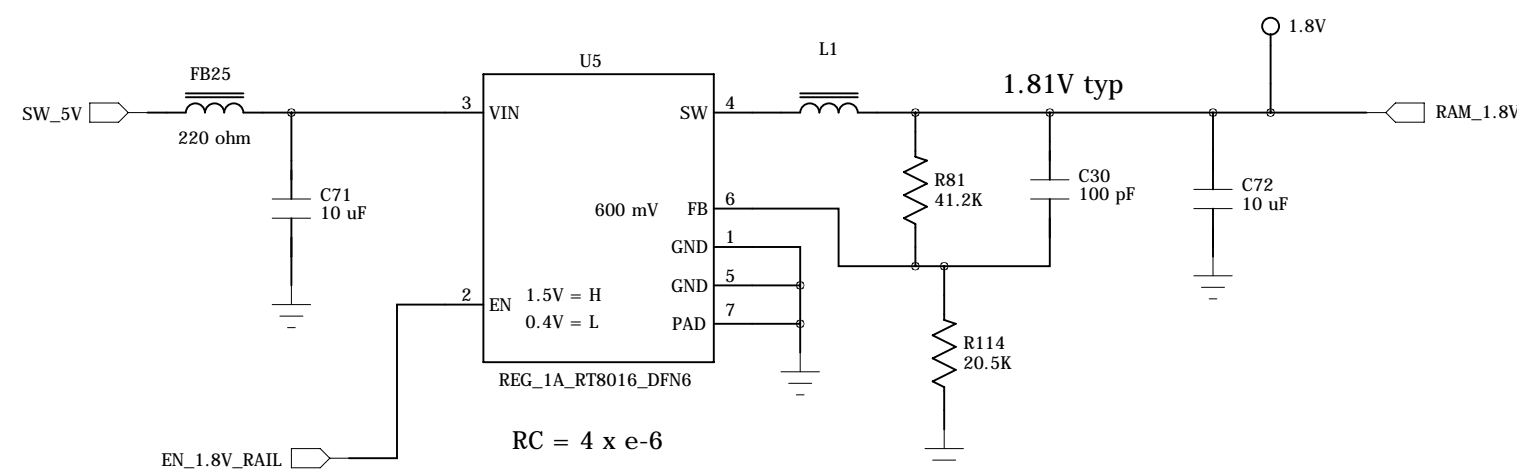
## Strapped SPI Boot

### Boot Source

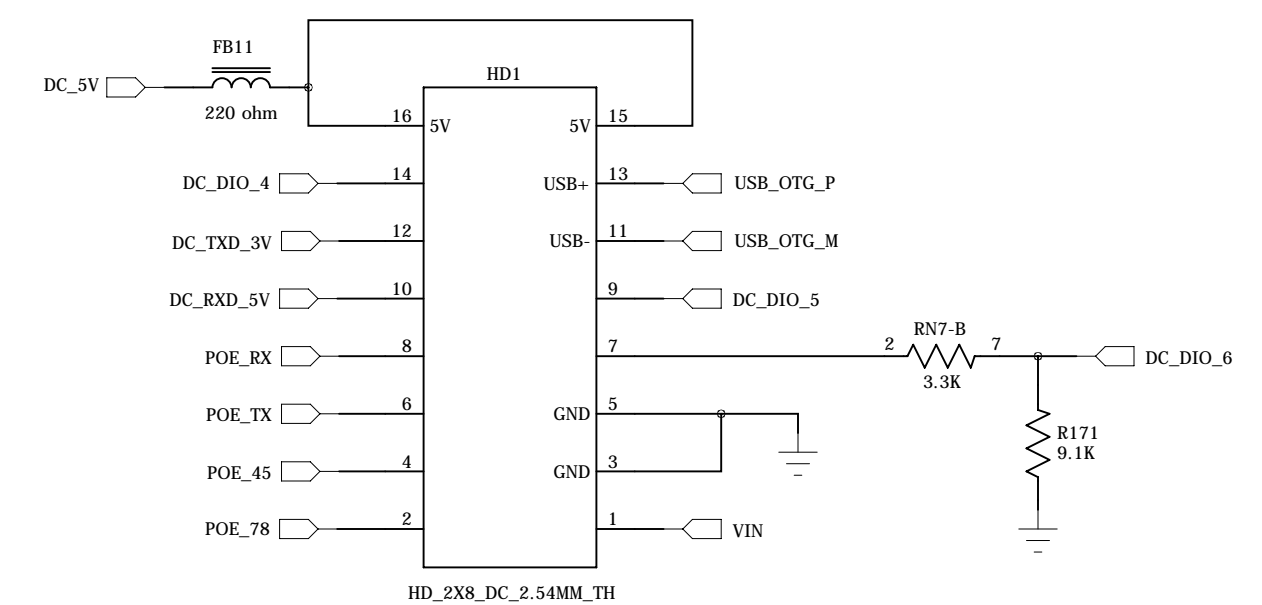
| LCD_3   | LCD_0 | Boot Source |
|---------|-------|-------------|
| 0 0 1 0 |       | SPI         |
| 1 0 0 1 |       | SD Card     |
| 0 0 0 0 |       | USB         |
| 0 1 0 0 |       | NAND        |



# RAM 1.8V Reg

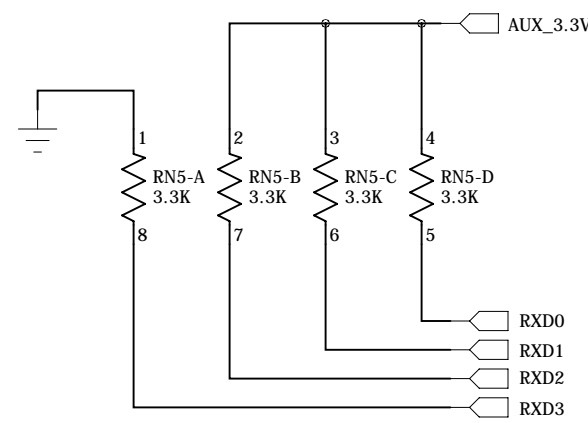


# Daughter Card Interface

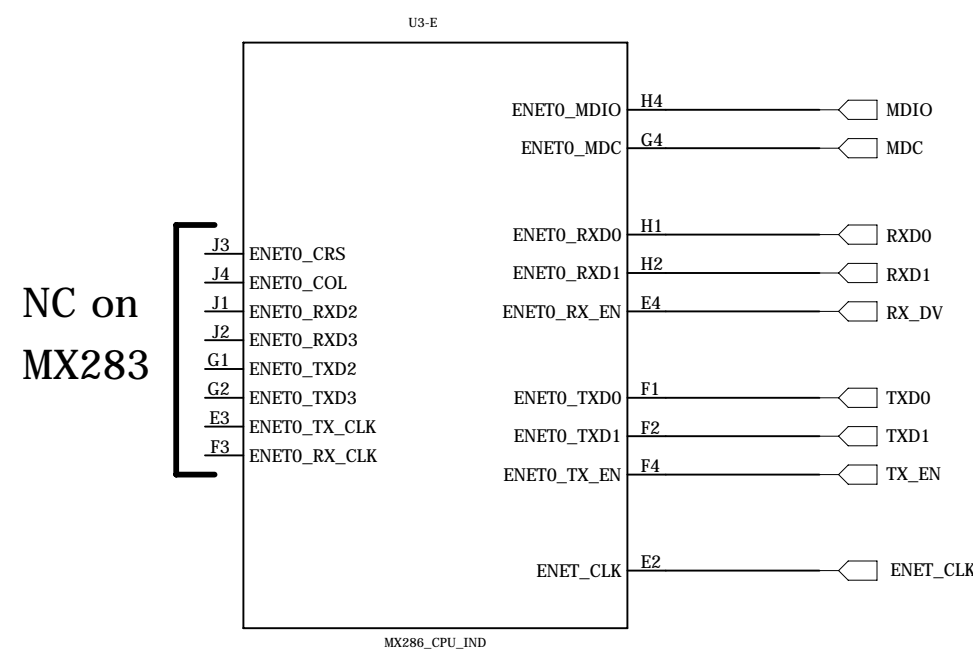


# 10/100 Ethernet 4-Port Switch

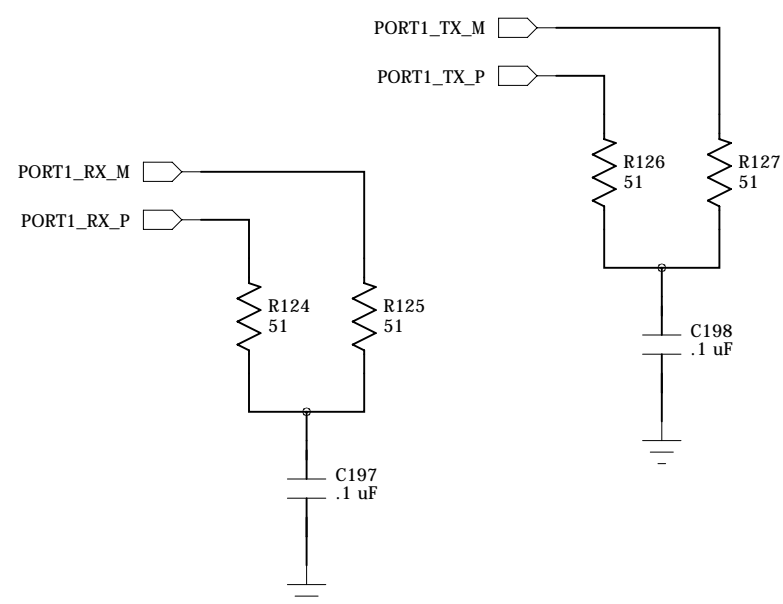
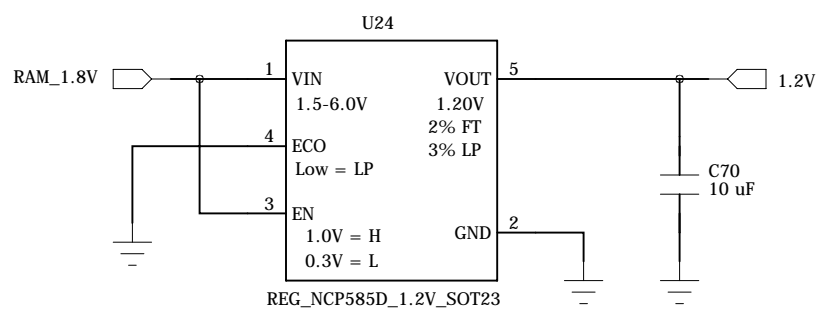
"0111" = RMII MAC mode



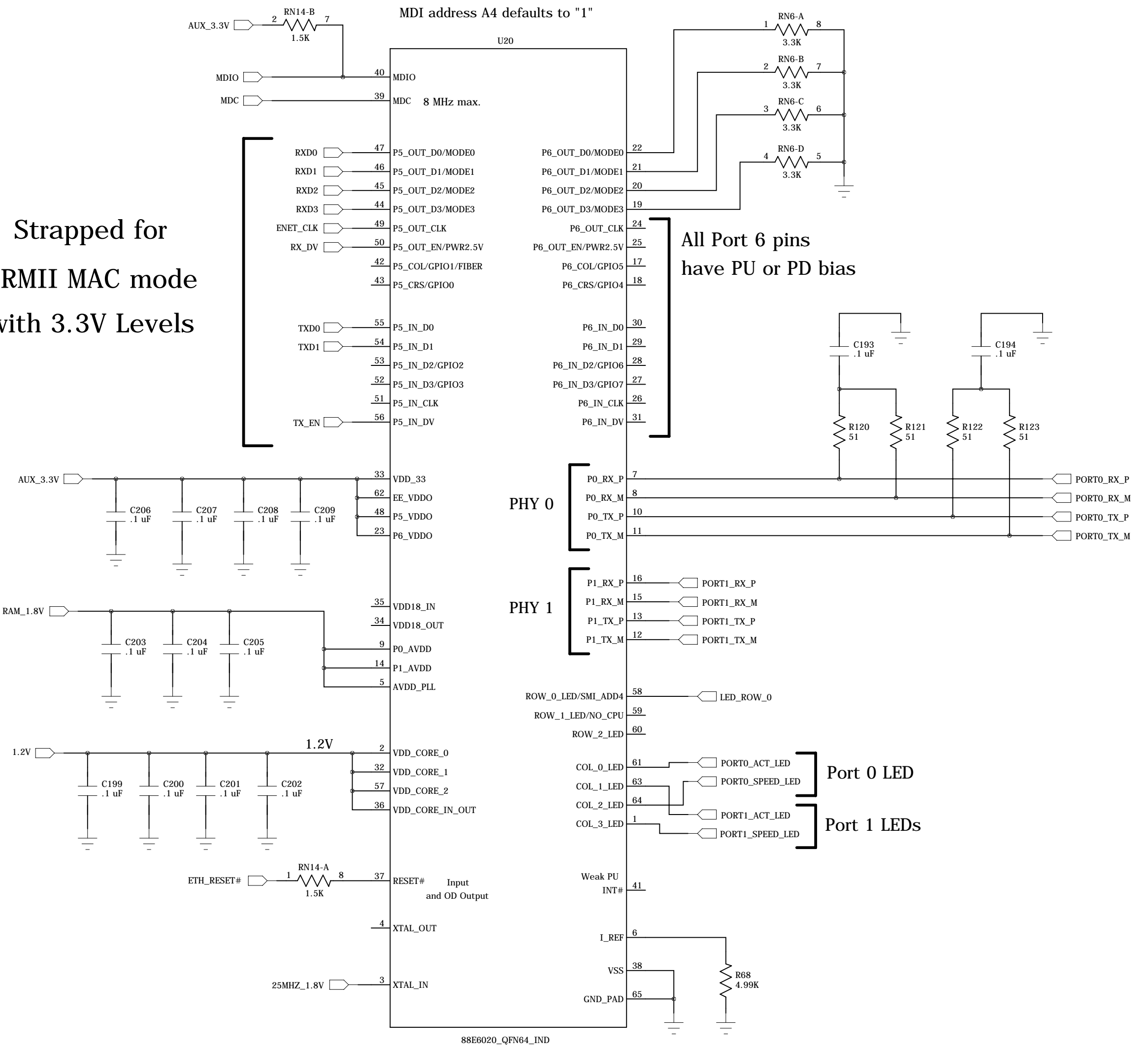
## MX283



## 1.2V Regulator



Strapped for  
RMII MAC mode  
with 3.3V Levels



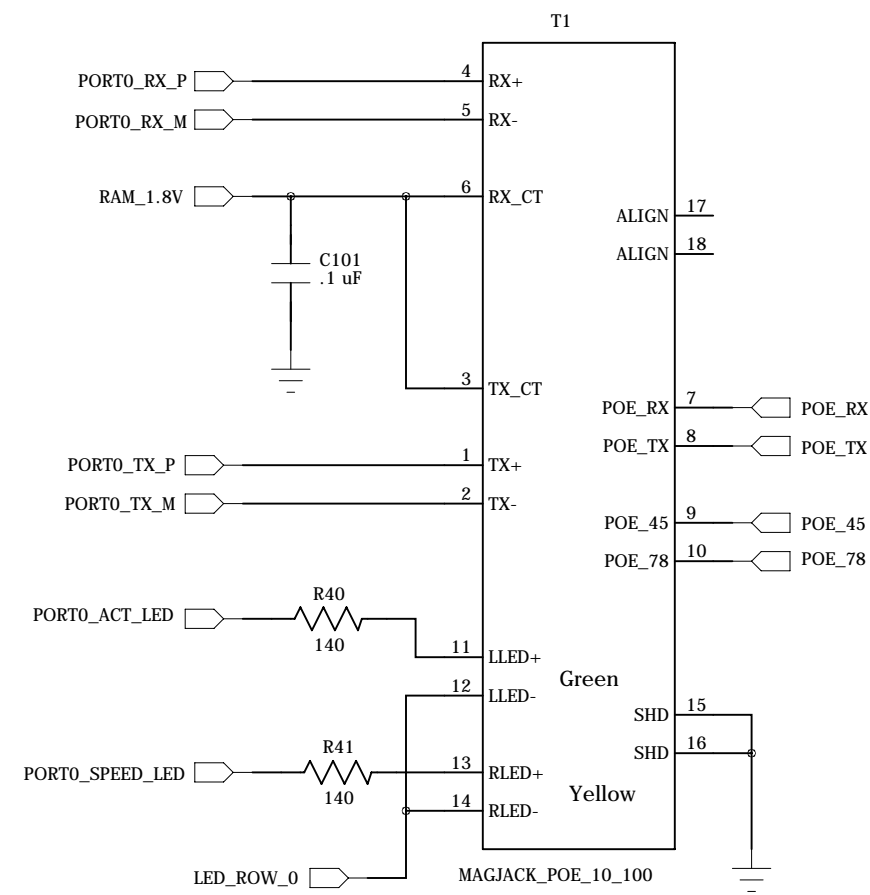
Auto MDIX is supported  
Polarity Correction also supported

|                                |                   |
|--------------------------------|-------------------|
| Technologic Systems            | Date Nov. 7, 2015 |
| Title: TS-7680 Ethernet Switch |                   |
| Rev: C                         | Designer          |
| Sheet 8 of 20                  |                   |



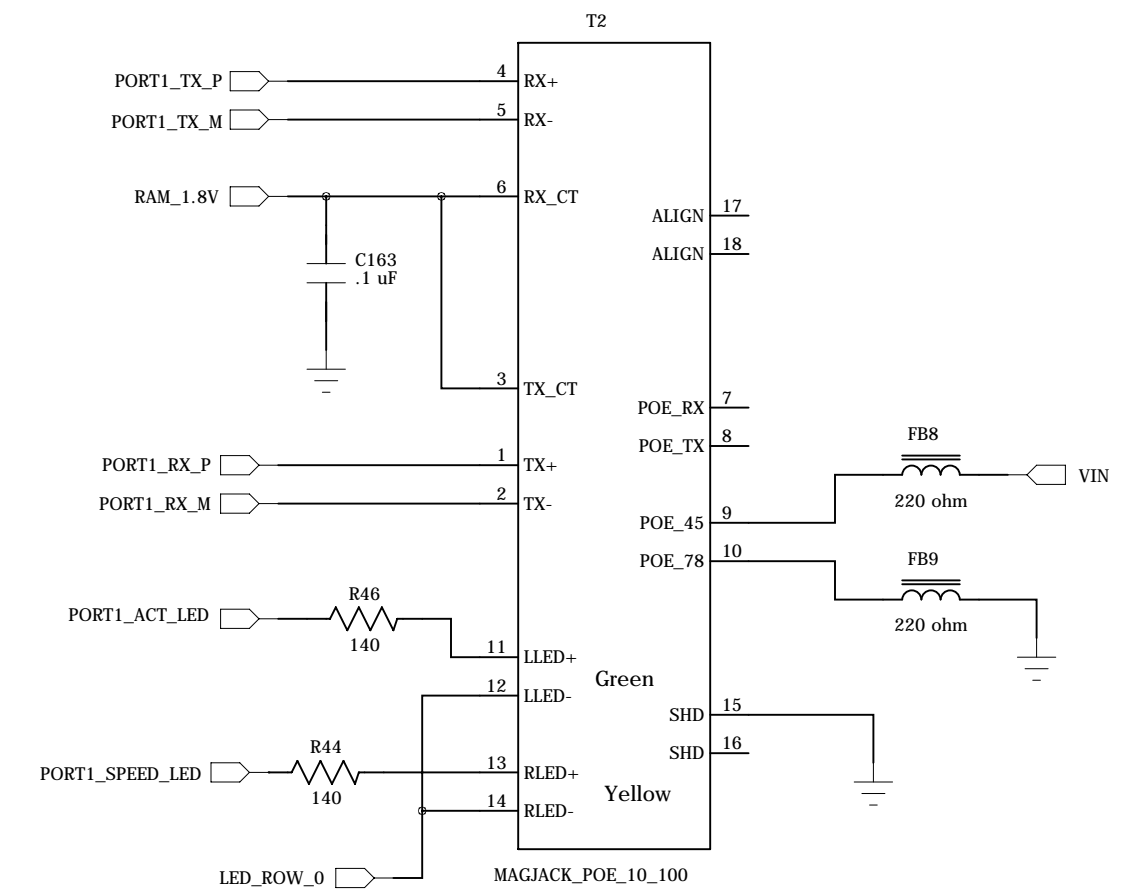
# Port #0

## 10/100 MagJack



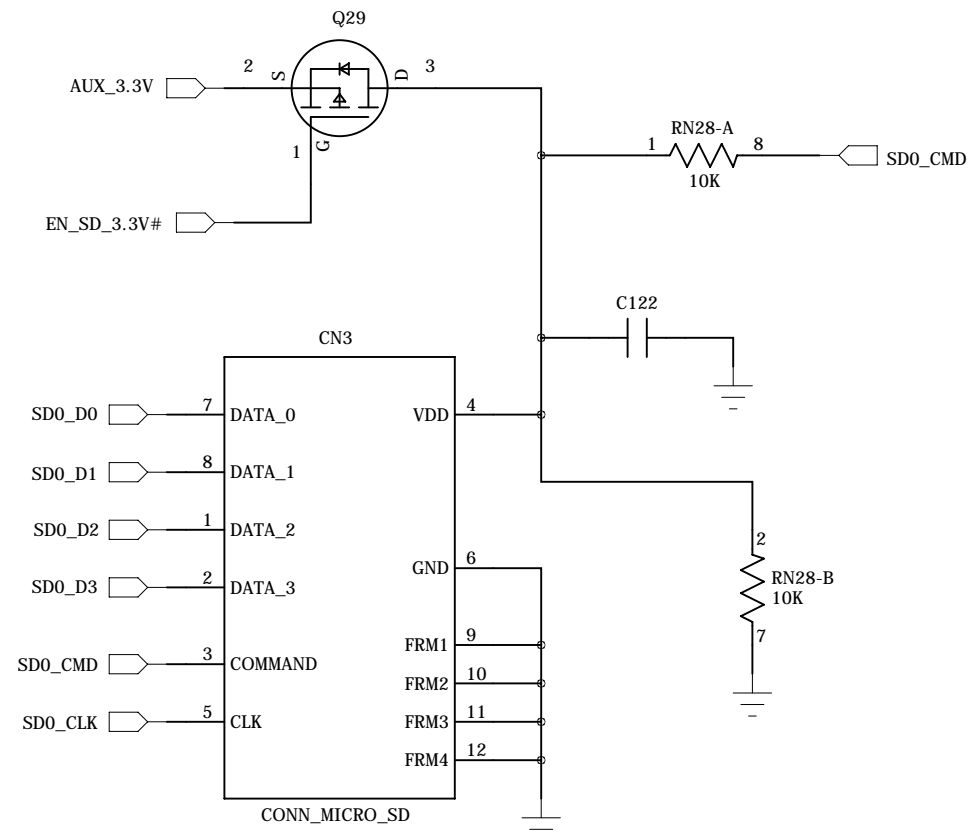
# Port #1

## 10/100 MagJack

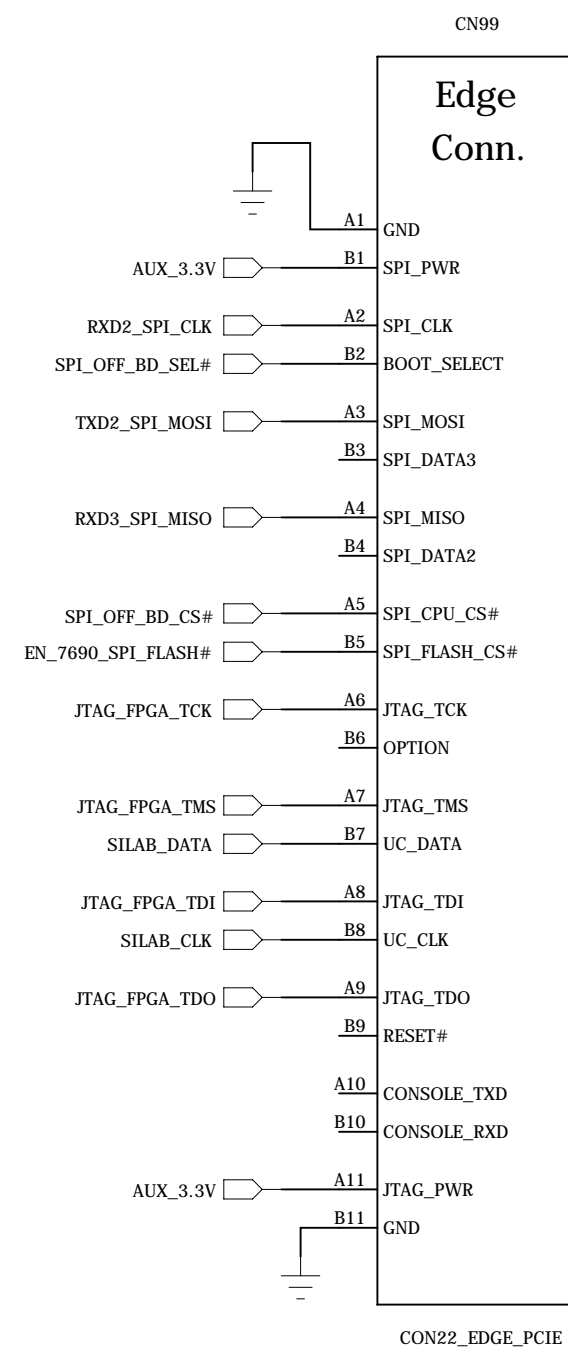


# Flash Memory

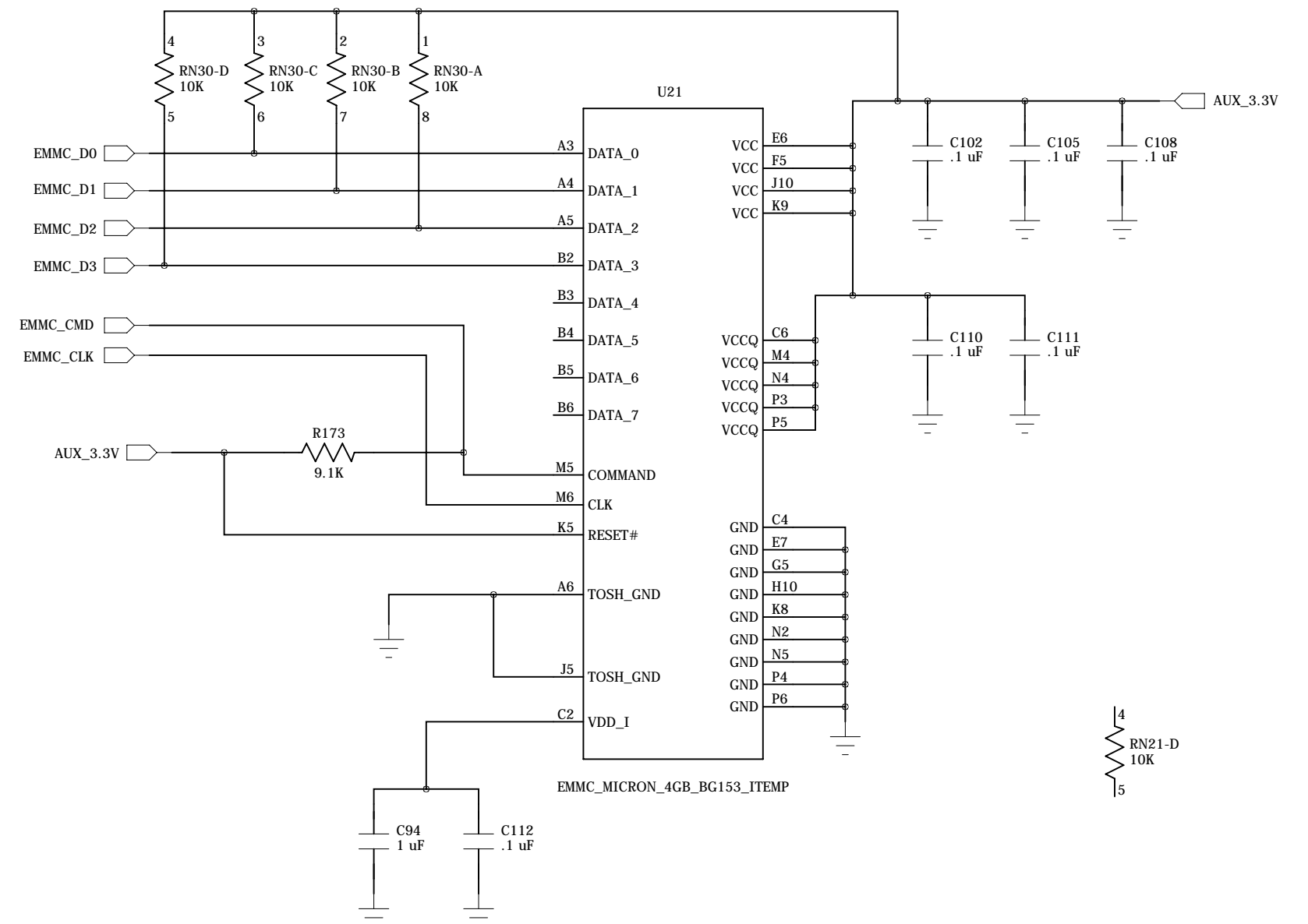
## Micro SD Card Socket



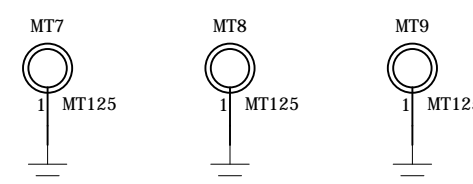
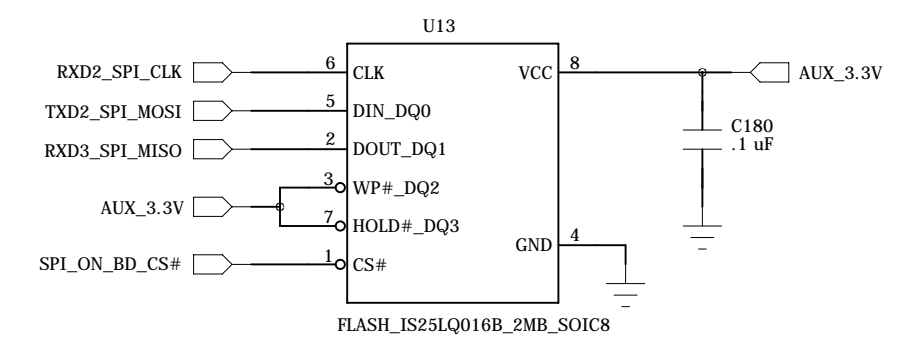
## Edge Conn.



## eMMC 4GB



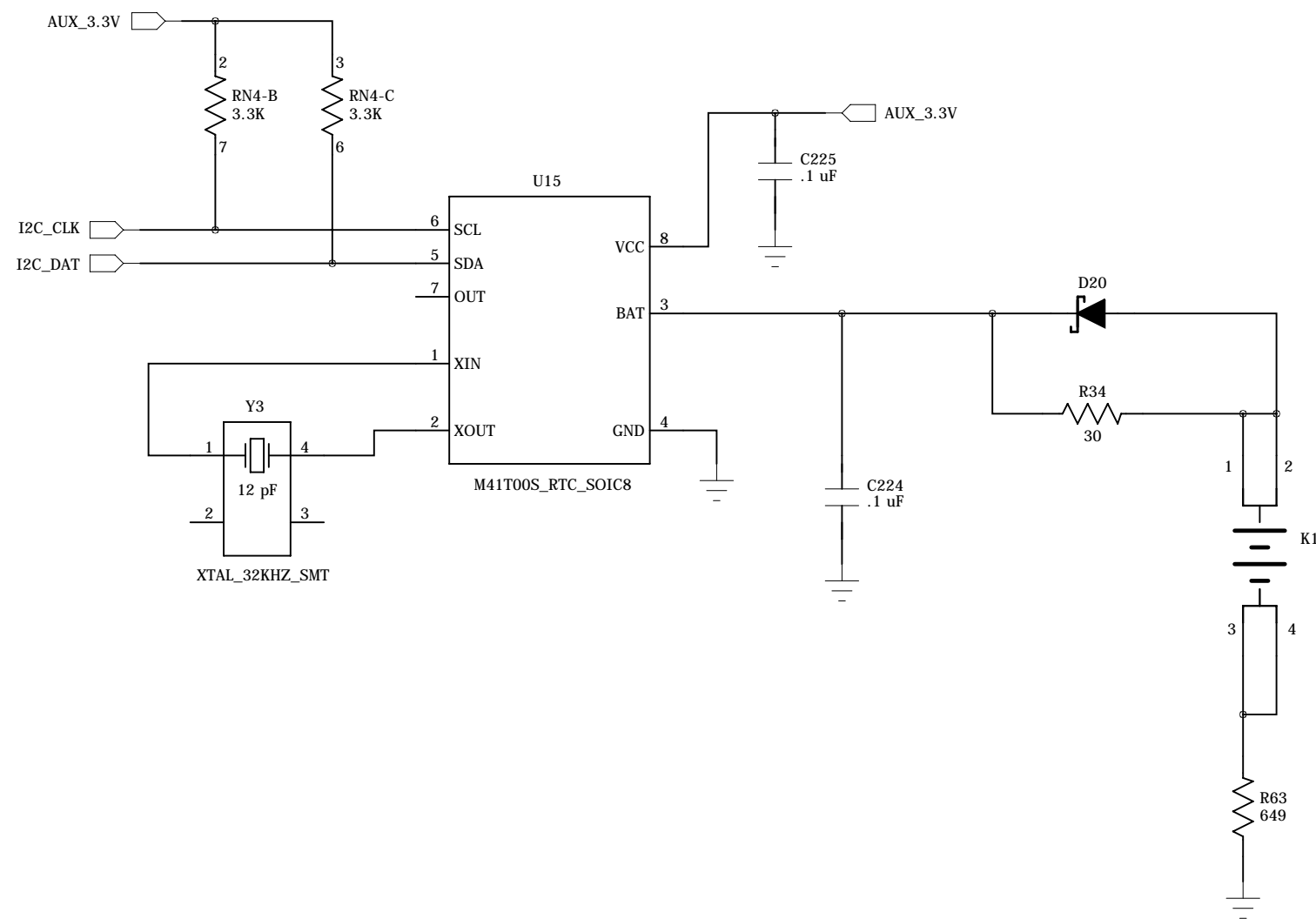
## 2MB SPI Boot Flash



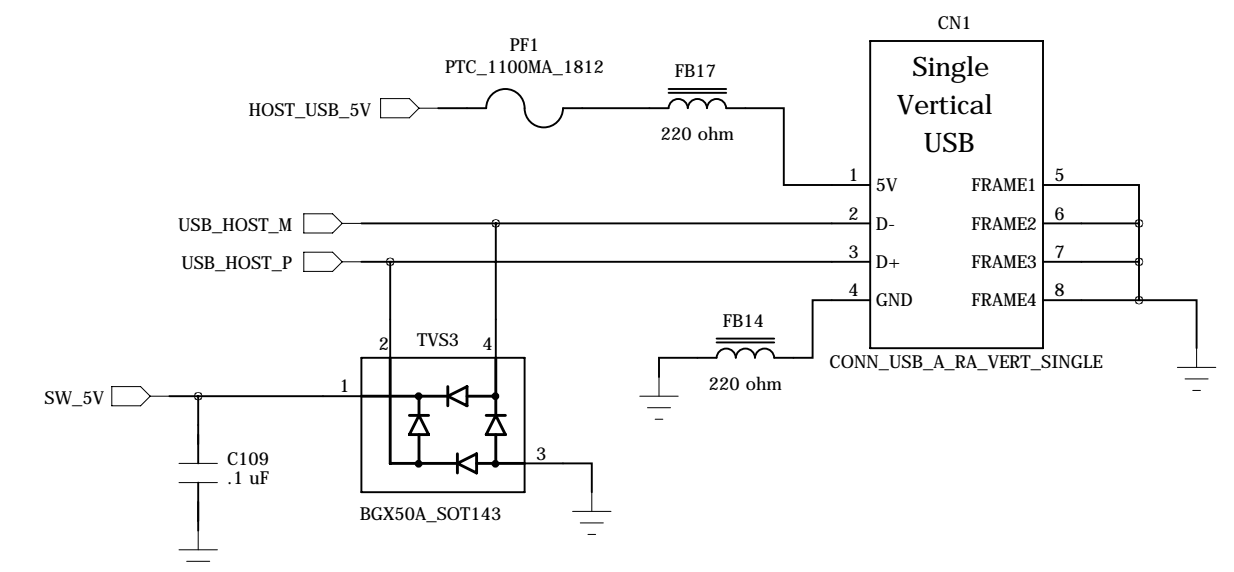
|                                 |                   |
|---------------------------------|-------------------|
| Technologic Systems             | Date Nov. 7, 2015 |
| Title: TS-7680 NAND and SD Card |                   |
| Rev: C                          | Designer          |
| Sheet                           | 10 of 20          |

# RTC and Host USB

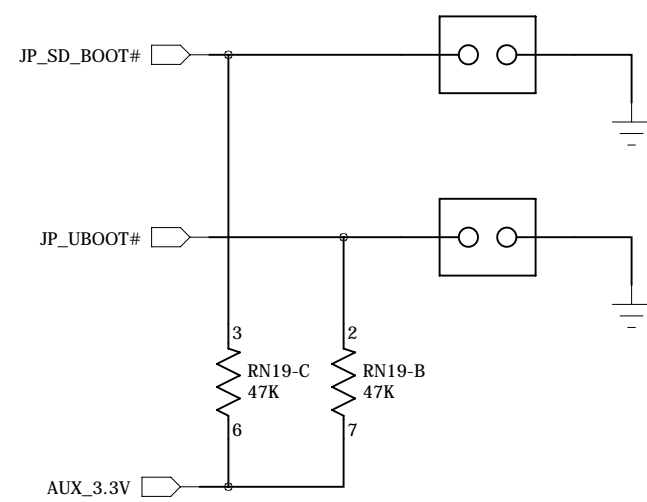
## ST Micro RTC



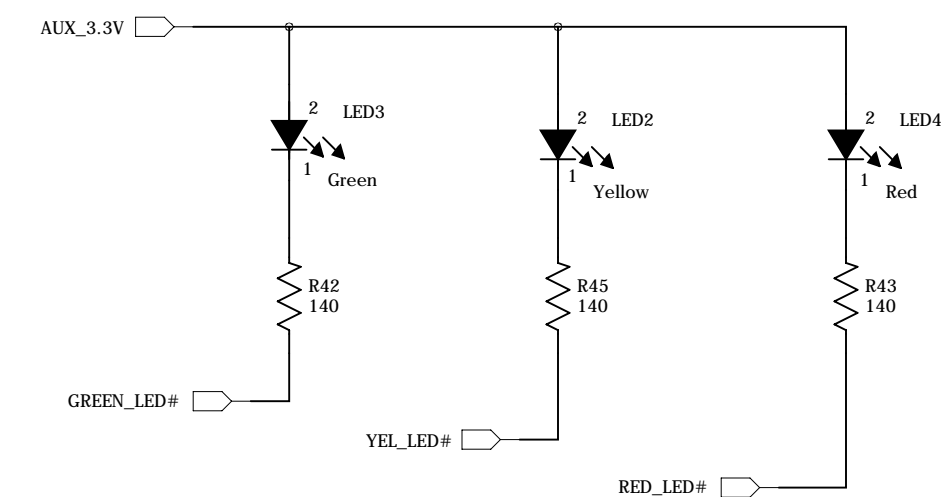
## External Host USB Port



## Boot Jumpers



## SMT RA LEDs



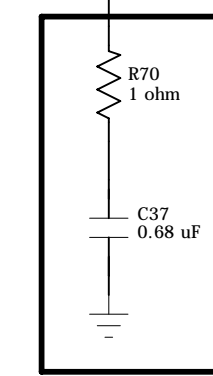
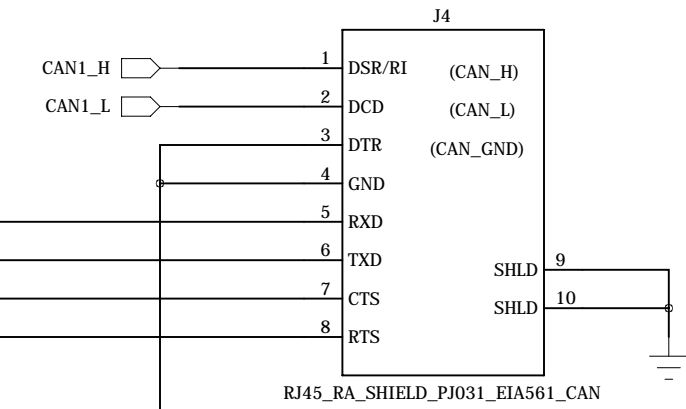
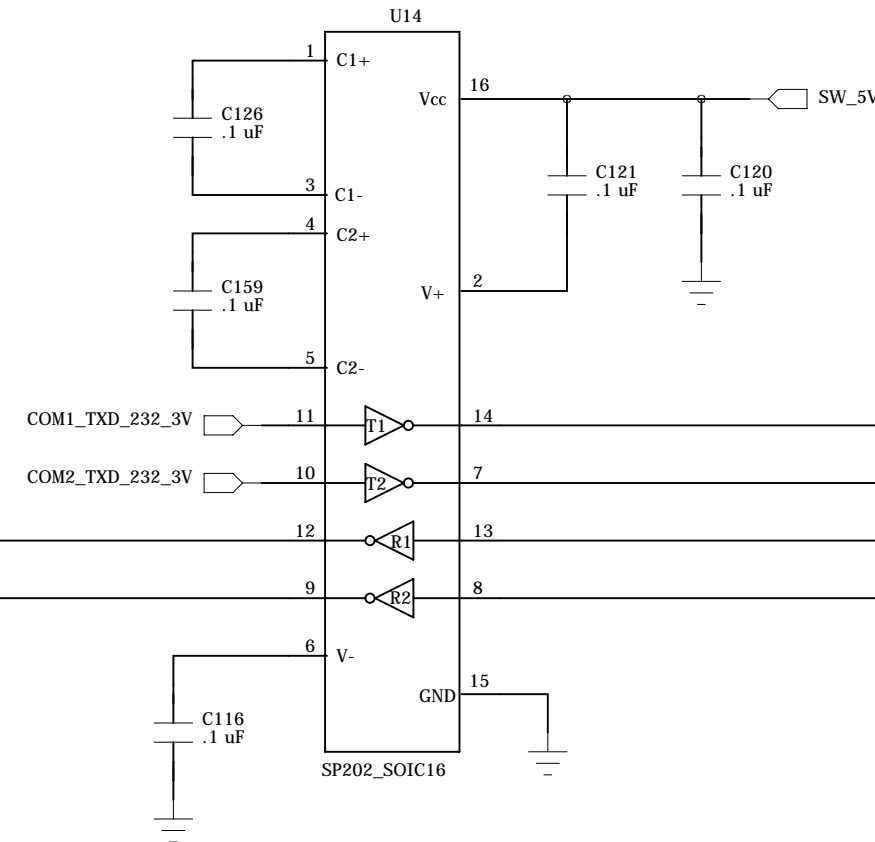
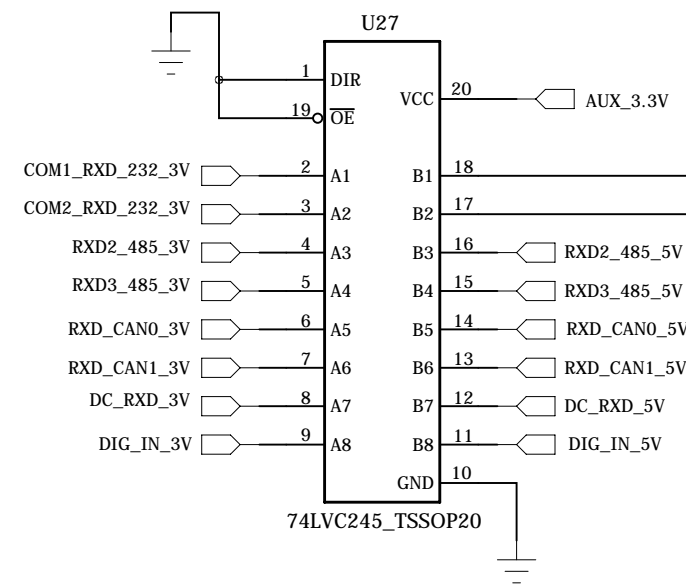
# RS-232 Ports and Daughter Card Headers

## RS-232 Transceiver

## RS-232/CAN

3.3V <-- 5V

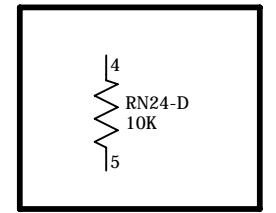
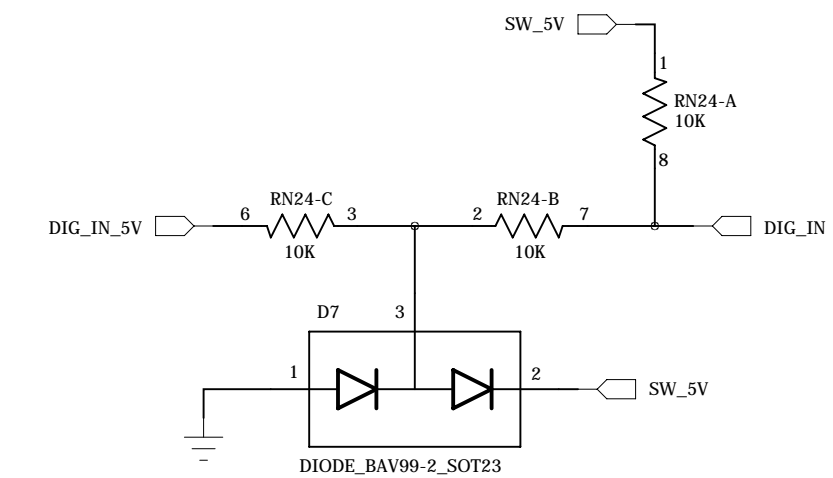
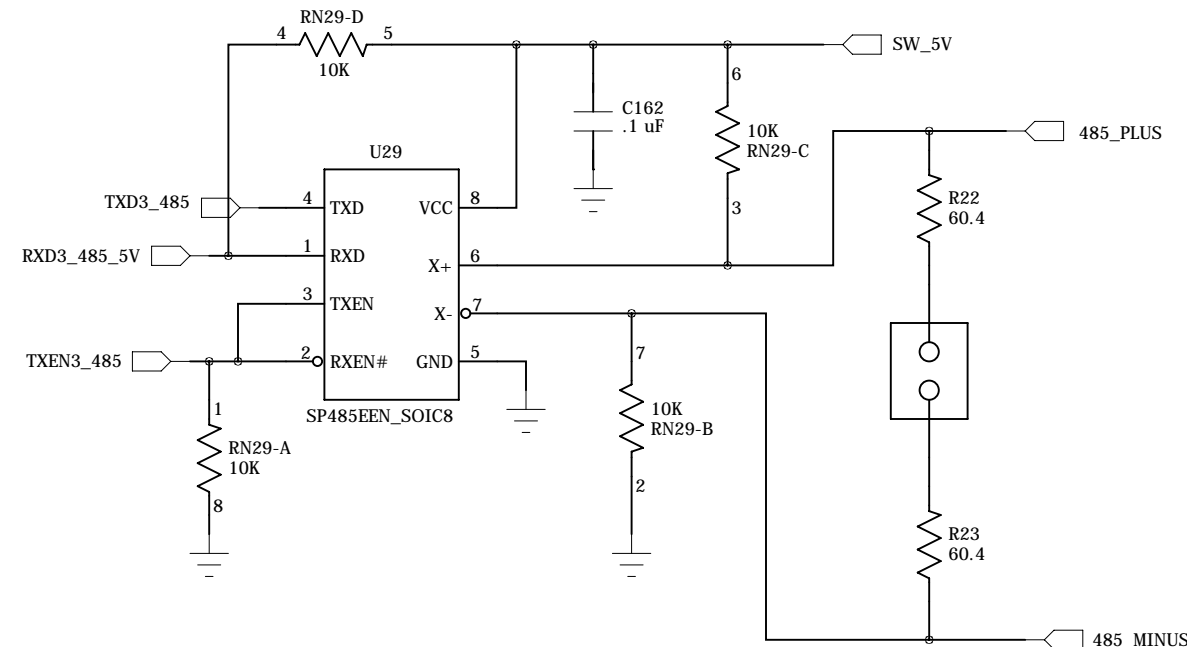
Level shifter



J1939 Shield Option

## Dig. Input

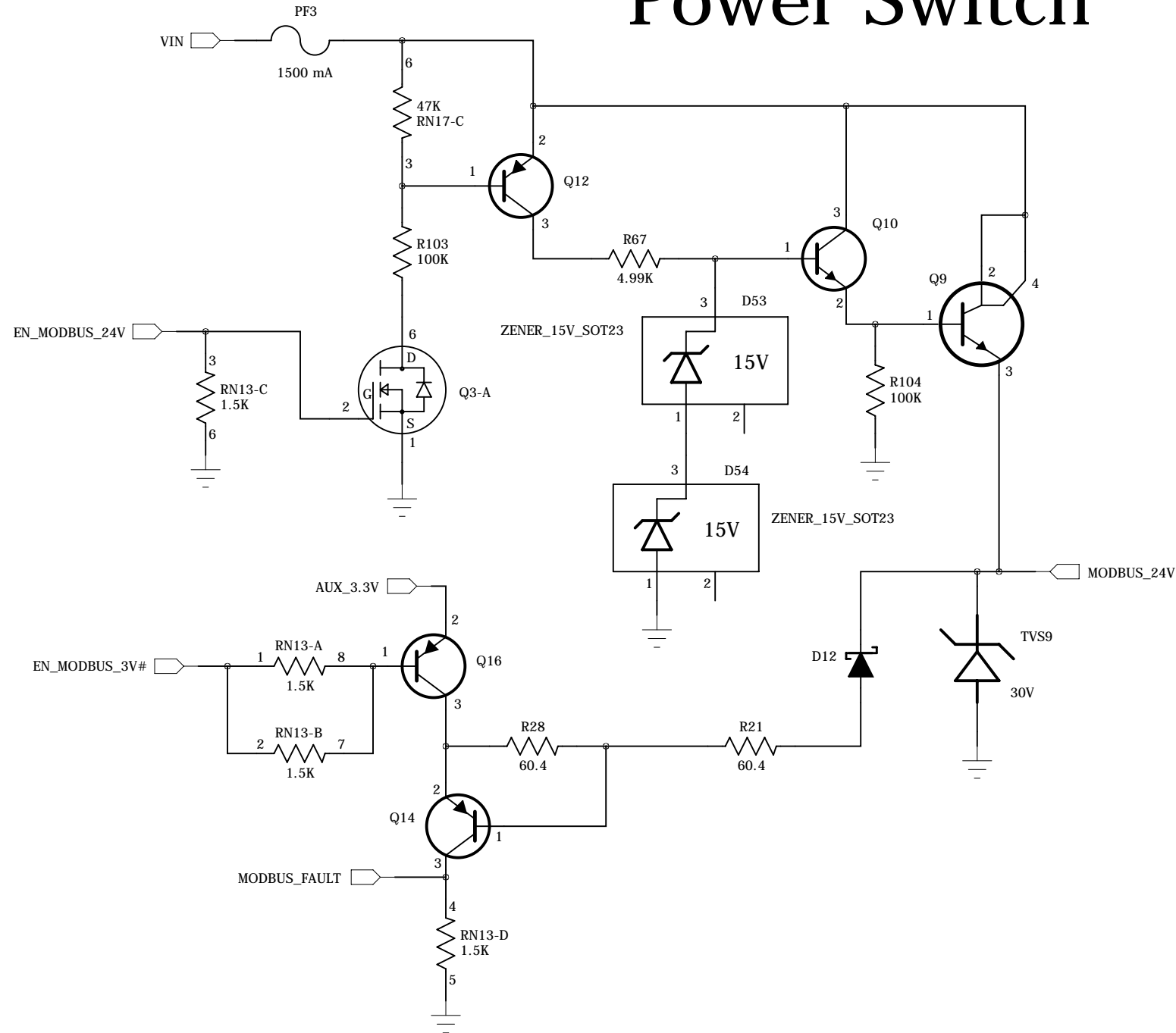
## STC RS-485 Driver



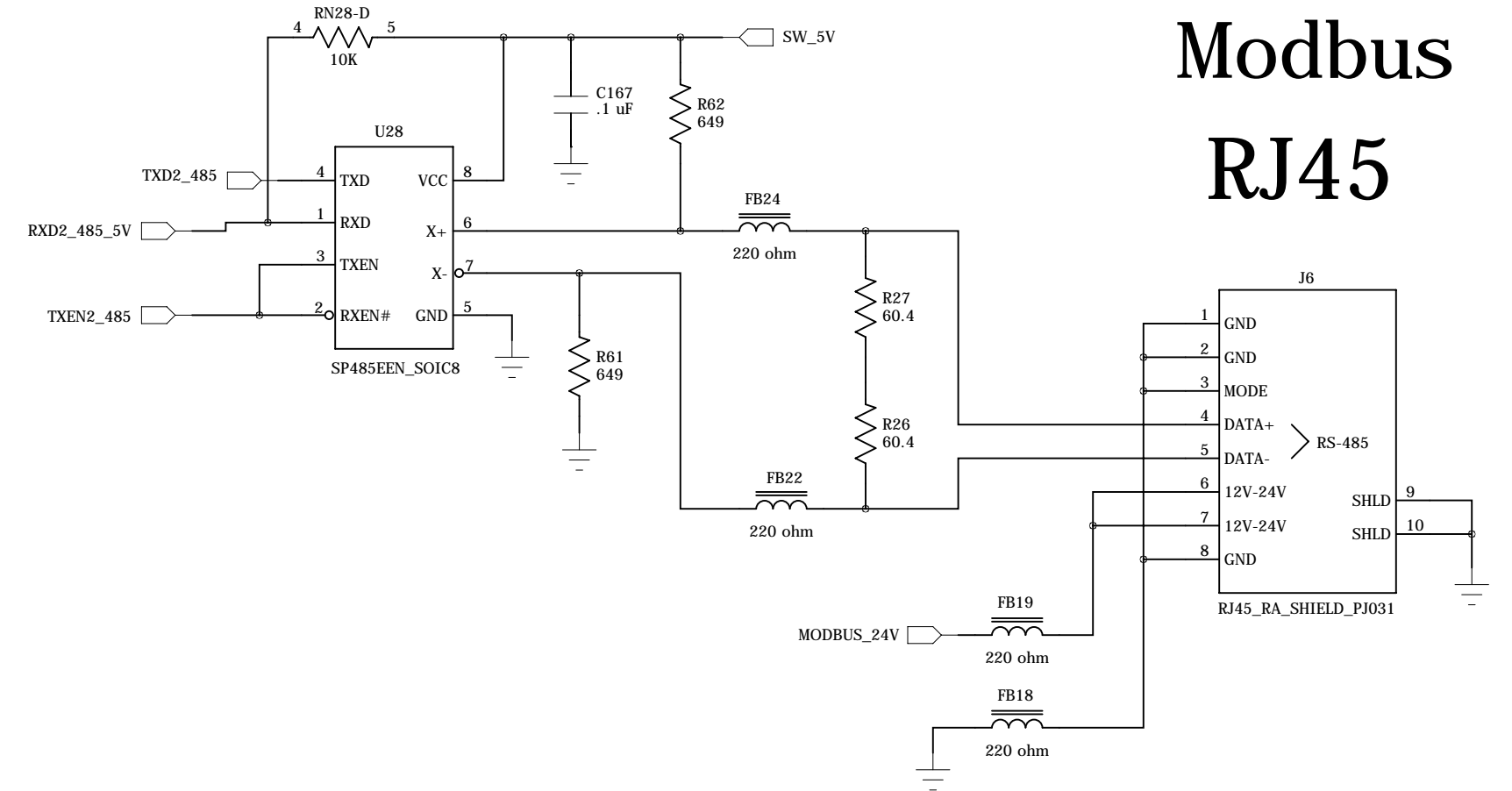
Do not use

# Mod Bus RS-485 and CAN Ports

## Modbus Power Switch

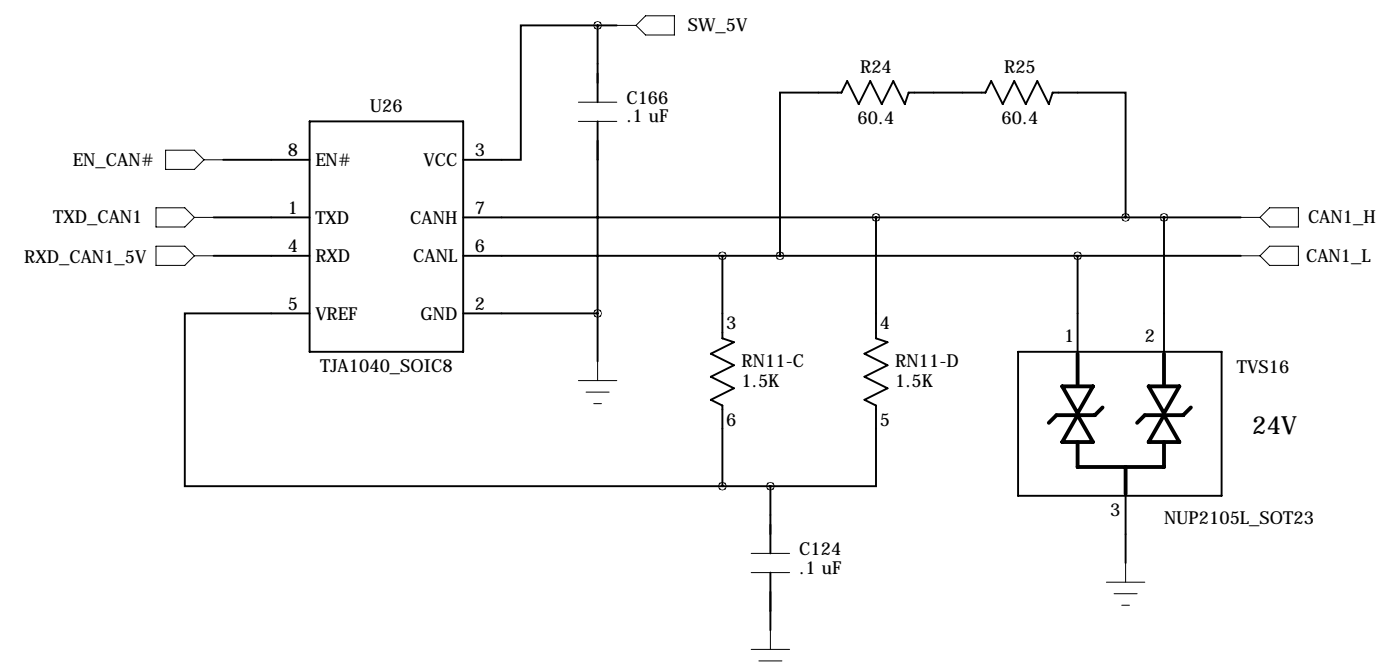


## RS-485 Driver

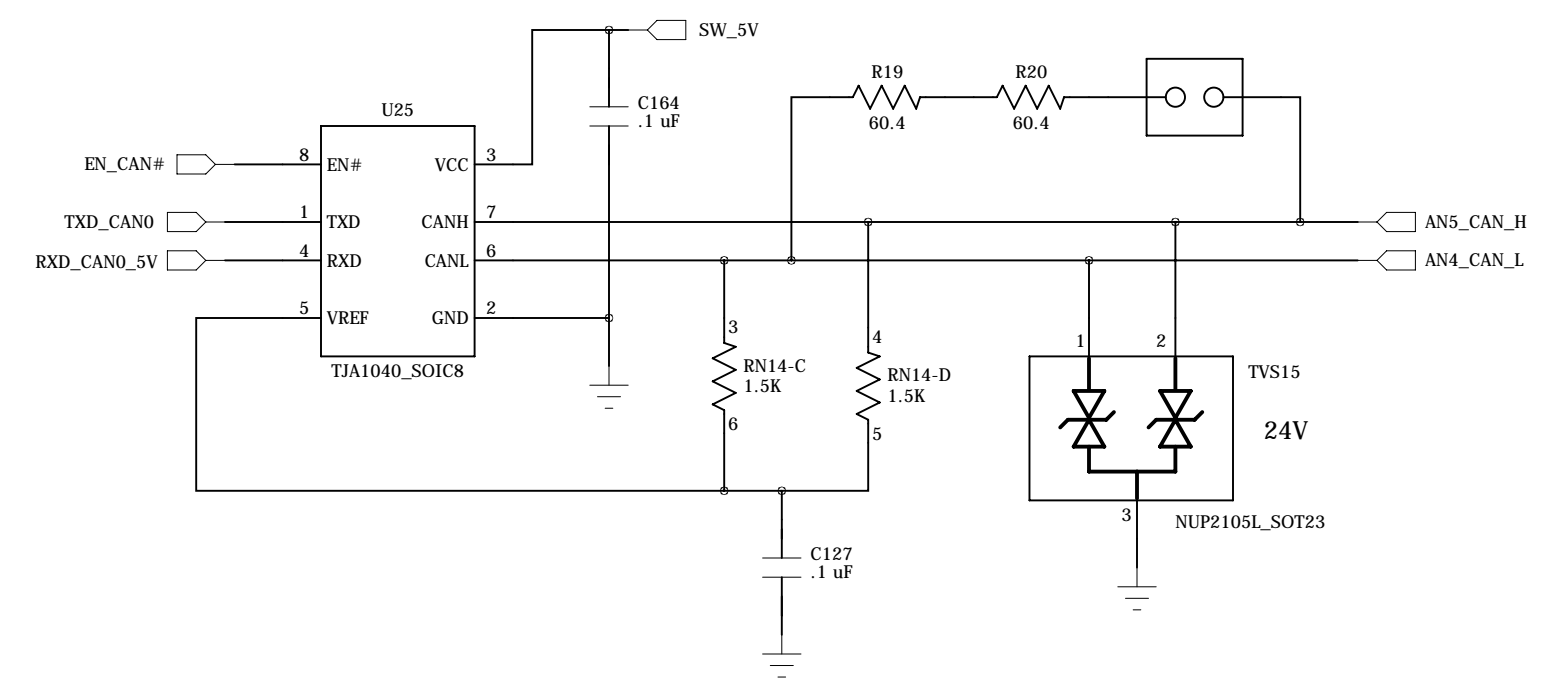


## Modbus RJ45

## CAN\_1 Transceiver



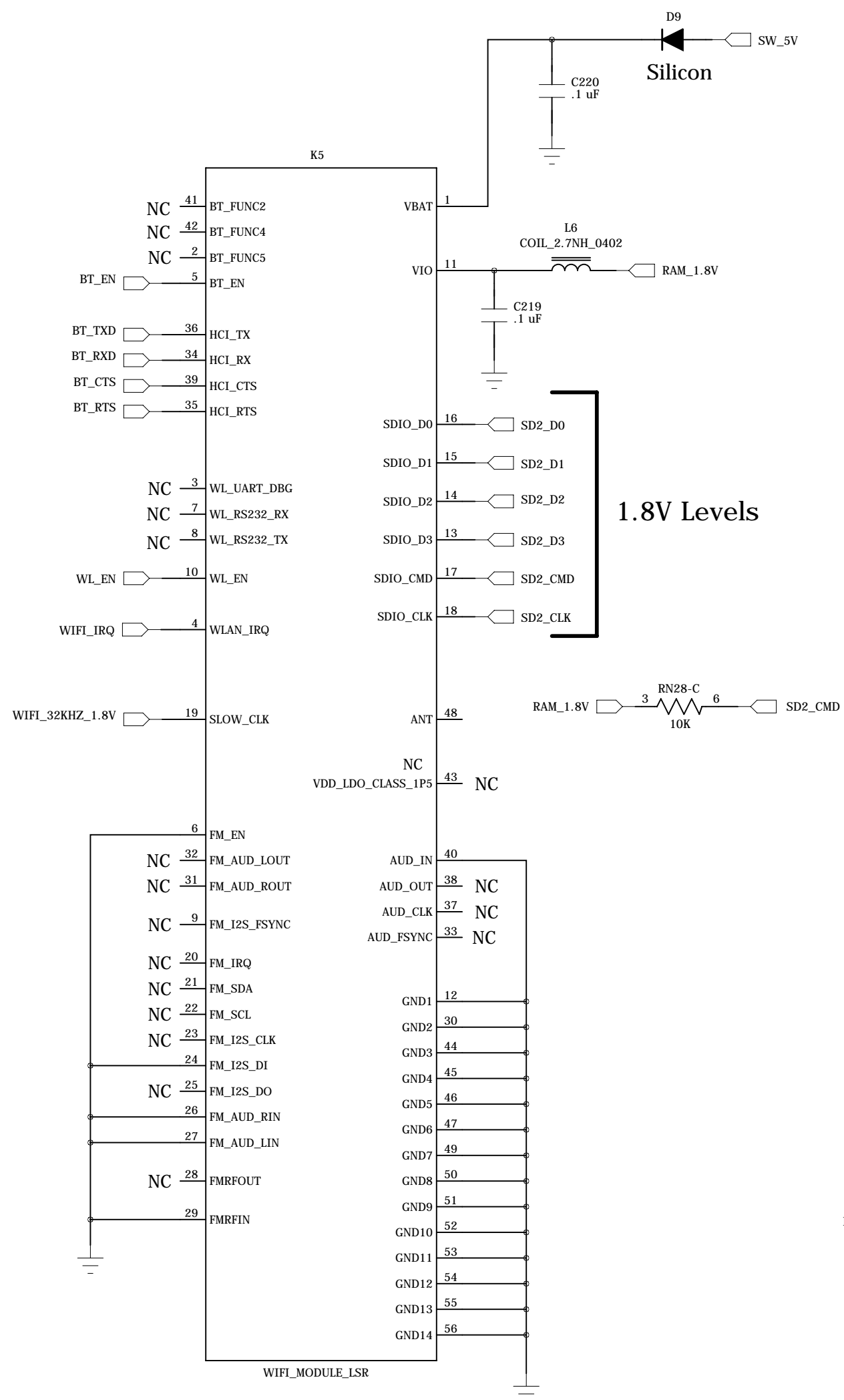
## CAN\_0 Transceiver



|                               |                   |
|-------------------------------|-------------------|
| Technologic Systems           | Date Nov. 7, 2015 |
| Title: TS-7680 Modbus and CAN |                   |
| Rev: C                        | Designer          |
| Sheet 13 of 20                |                   |

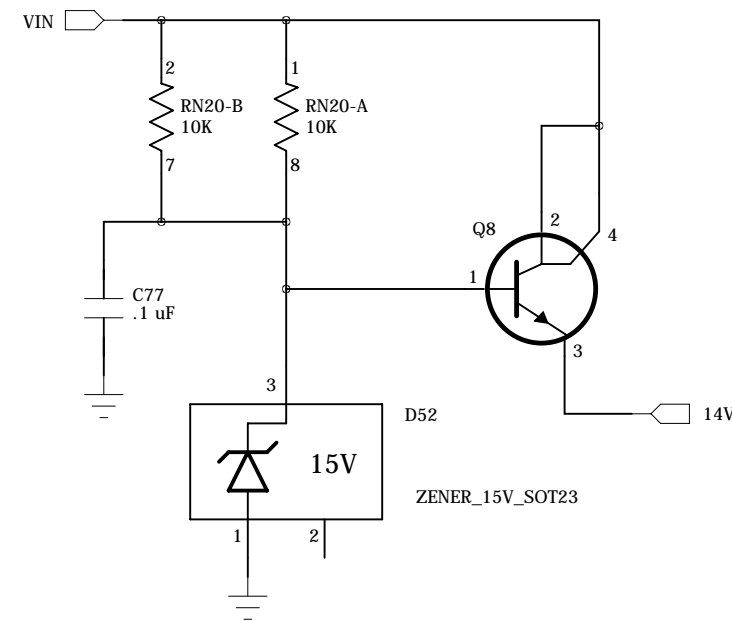
# WiFi Radio

All I/O must be 1.8V levels

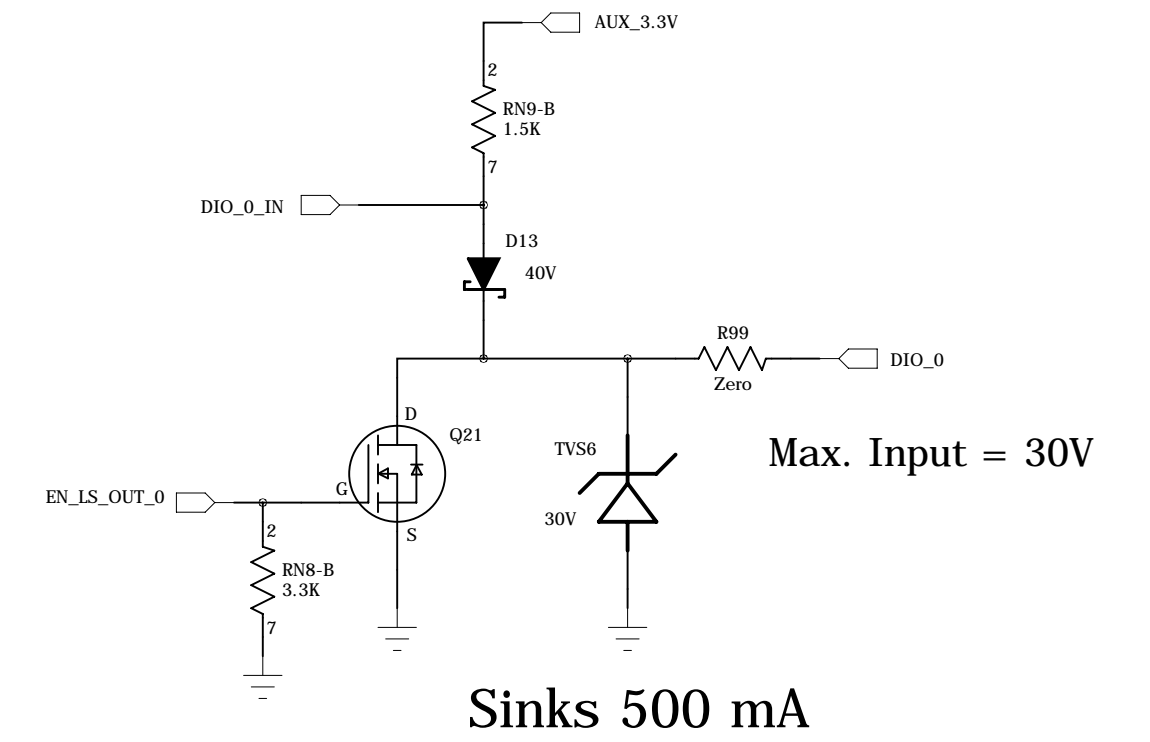


# DAC

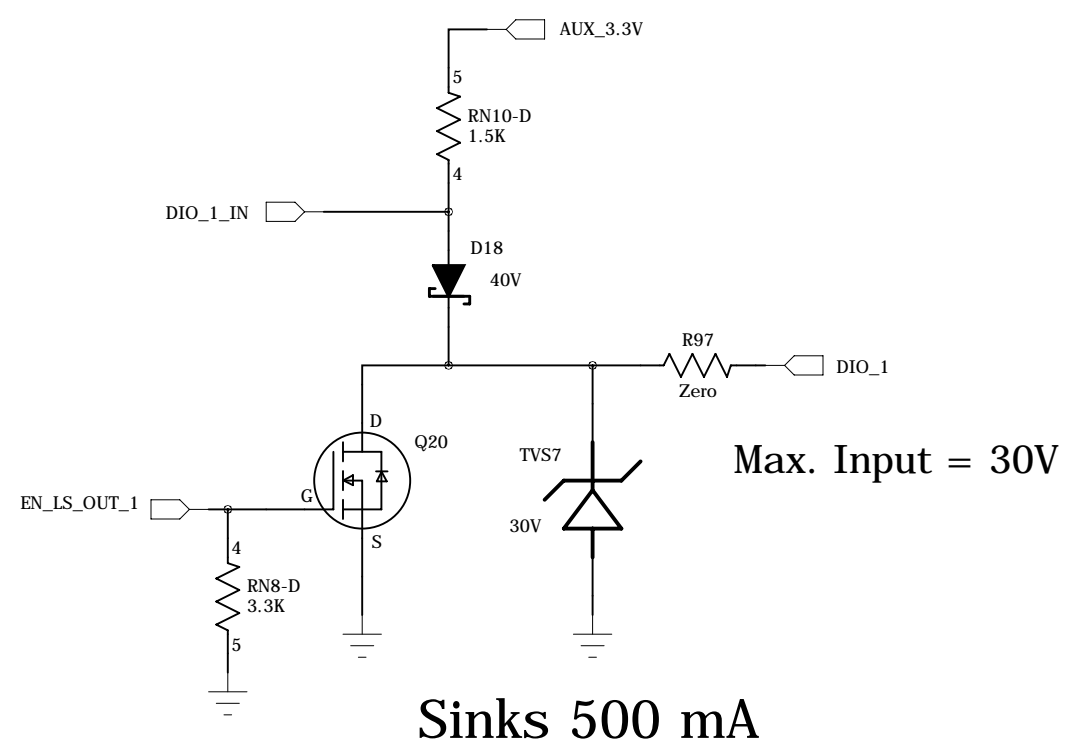
## 14V Supply



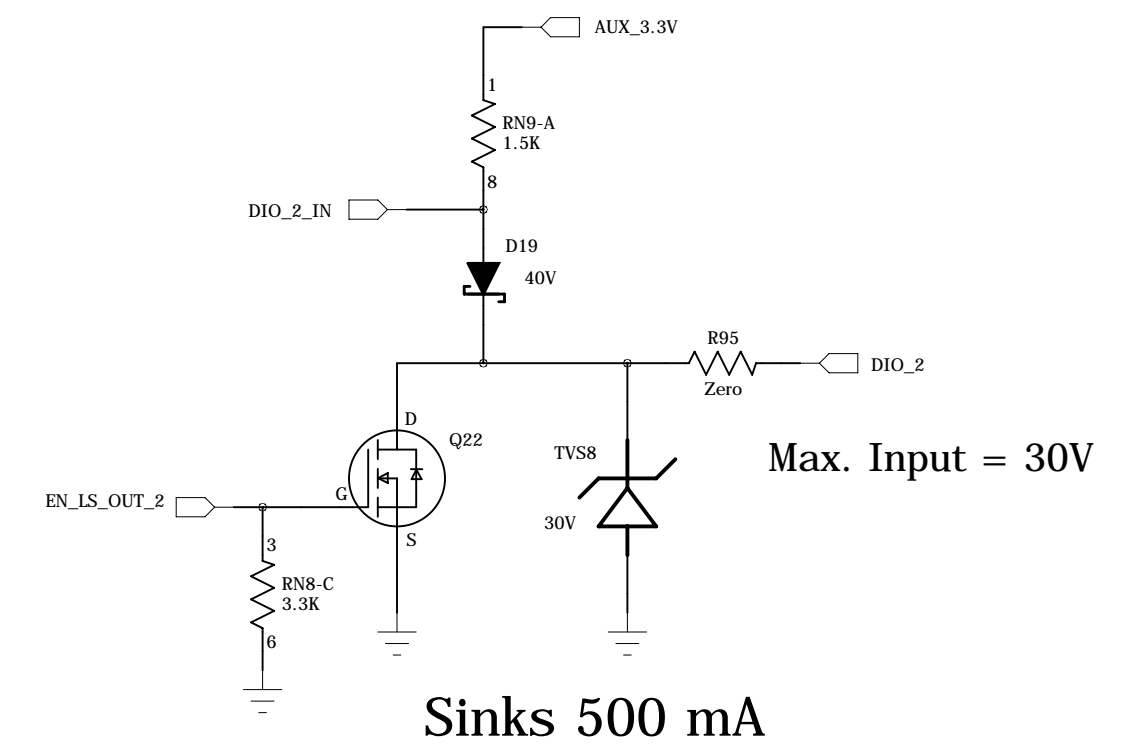
# DIO\_0



# DIO\_1



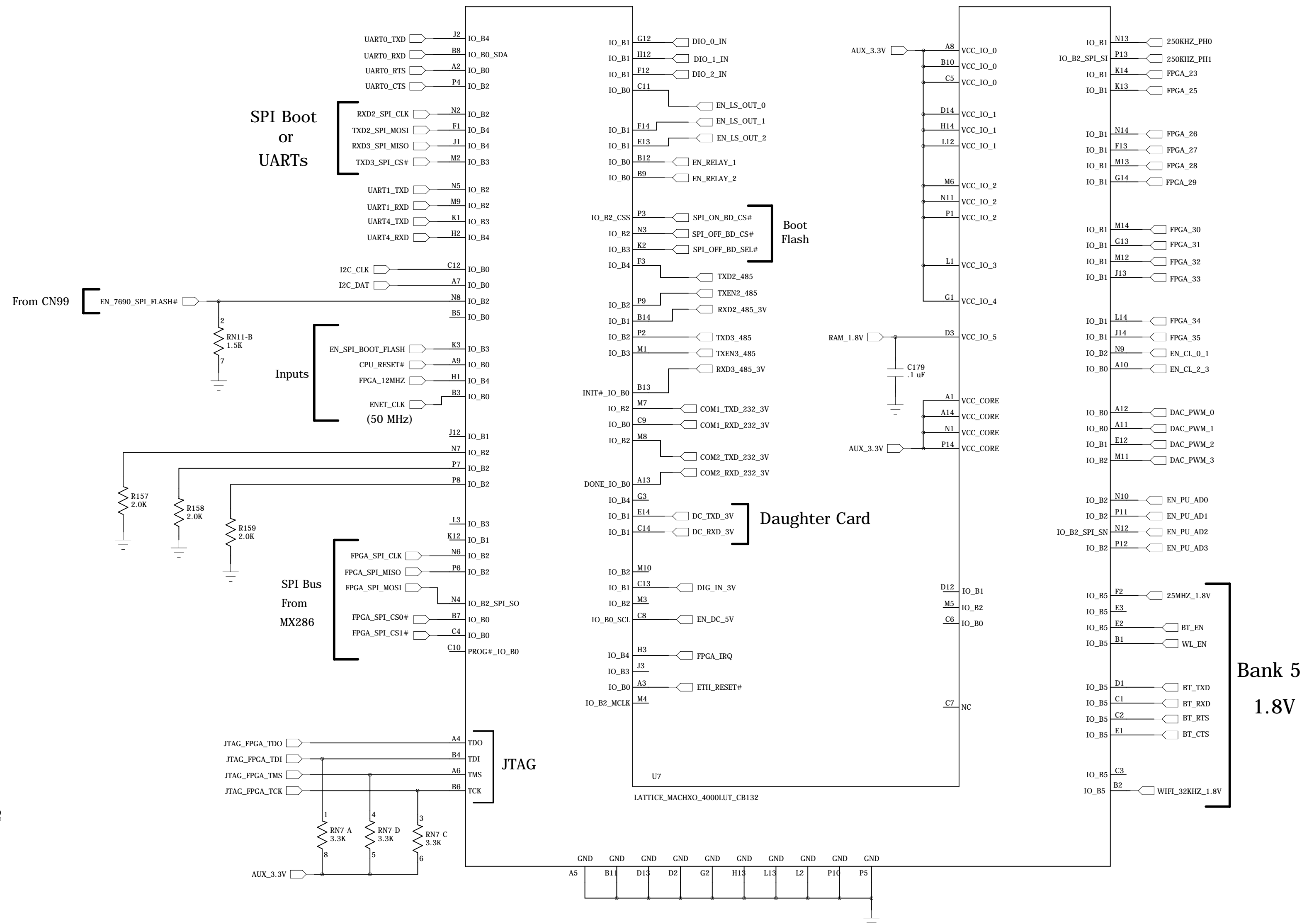
# DIO\_2



# MACH XO2 FPGA

## FPGA required for:

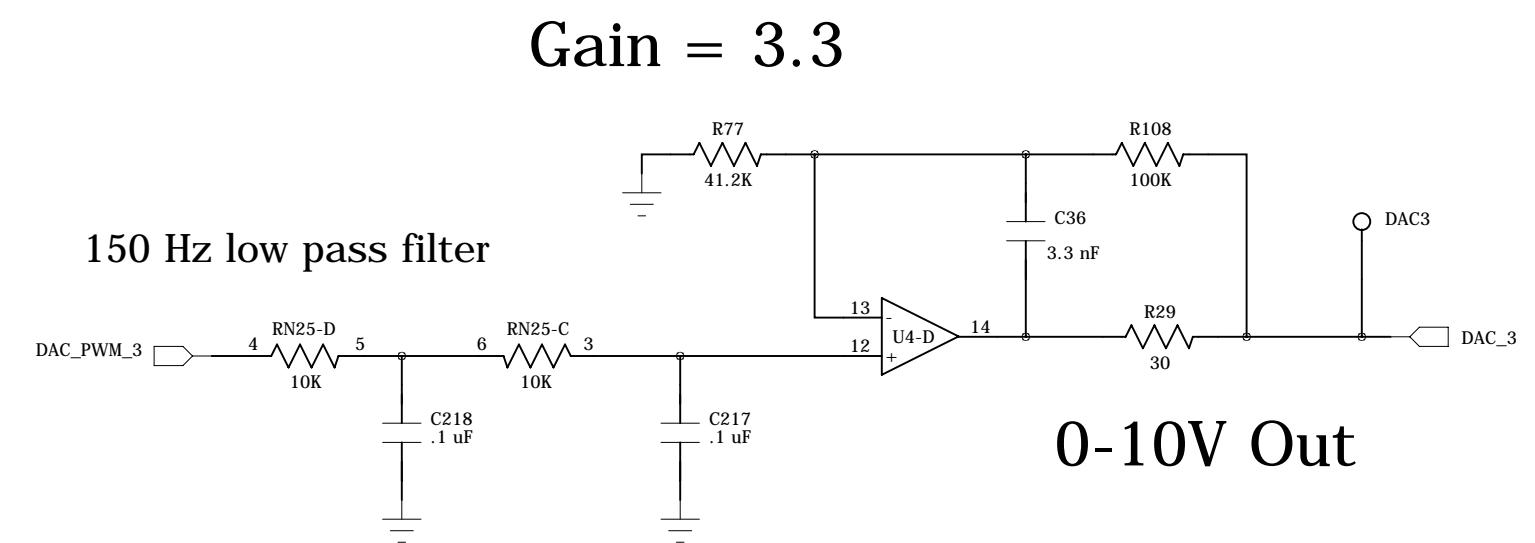
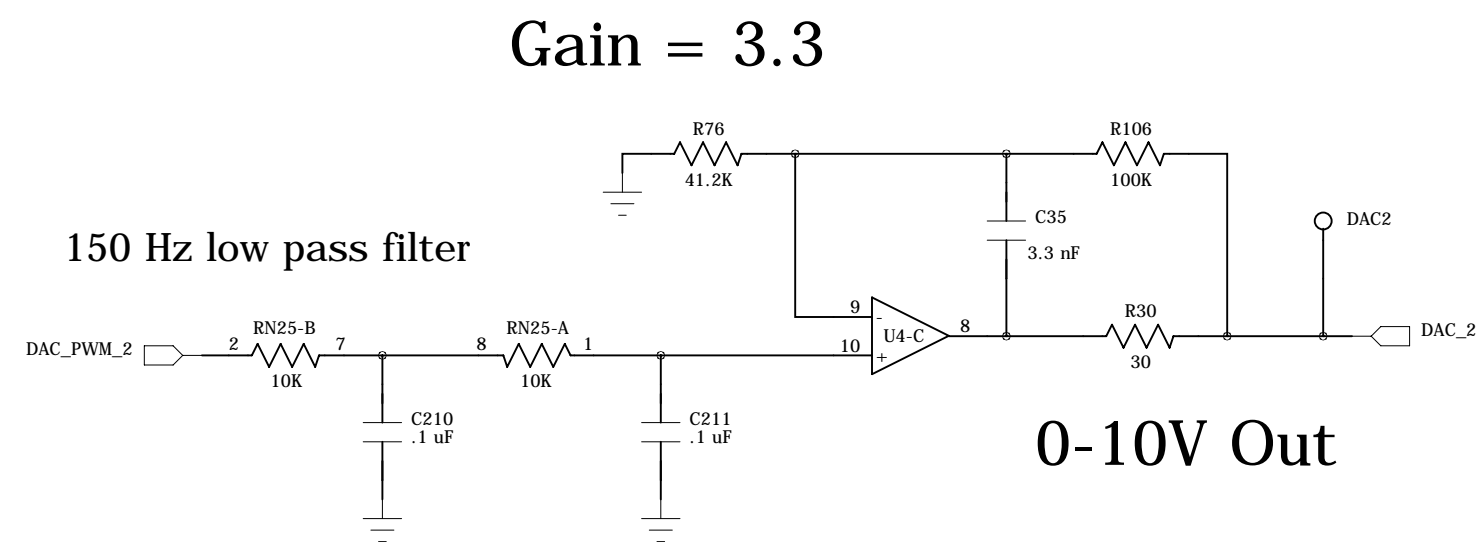
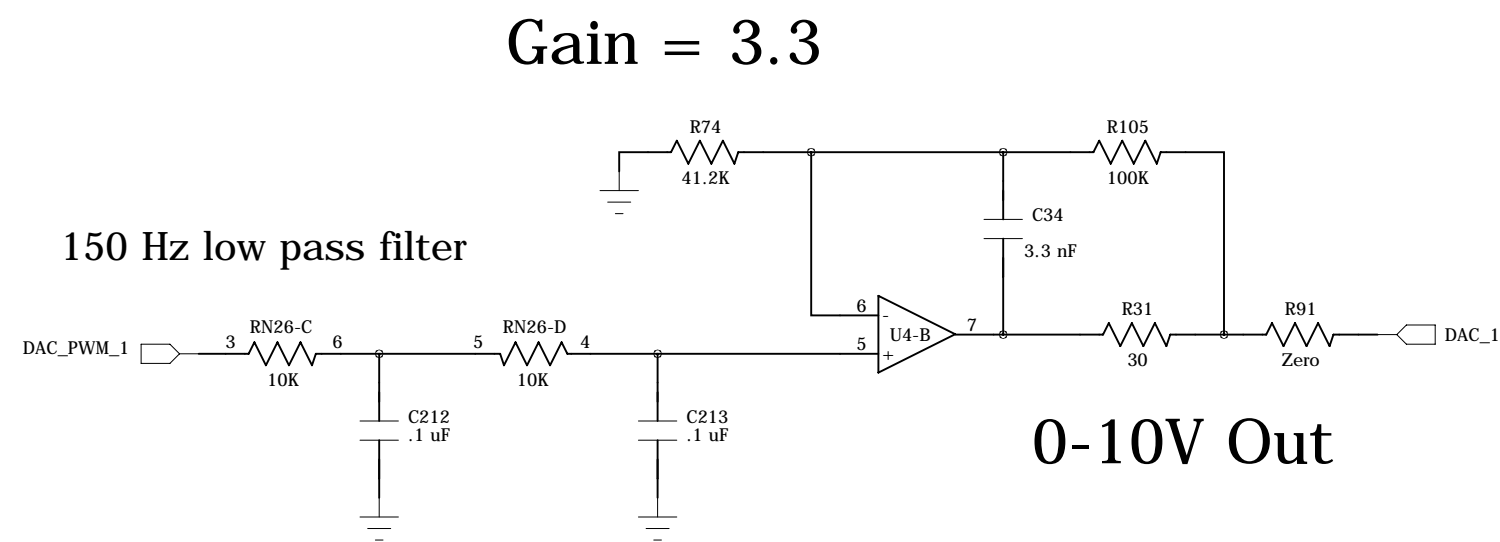
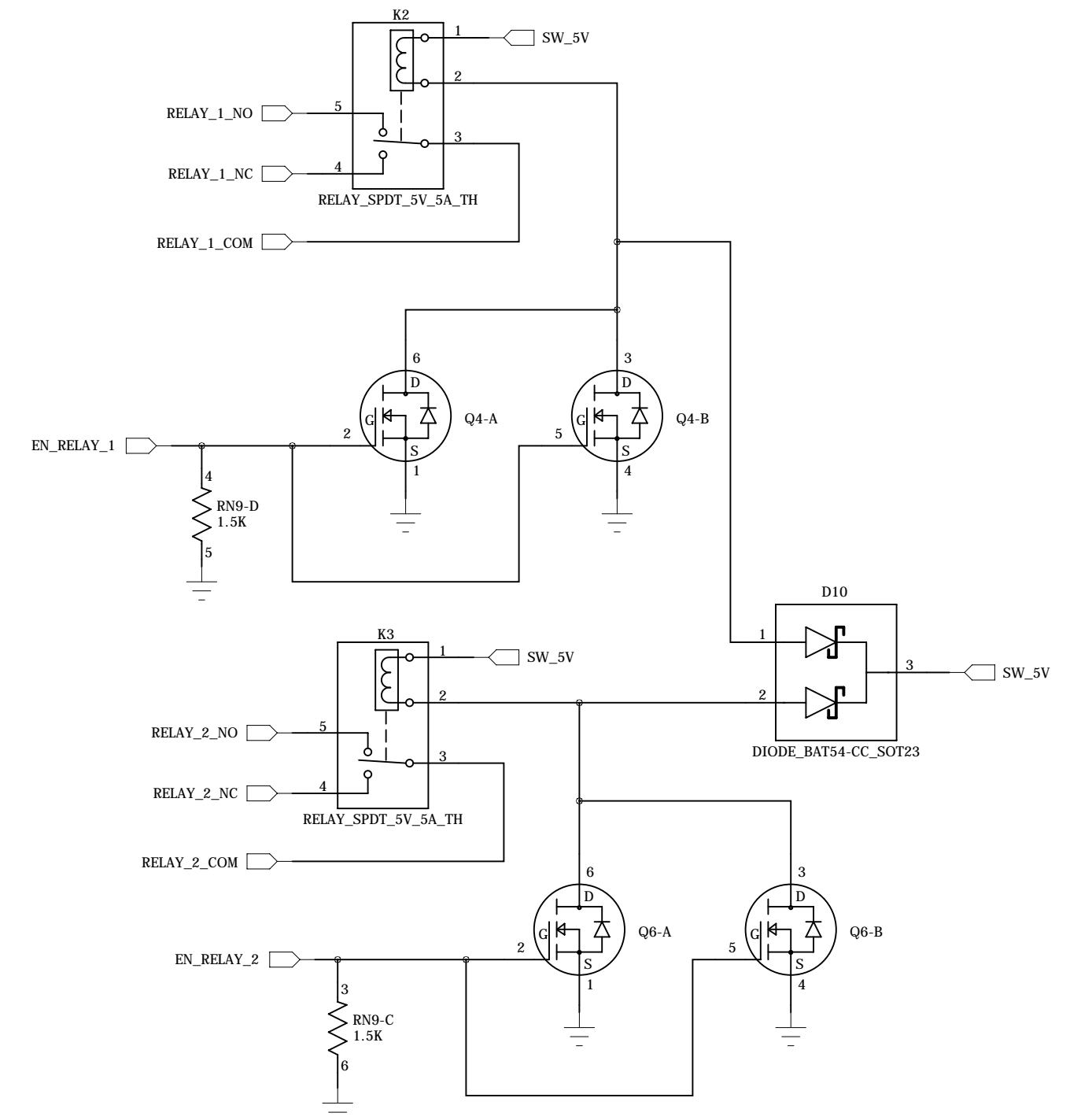
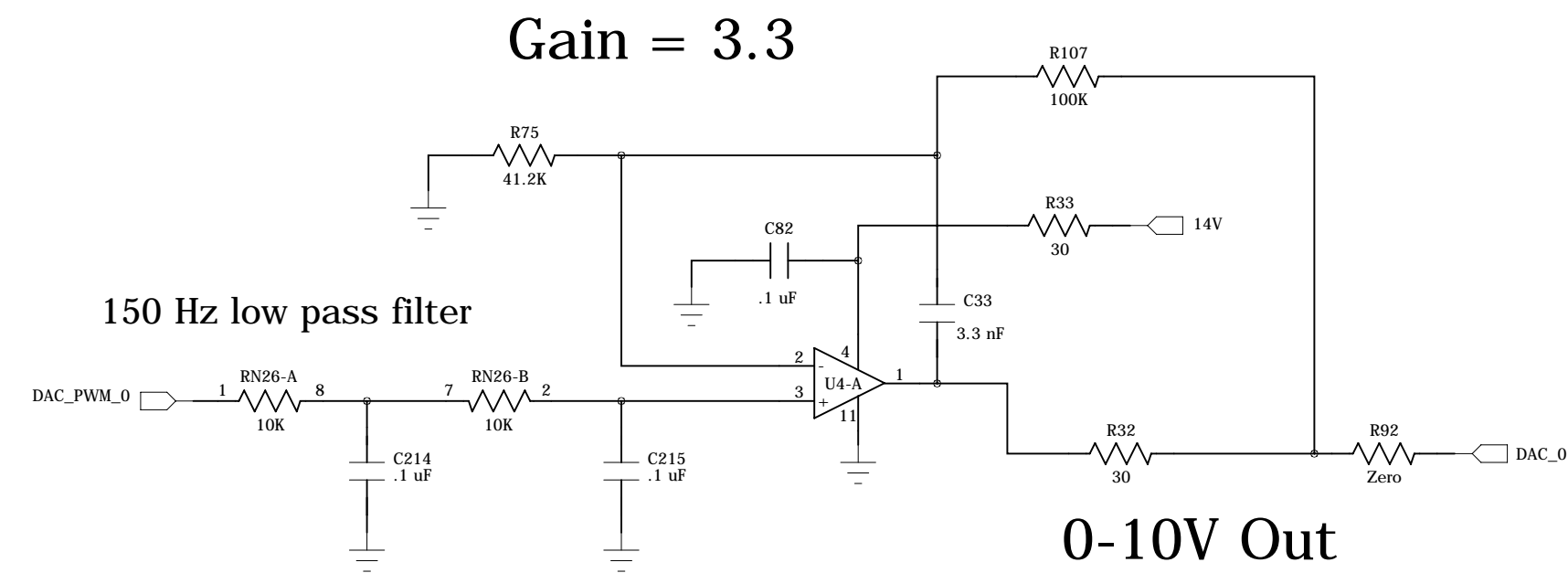
- Auto-485 for two UARTs
- PWMs for DACs
- MUX for all UARTs
- Bluetooth Level Shifting
- Additional I/O
- HD4 Daughter Card (Future)



UART2 and UART3 changed to SPI when Booting from SPI

# 10-bit DACs

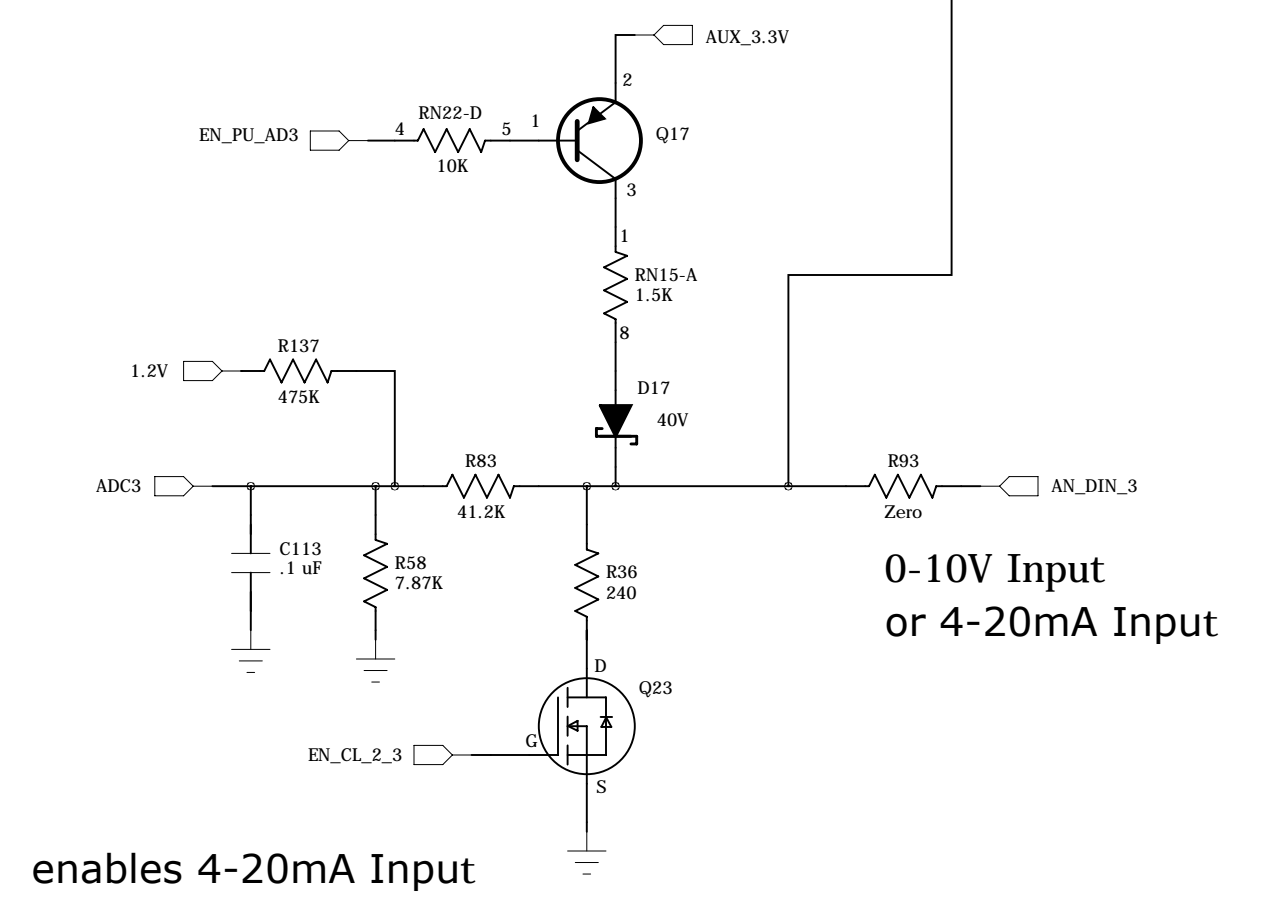
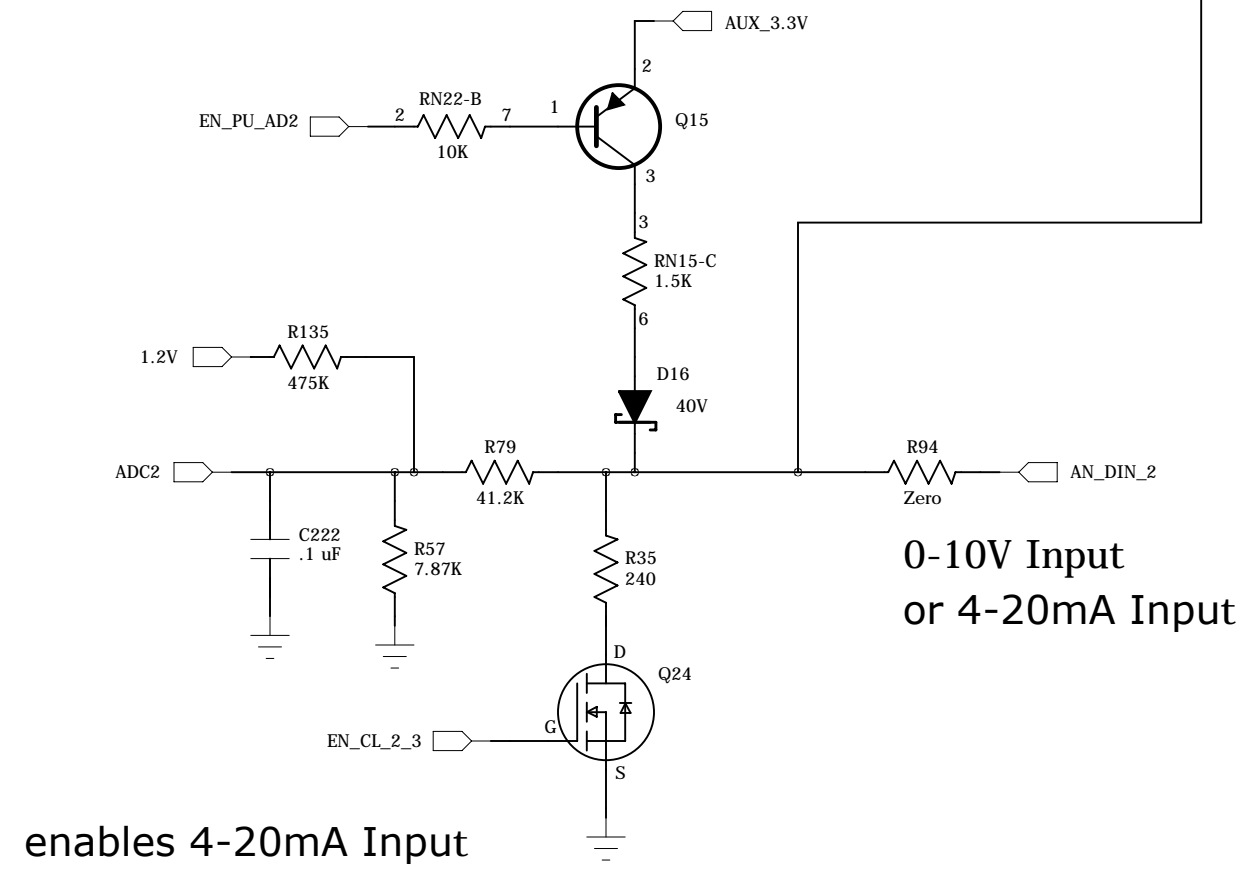
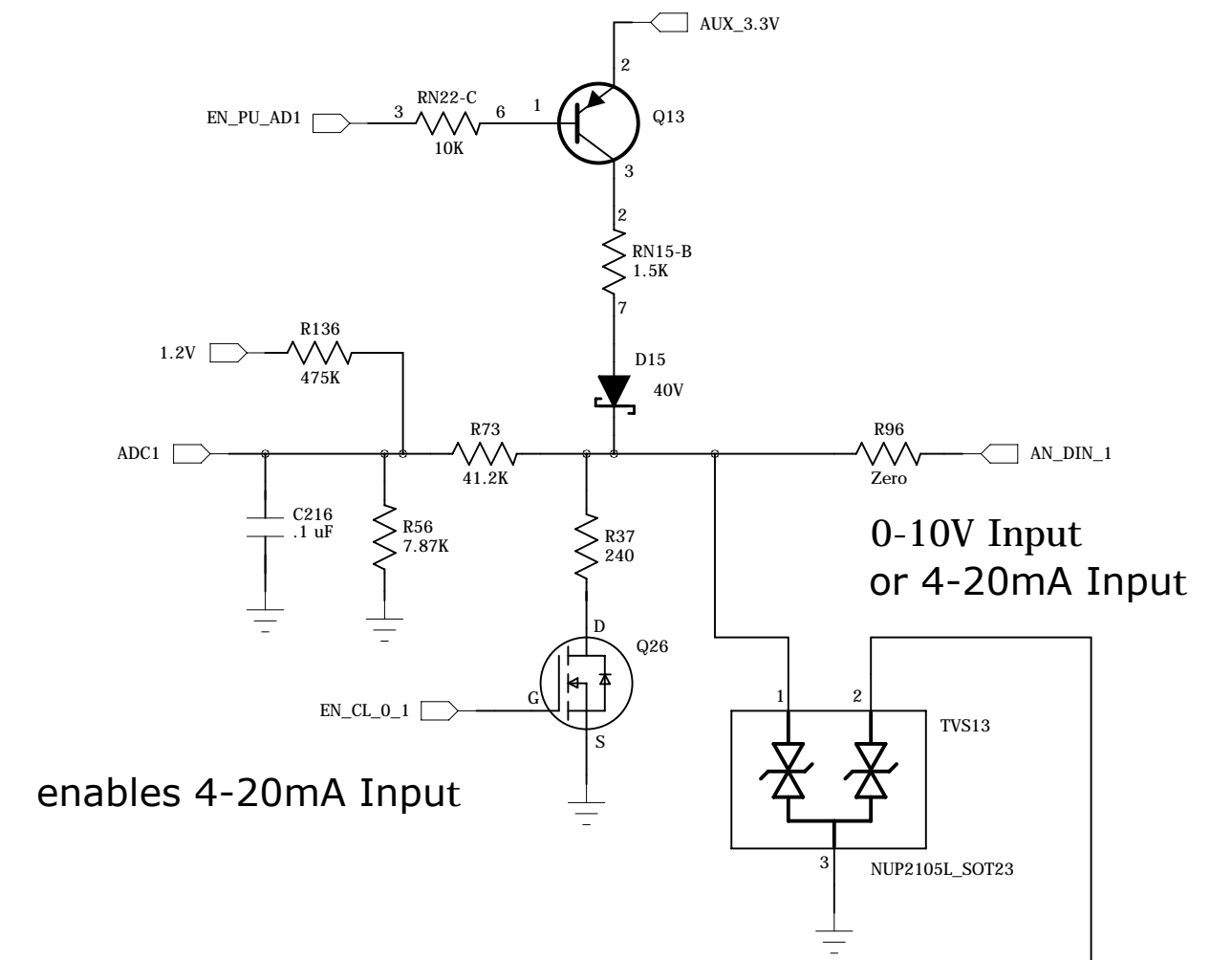
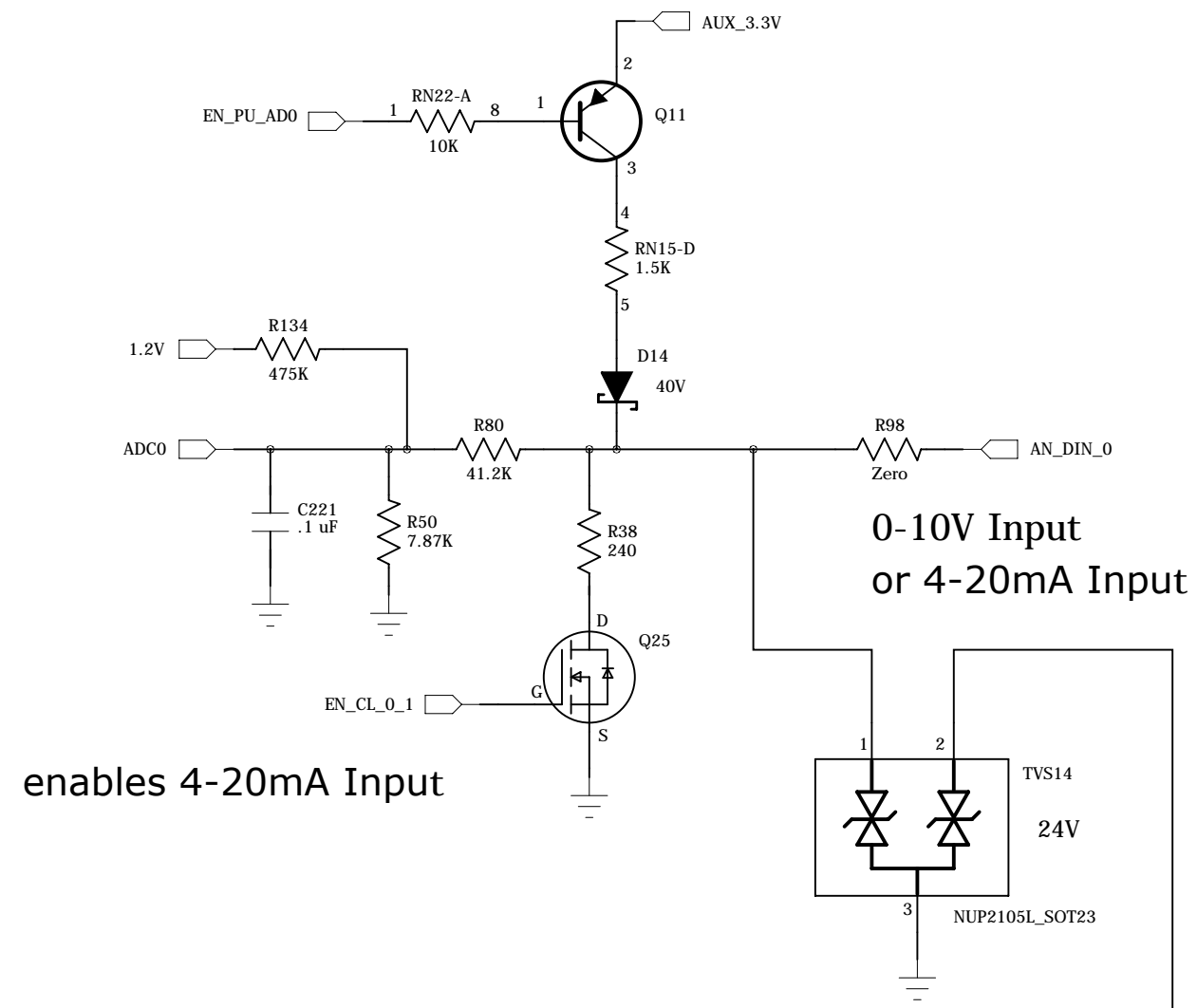
# Relays



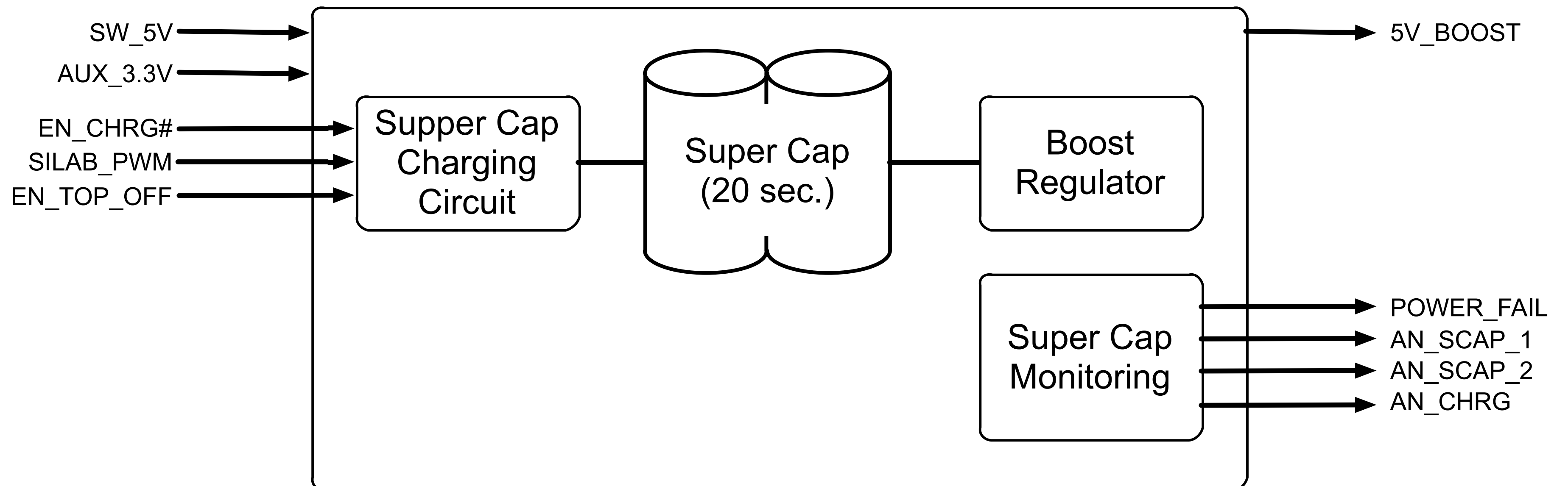


# Analog In Channels

## 0-10V or 4-20mA Inputs



# SuperCap 20 Second Power Hold



20 seconds assumes 3 watt load  
SuperCaps charged to 4.8V  
Functions down to SuperCap = 2.8V

|                                  |                   |                |
|----------------------------------|-------------------|----------------|
| Technologic Systems              | Date Nov. 7, 2015 |                |
| Title: TS-7680 Super Cap Circuit |                   |                |
| Rev: C                           | Designer          | Sheet 18 of 20 |

## Boost 5V Reg

V\_INT is normally 5V

But when Mains fail, and in Power Hold,  
it will range from 4.5V down to 2.0V

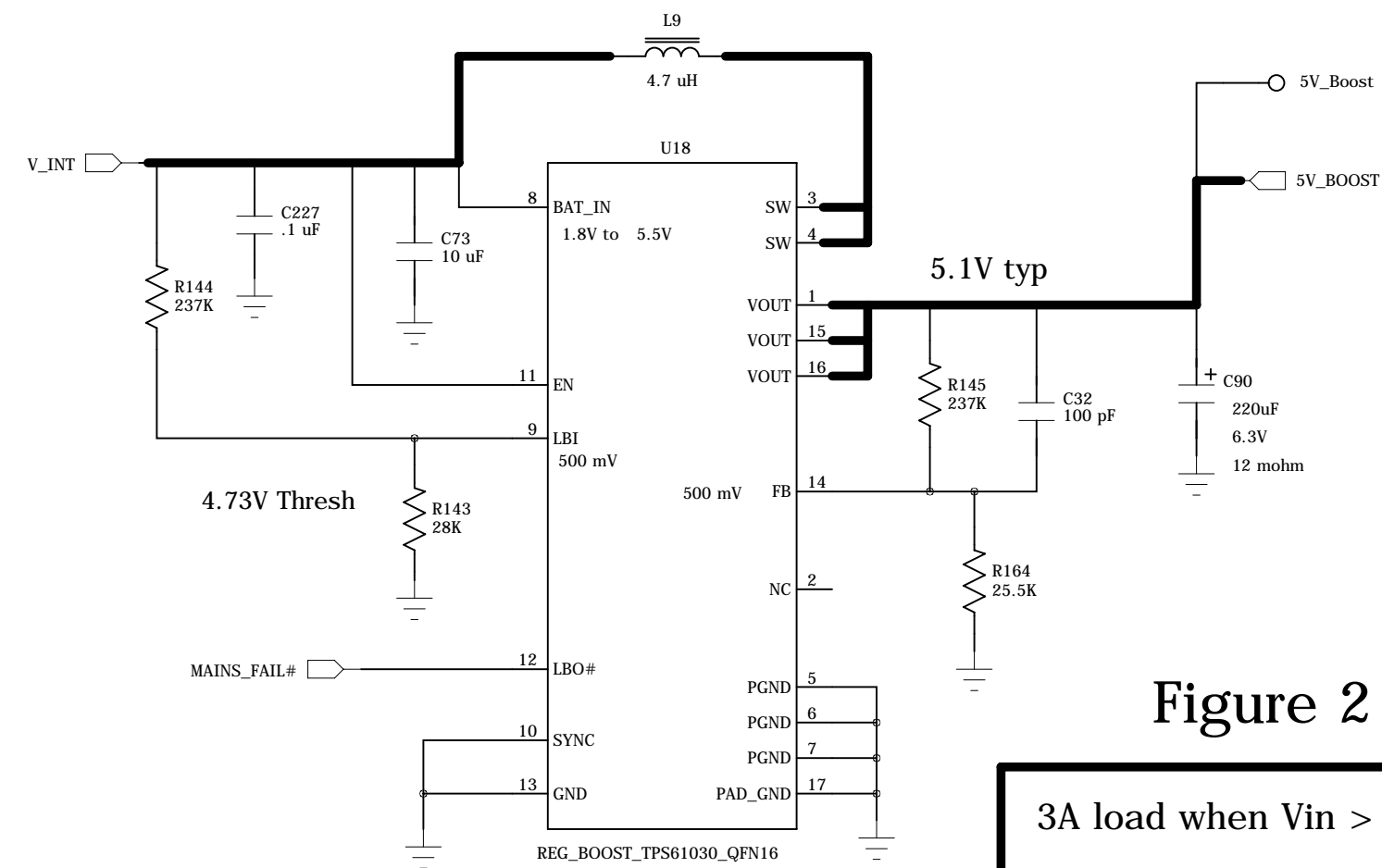
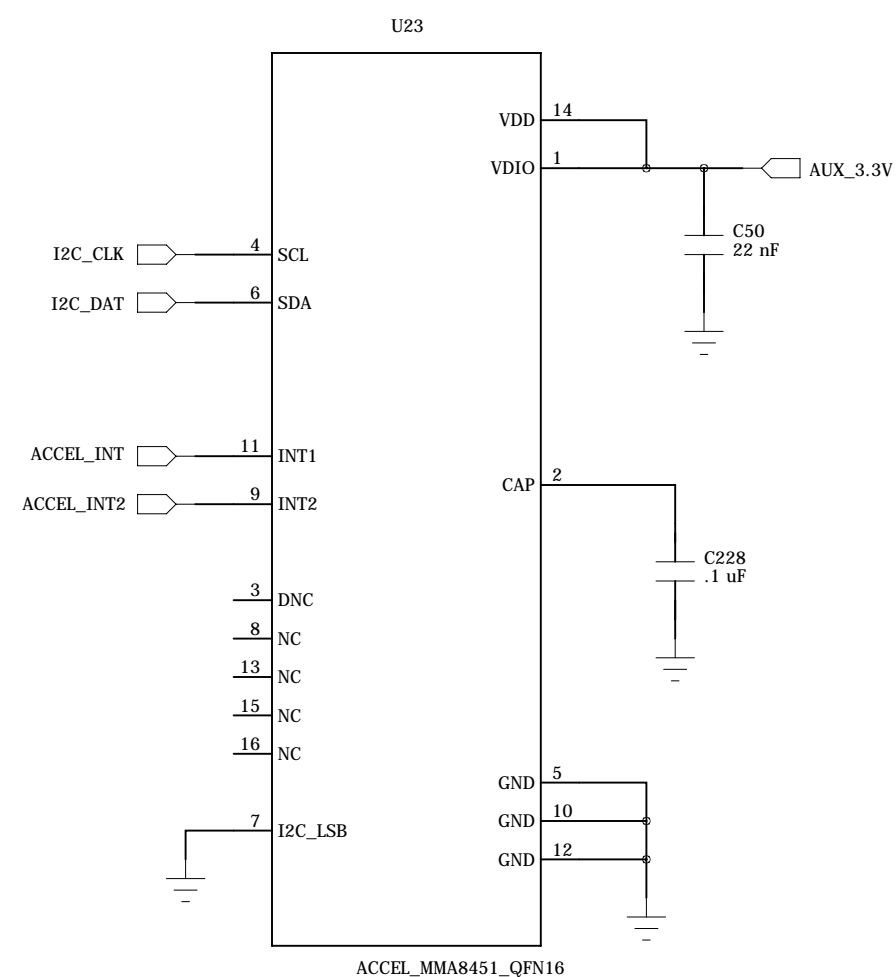


Figure 2

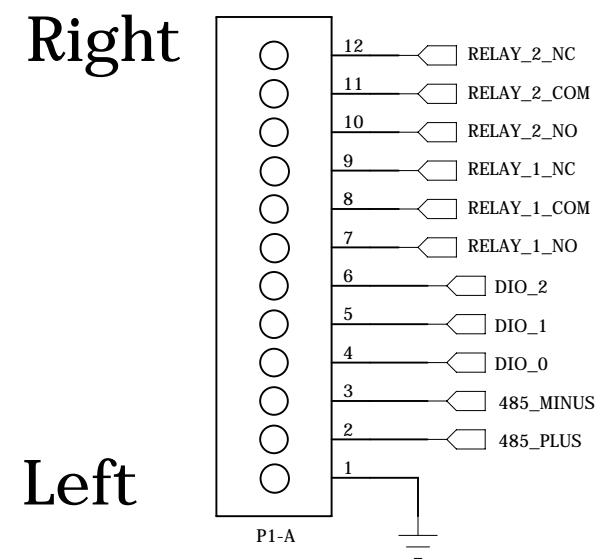
3A load when Vin > 4.6V  
2A load when Vin > 3.5V  
1A load when Vin > 1.8V

## Accelerometer

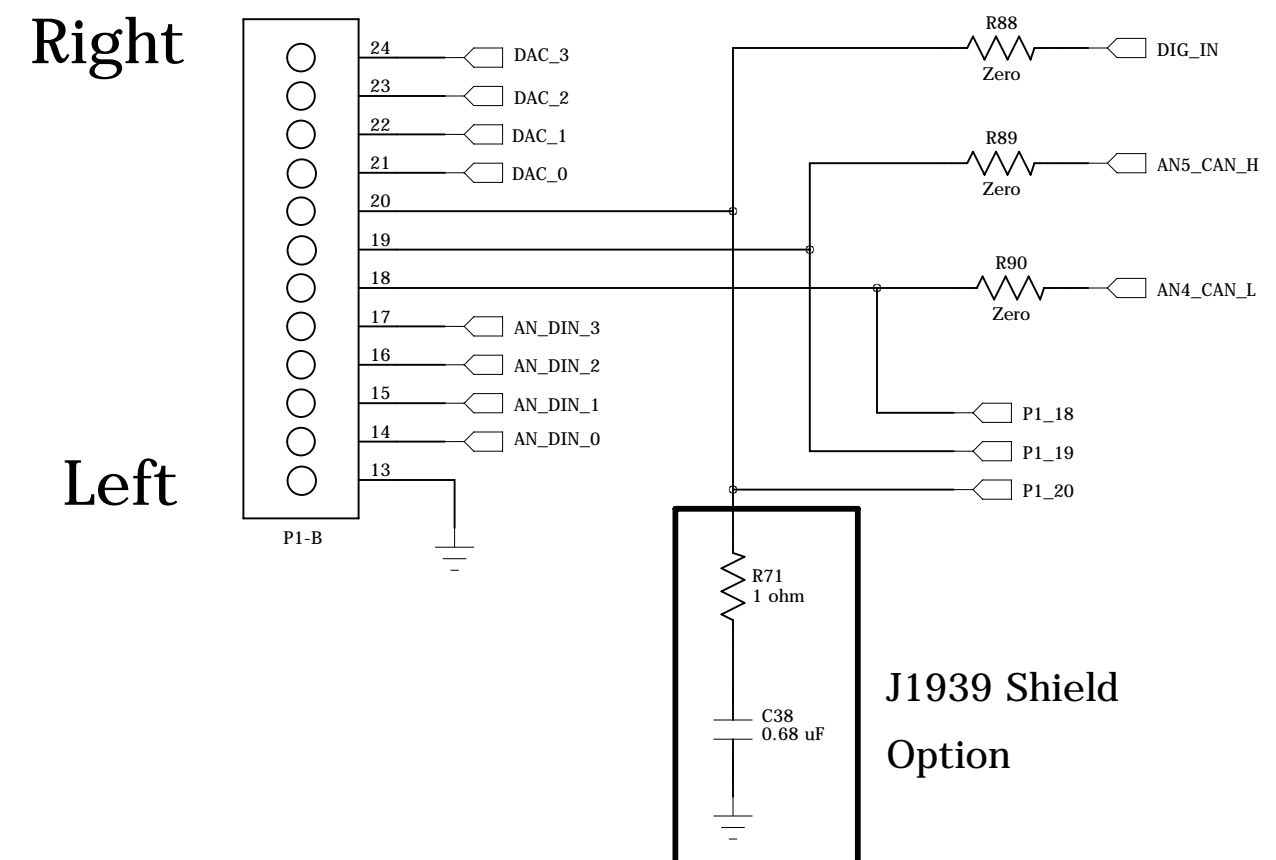


# 24 Screw Term. Positions

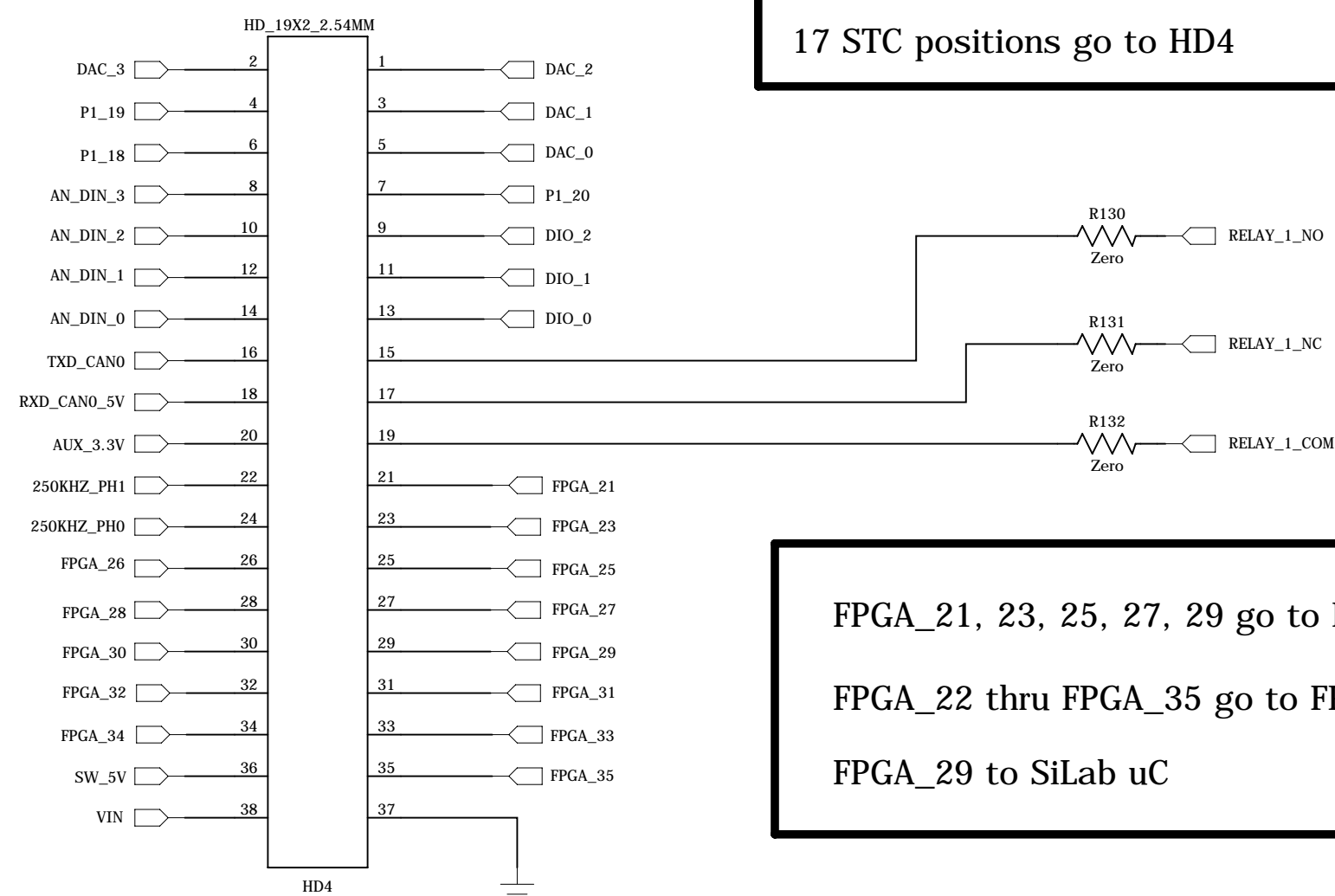
## Top Row



## Bottom Row



## DC Header



17 STC positions go to HD4

FPGA\_21, 23, 25, 27, 29 go to MX286 (5)  
 FPGA\_22 thru FPGA\_35 go to FPGA (14)  
 FPGA\_29 to SiLab uC

|                                       |                   |
|---------------------------------------|-------------------|
| Technologic Systems                   | Date Nov. 7, 2015 |
| Title: TS-7680 Screw Term. Connectors |                   |
| Rev: C                                | Designer          |
| Sheet 20 of 20                        |                   |