

# Standard Options

XOPP1  
2  
ASSEMBLY\_OPTIONS

PCB\_7670\_E  
NC  
1  
PCB\_99

- Option 1 TS-7670-128-2048F-I SBC with a NXP/Freescale i.MX28 454MHz ARM9 CPU, 128 MB of DDR2 RAM, and 2GB of eMMC, I-Temp (-40C to 85C)
- Option 2 TS-7670-256-2048F-2CAN-I SBC with a NXP/Freescale i.MX28 454MHz ARM9 CPU, 256 MB of DDR2 RAM, 2GB of eMMC, and 2nd CAN, I-Temp (-40C to 85C)
- Option 3 TS-7670-256-2048F-I-DEV SBC with a NXP/Freescale i.MX28 454MHz ARM9 CPU, 256 MB DDR2 RAM, 2GB eMMC, 2nd CAN port & GPS radio, I-Temp (-40C to 85C)

## Optional Components/Features Summary

All Parts are Industrial Temp

### 256 MB RAM Option

Included only on -256-xxx Standard Options

CHANGE: U19 to 256 MB Ind. Temp

### 2nd CAN Port

Included only on -2CAN & -DEV Standard Options

ADD: U26 and TVS6

### GPS Option

Included only on -DEV Standard Option

ADD: U14, CN2, PF2, L4

### Serial Port Usage

UART0 = RS-232  
UART1 = RS-232  
UART2 = Modbus  
UART3 = DC  
UART4 = GPS Radio  
Debug = Console/USB

DC = Daughter Card

4 DIO also go to DC

MX286 UART0 supports RTS/CTS  
hardware flow control

\* Res. Straps on Page 11

Web Schematic: Some proprietary information has been withheld.

Technologic Systems	Date May 8, 2017	
Title: TS-7670 Microcontroller		
Rev: E	Designer	Sheet 0 of 15

# TS-7670 Rev.E

## Rev.E Changes:

Strip out M0 parts and NAND Flash

Change the way "SD\_BOOT" Jumper works  
JP1 directly controls CPU Strap pins  
SiLab no longer needs to drive CPU Boot straps  
SiLab can still read two Jumpers

Change RA LED pads to be bigger

RJ45 plastic align holes too small on PCB

Change eMMC to 153 ball size

Update 5V Reg.

Add RS-485 new TVS

Change to new CN99 for CM Quick Test support

Allow SPI Boot over CN99

Allow MX28 to program SiLab

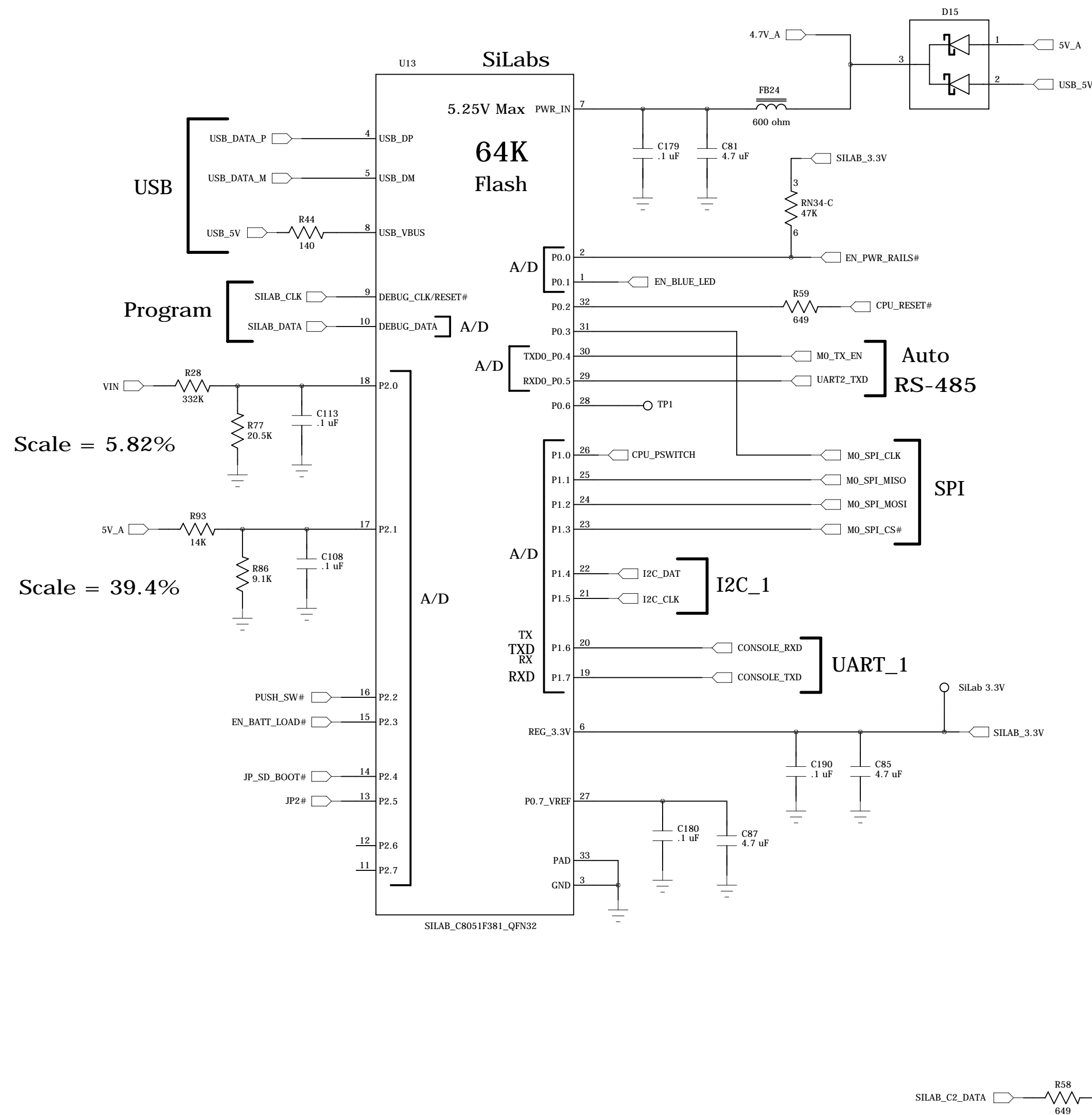
Change to Vert. Battery Holder

Add a unique way to ID Rev.E (reading CPU ball T7)

Add Res straps - total = 4

Rev.E Board can be identified  
by reading CPU ball T7  
with weak PU Res enabled

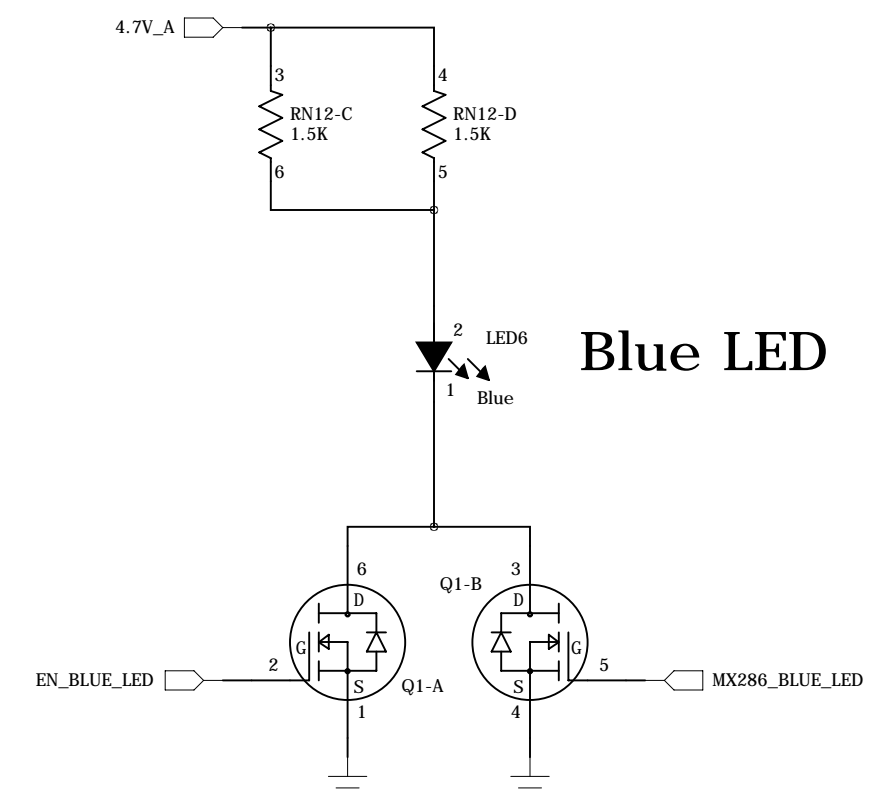
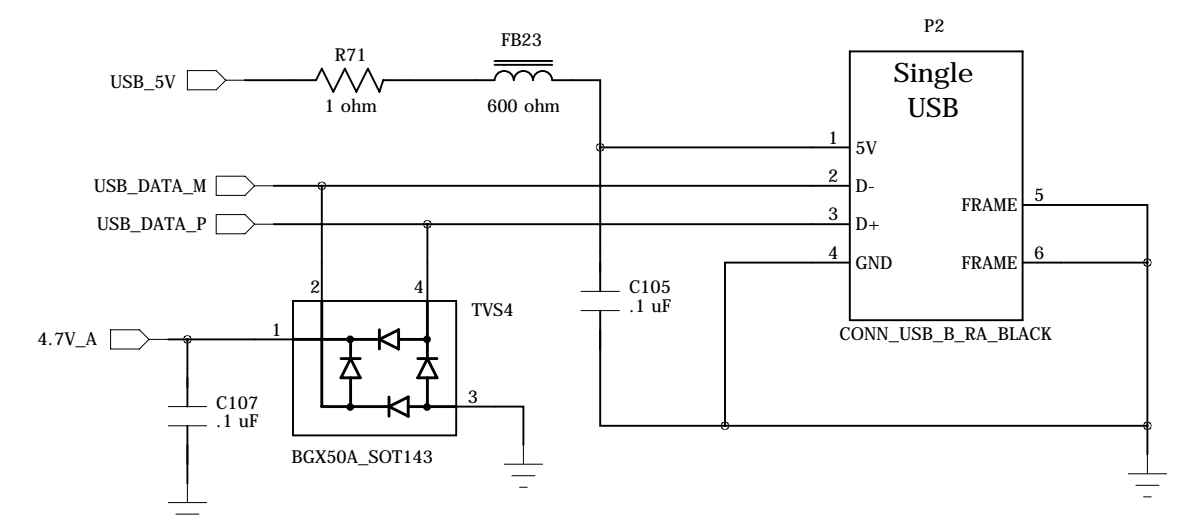
# USB Device Port and SiLab uC



Scale = 5.82%

Scale = 39.4%

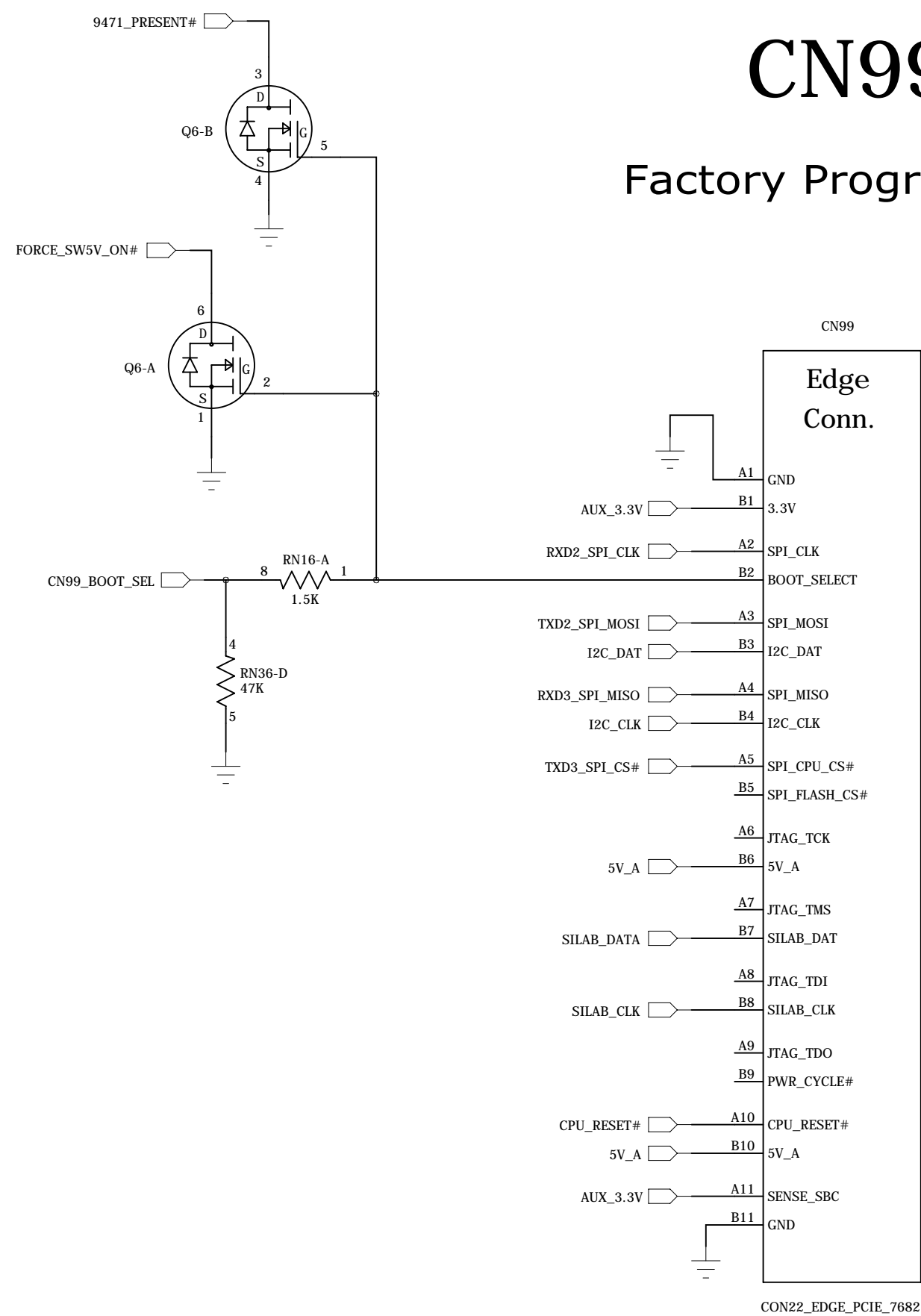
## USB Device Port



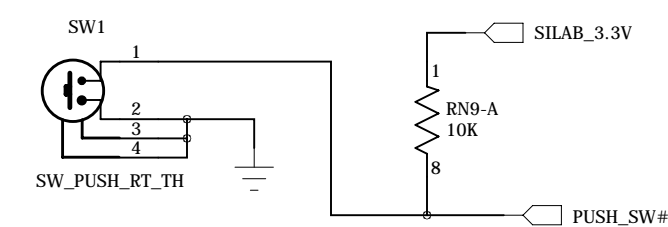
Technologic Systems		Date May 8, 2017
Title: TS-7670 Microcontroller		
Rev: E	Designer	Sheet 3 of 15

# CN99

## Factory Programing/Test

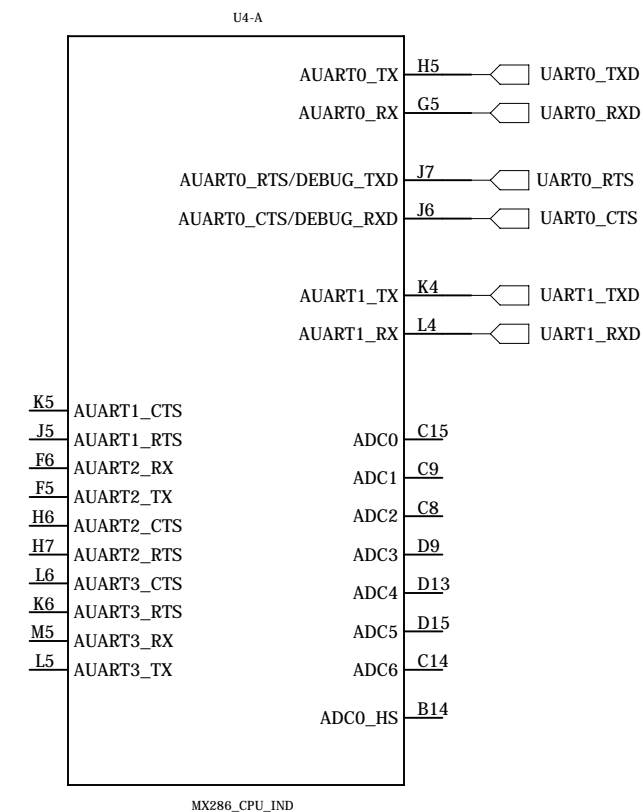


# Push Switch

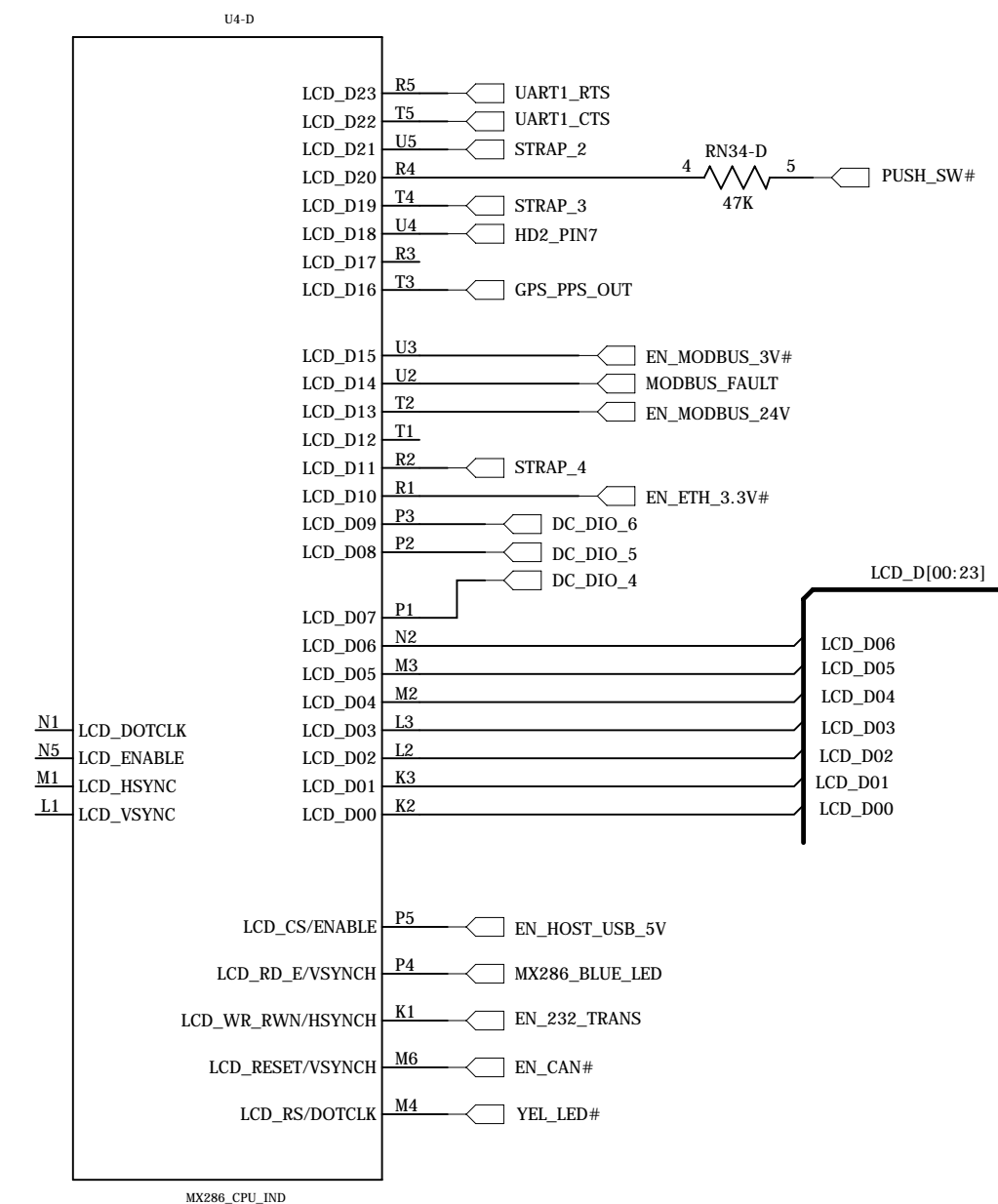


# MX286 ARM9 CPU

## UARTs, ADC



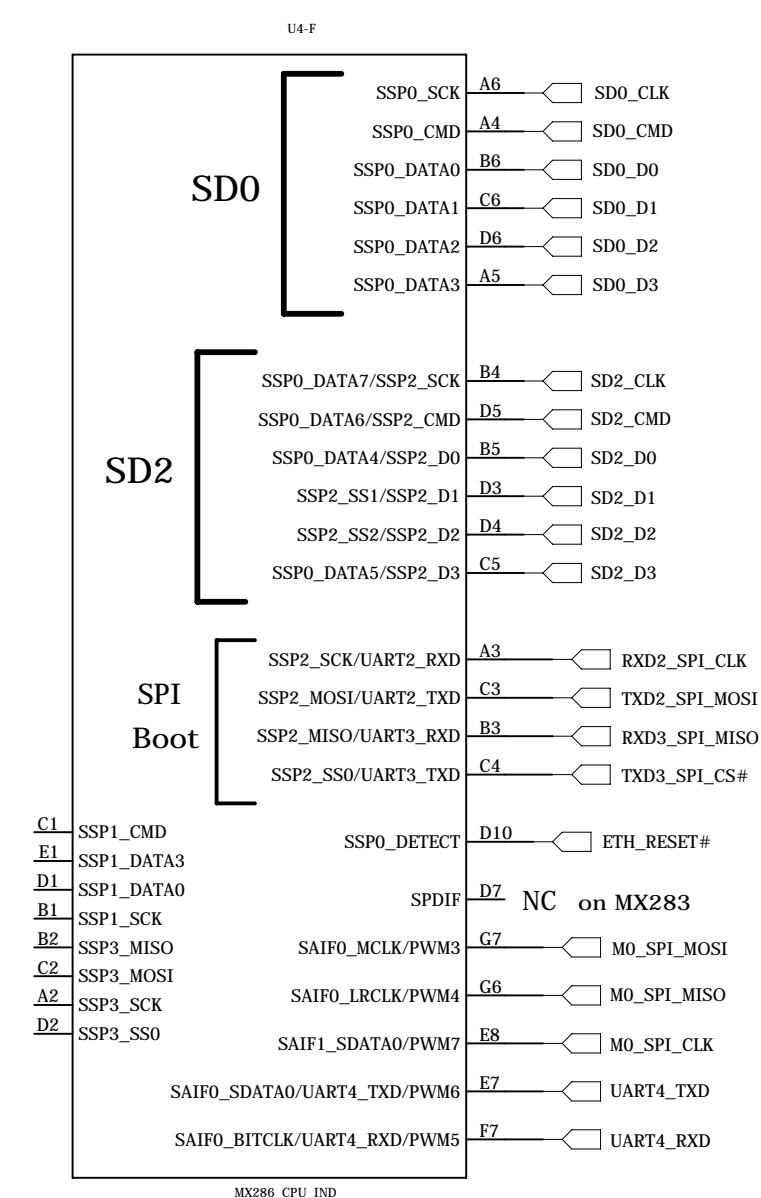
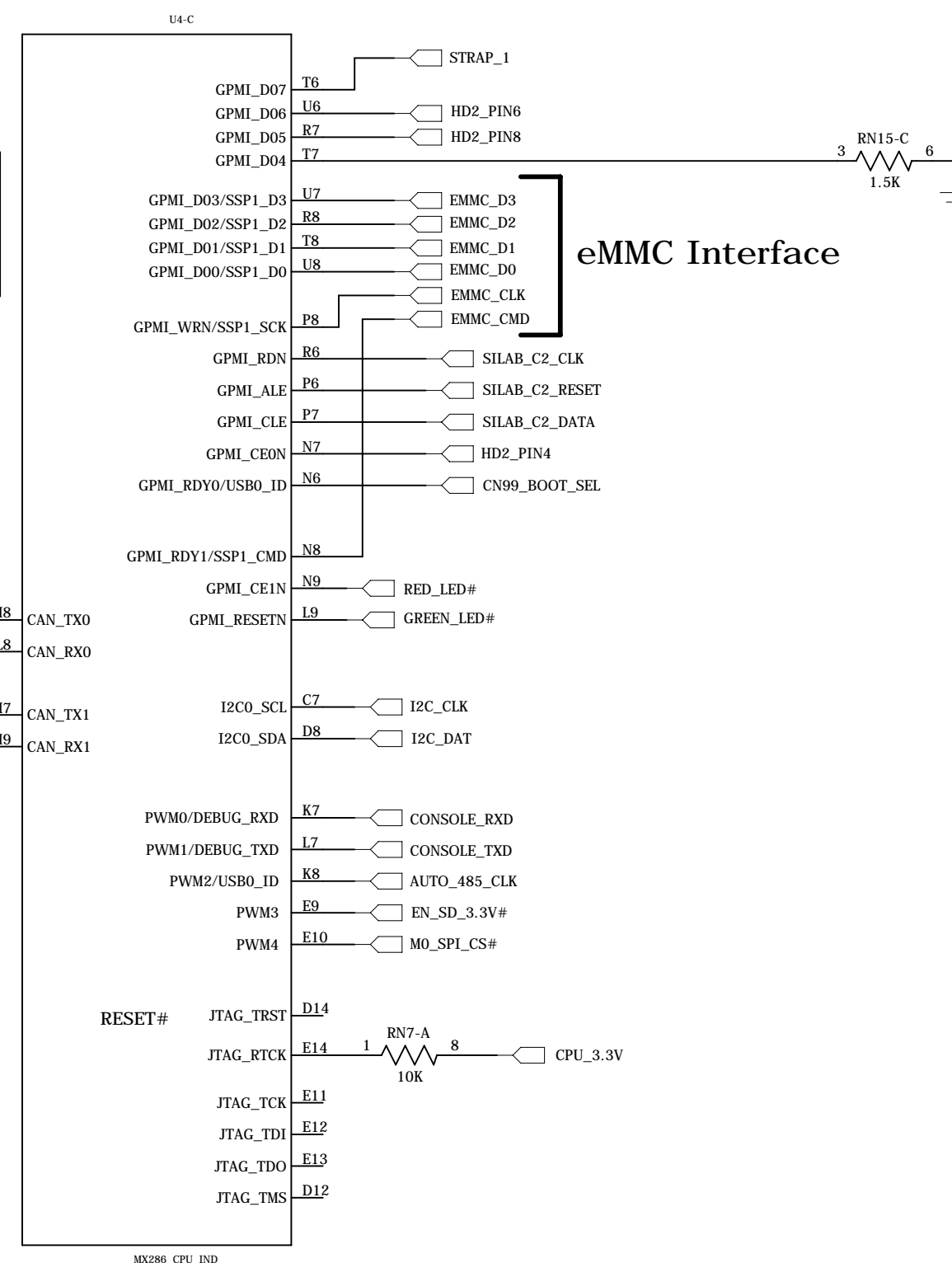
## LCD

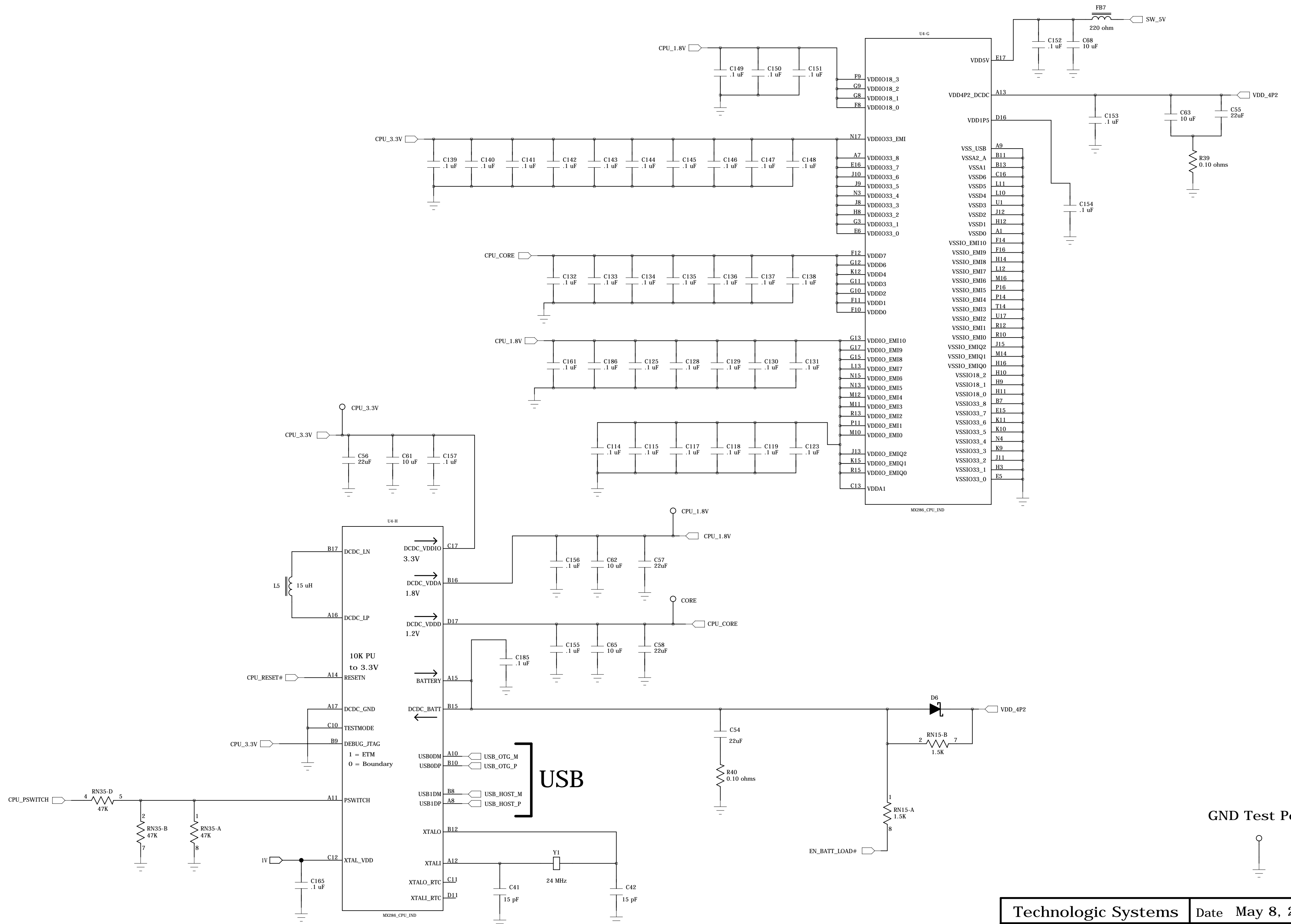


## NAND, PWM JTAG, I2C

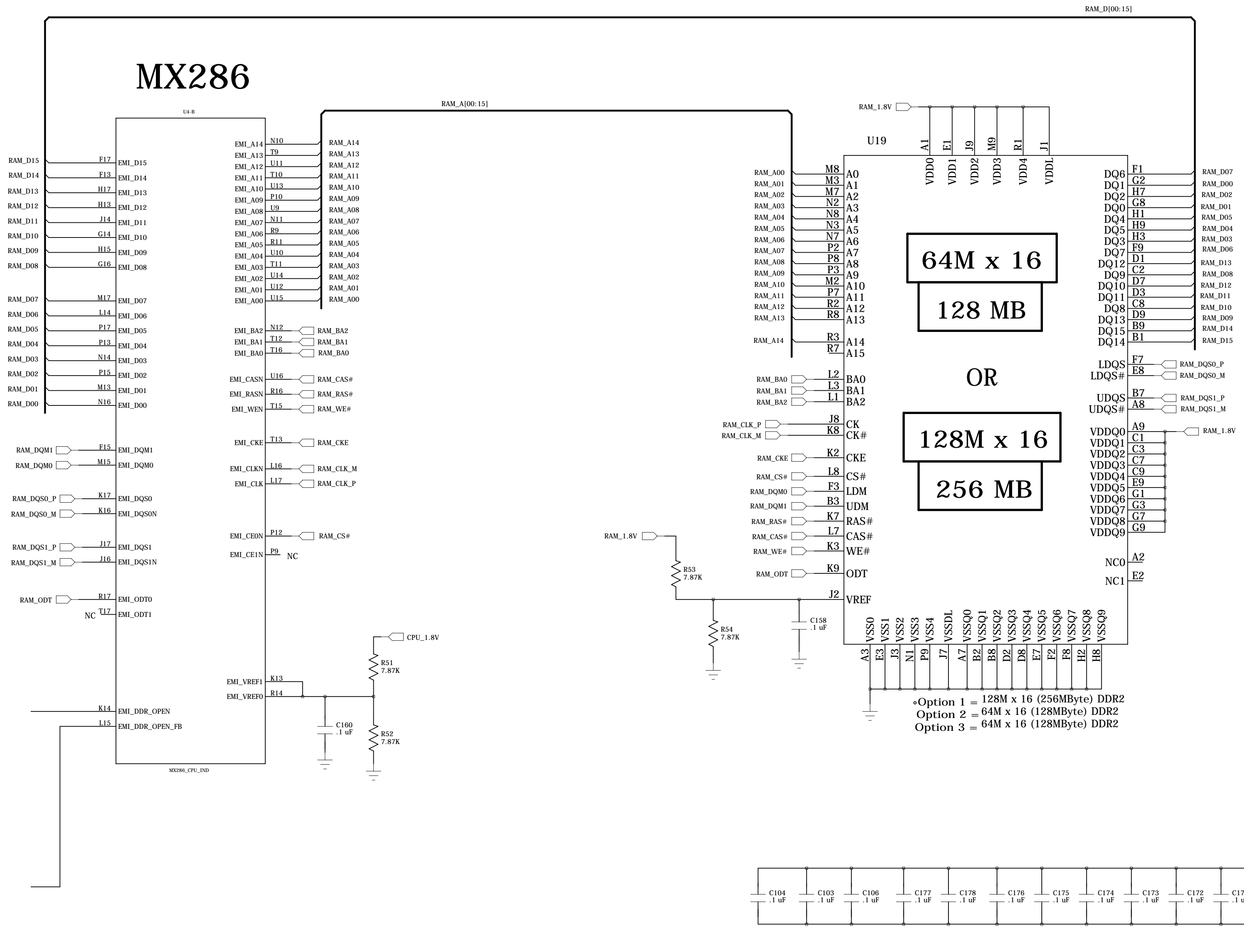
## Audio SD Card SPI Boot

SPI  
SCK = CLK  
CMD = MOSI  
DO = MISO  
D3 = CS#





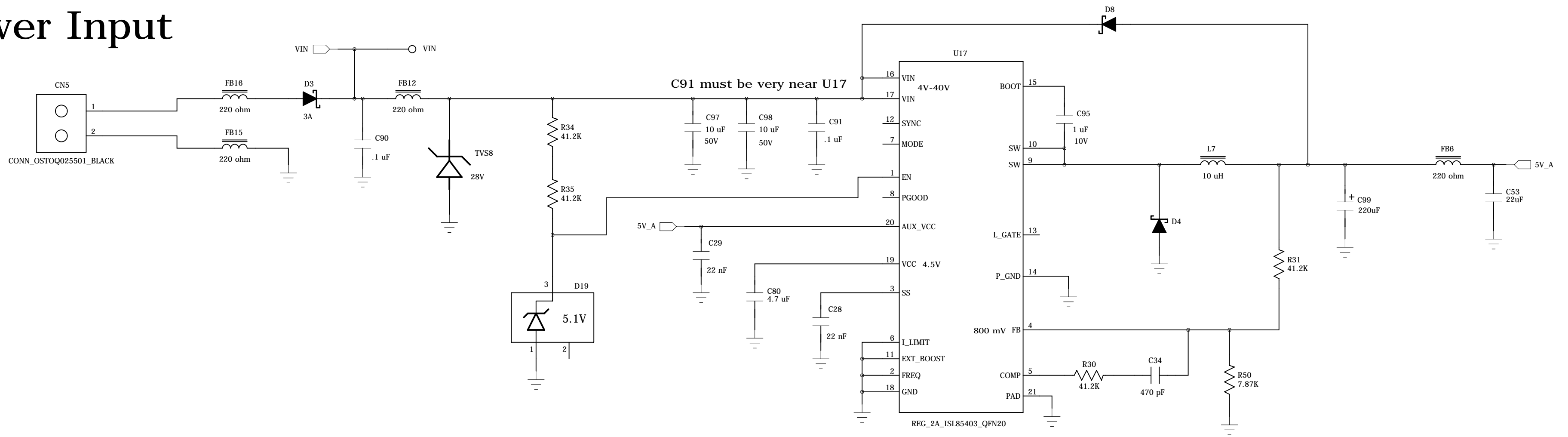
# DDR2 SDRAM (128 or 256 MByte)



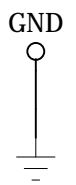
# 8-28 VDC

# 5V Power Supply (2000 mA)

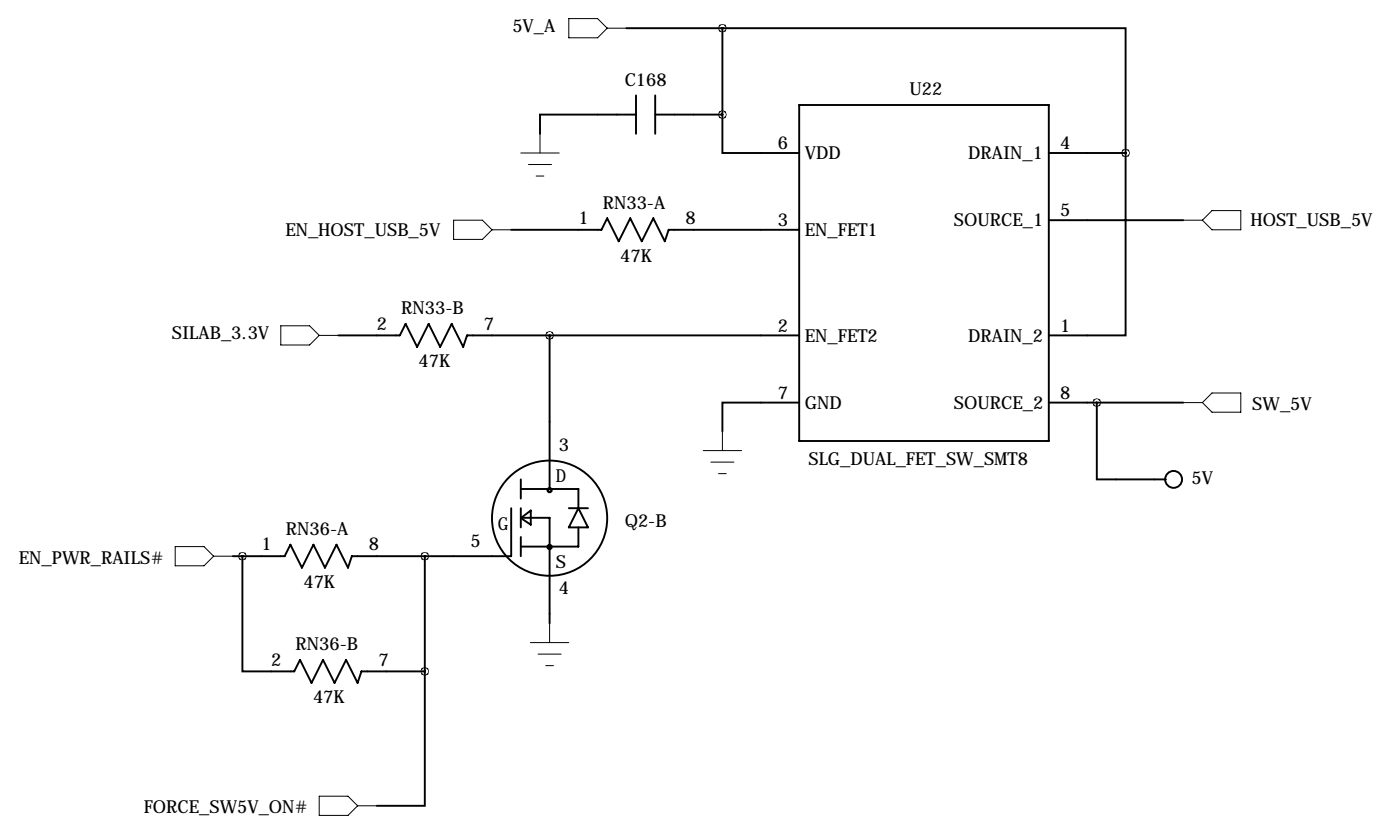
## Power Input



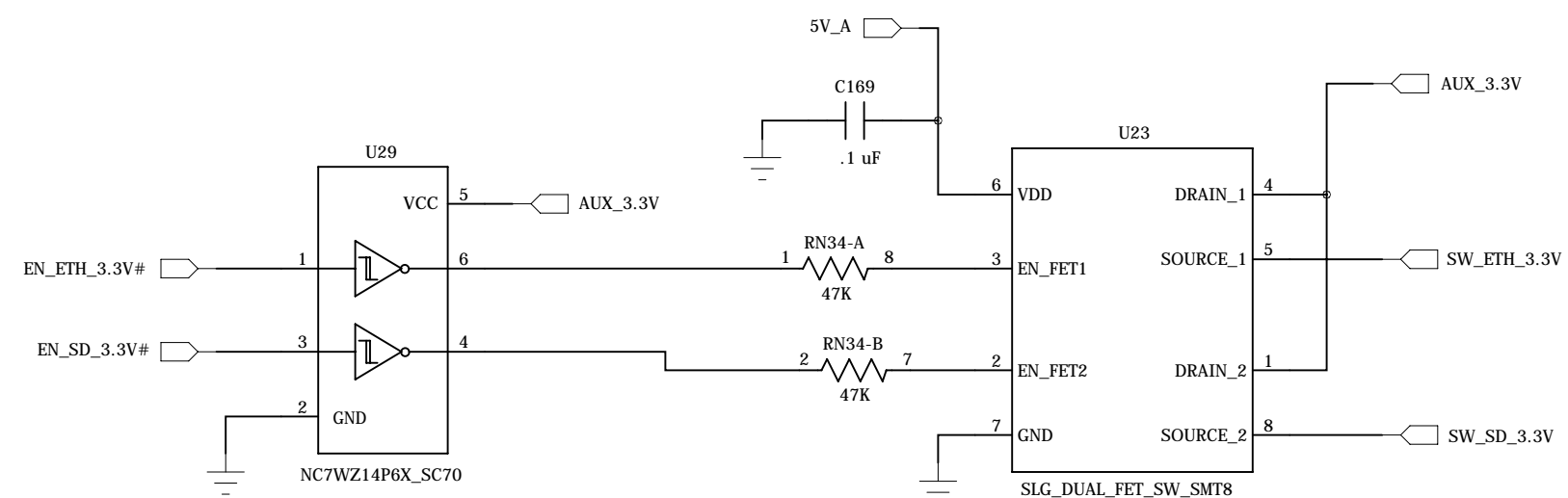
.063 hole



## USB and MX286 Switched Power

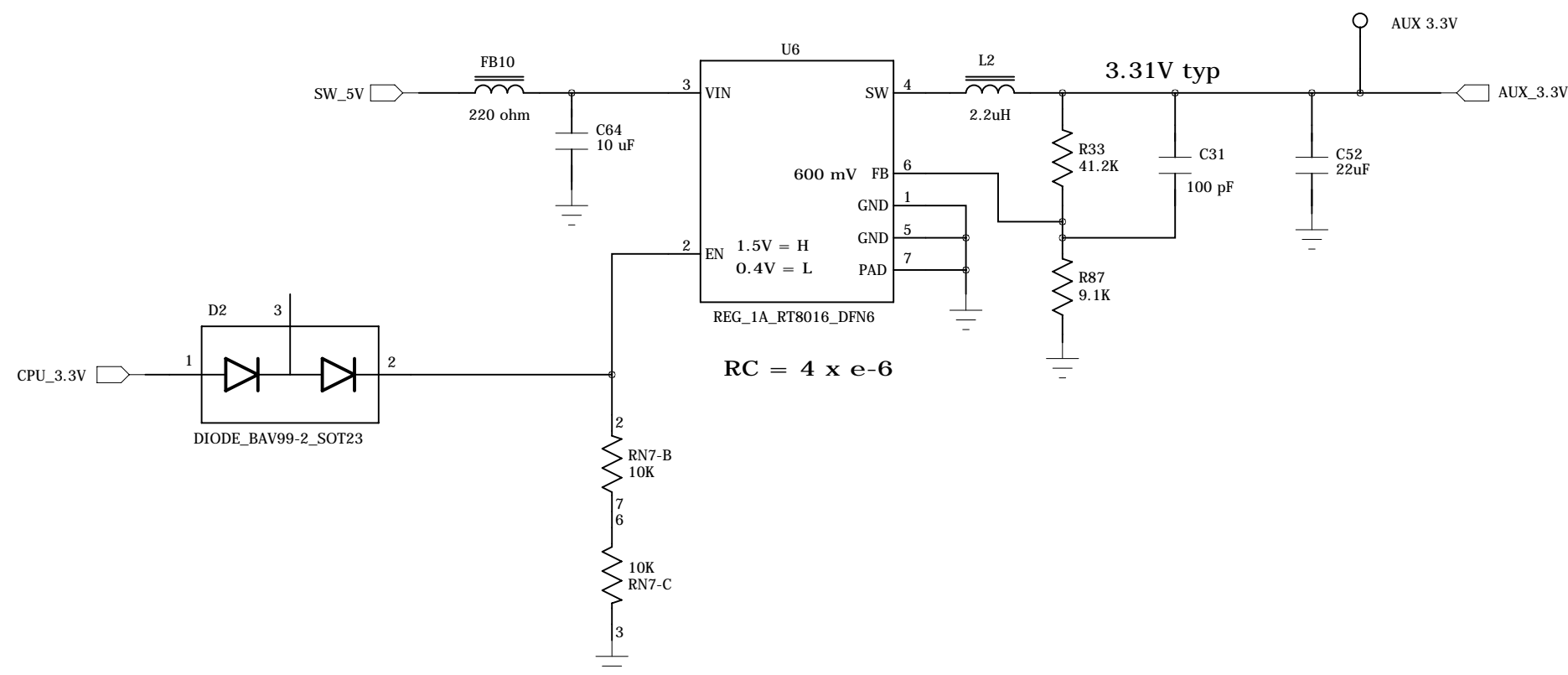


## Ethernet and SD Switched Power

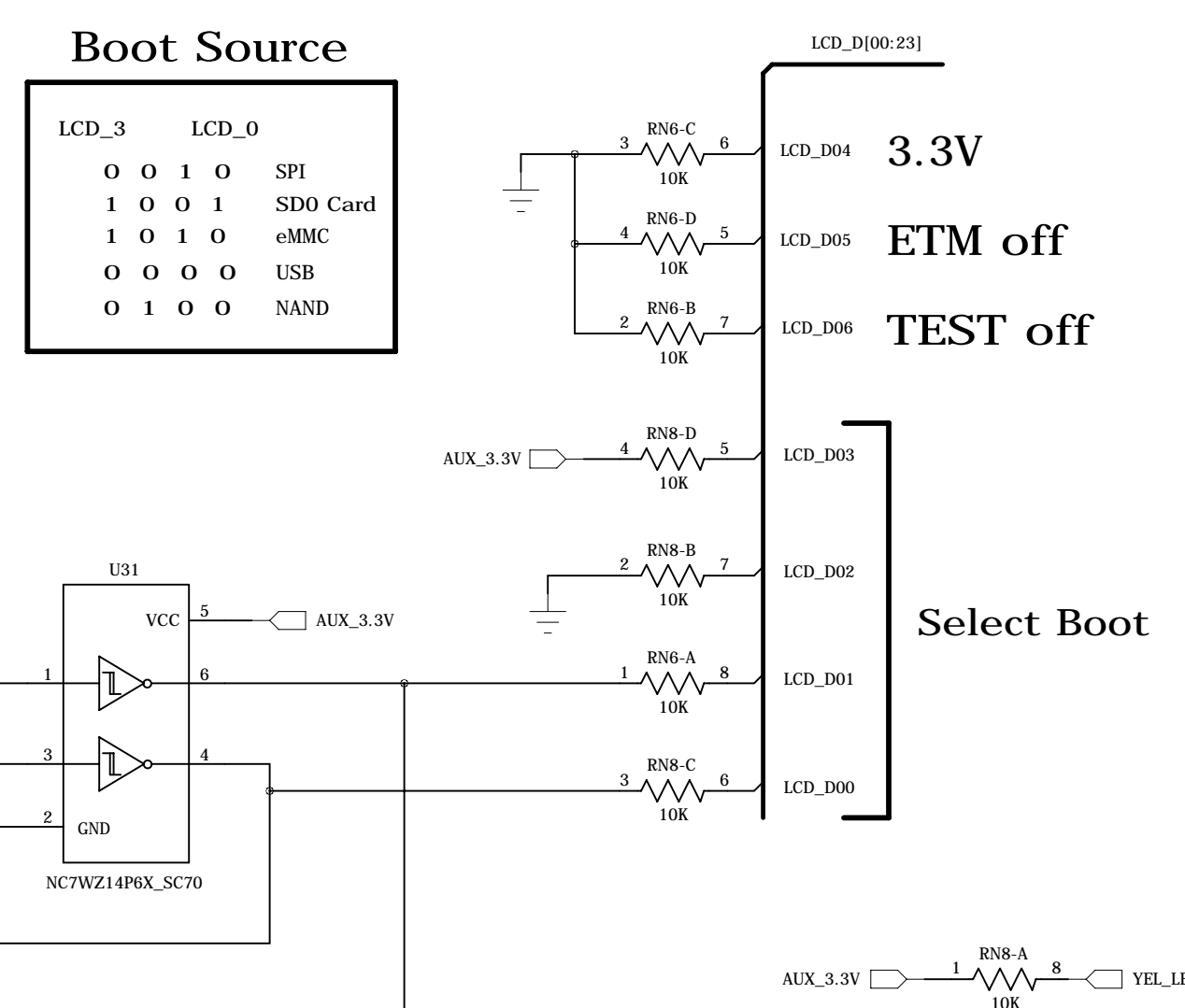




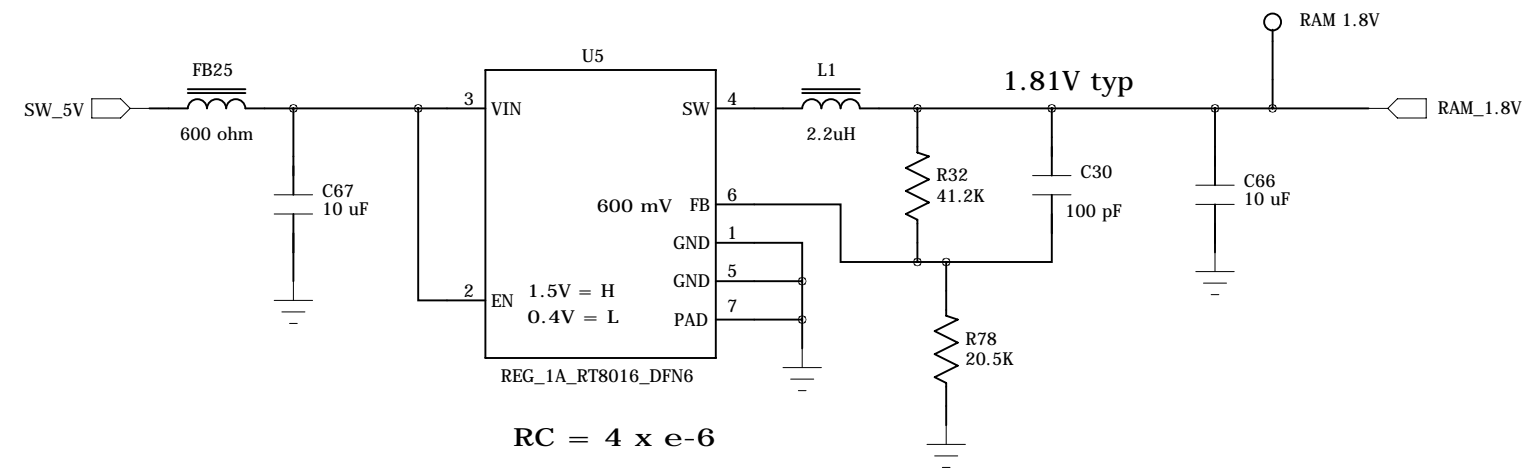
# Aux. 3.3V Reg



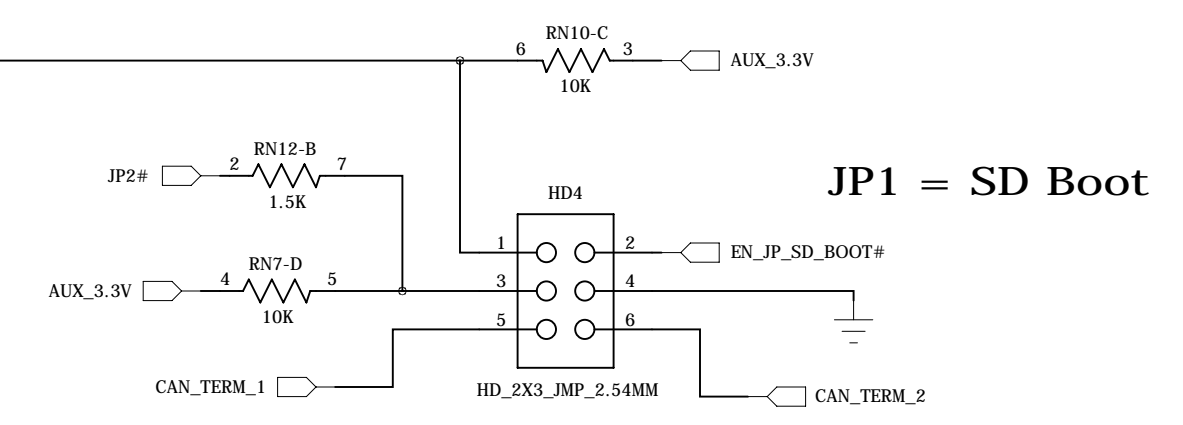
# Boot Strap Bias Res.



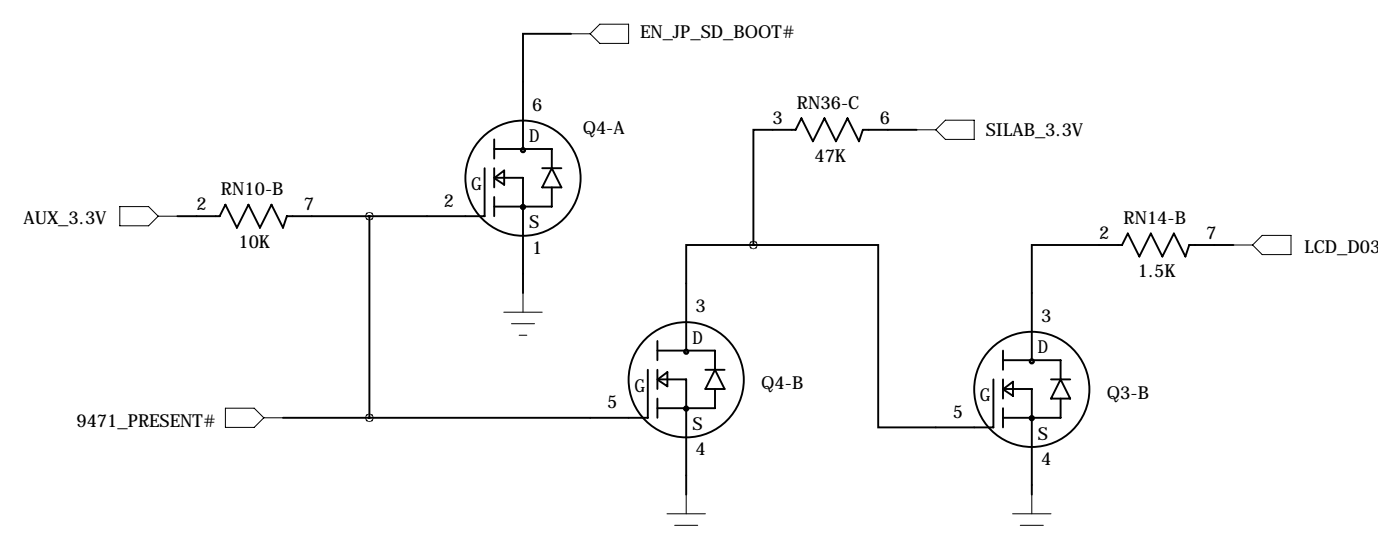
# RAM 1.8V Reg



# Boot Jumpers



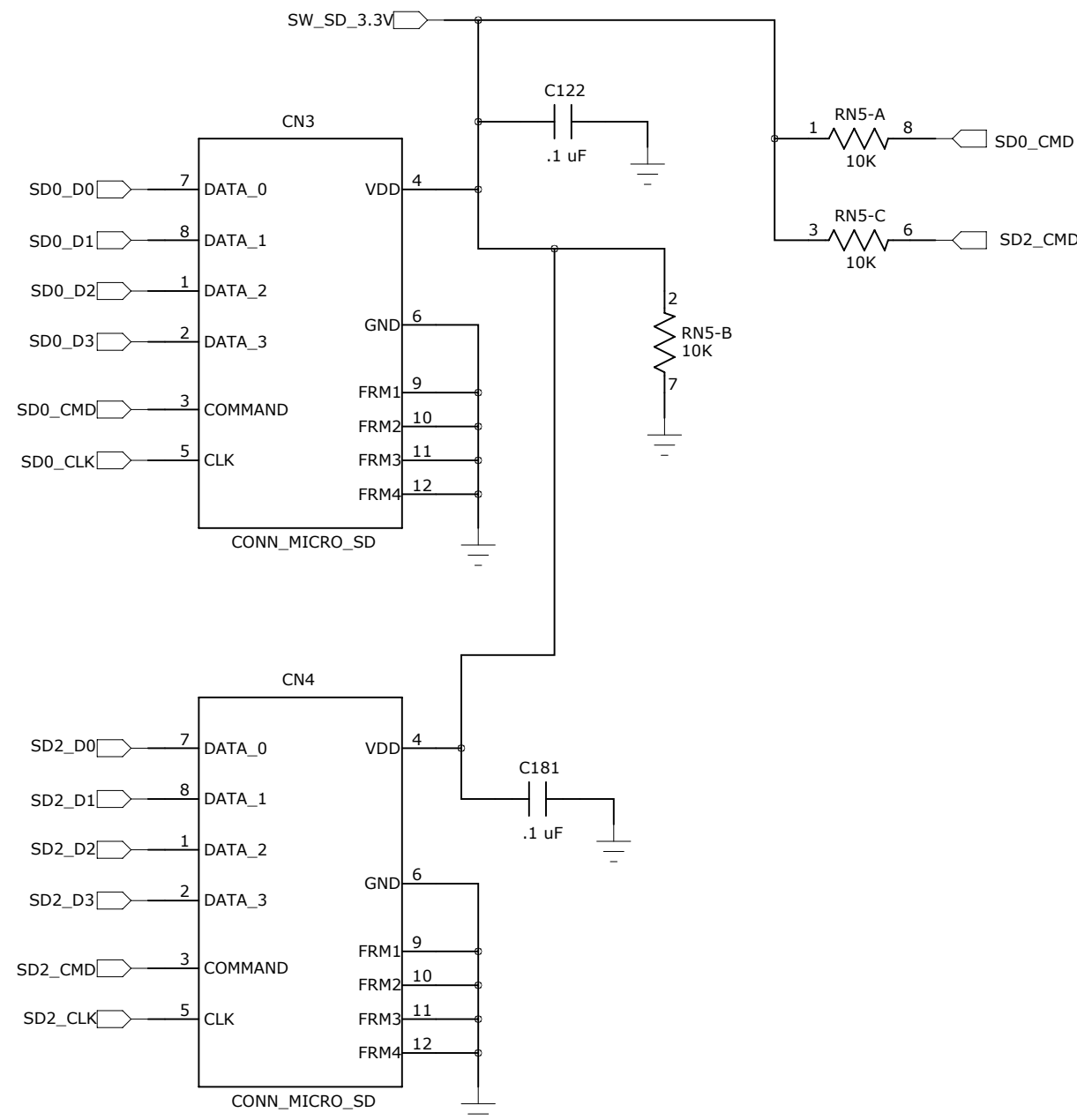
# Factory Programing Interface



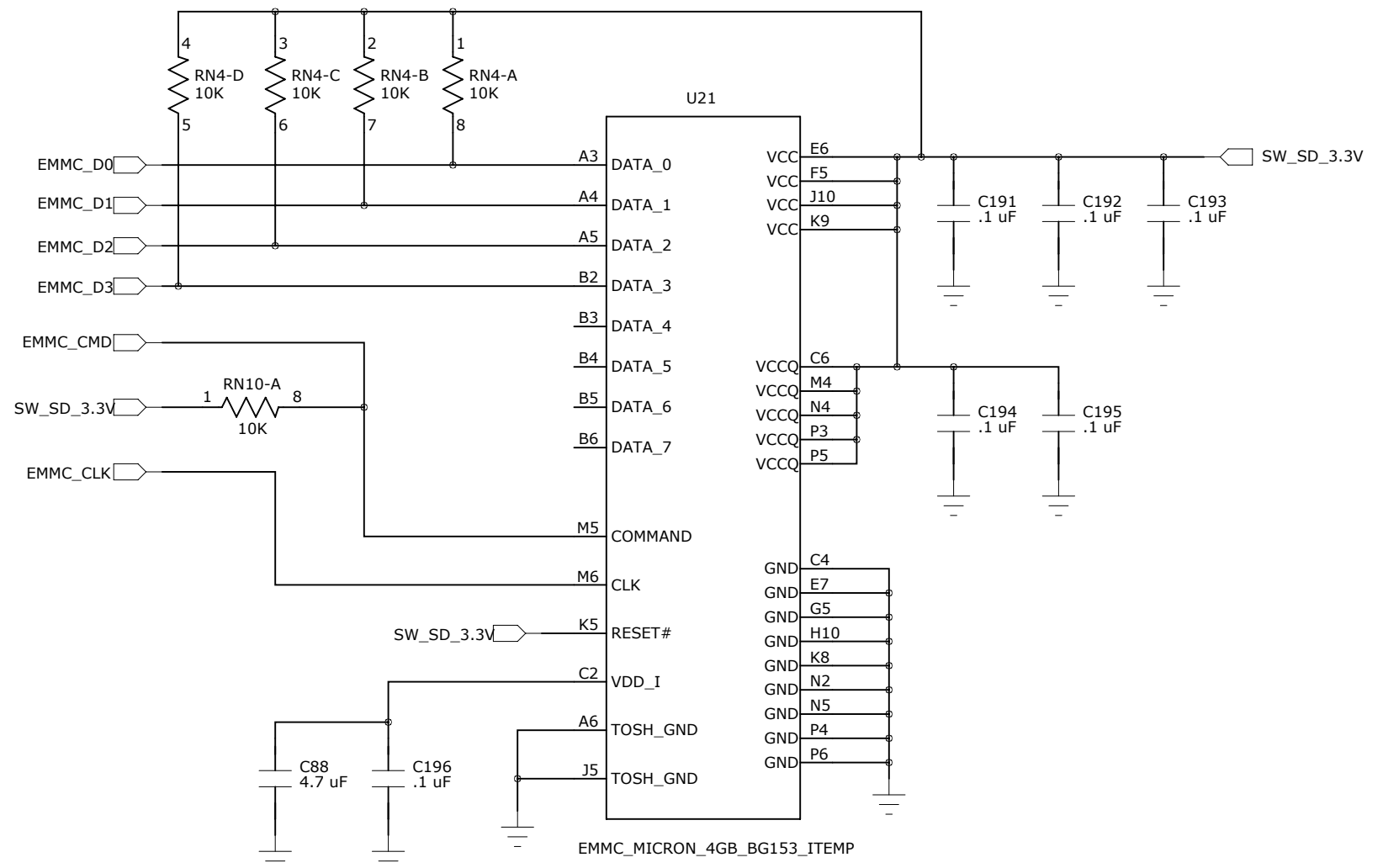


# Flash Memory

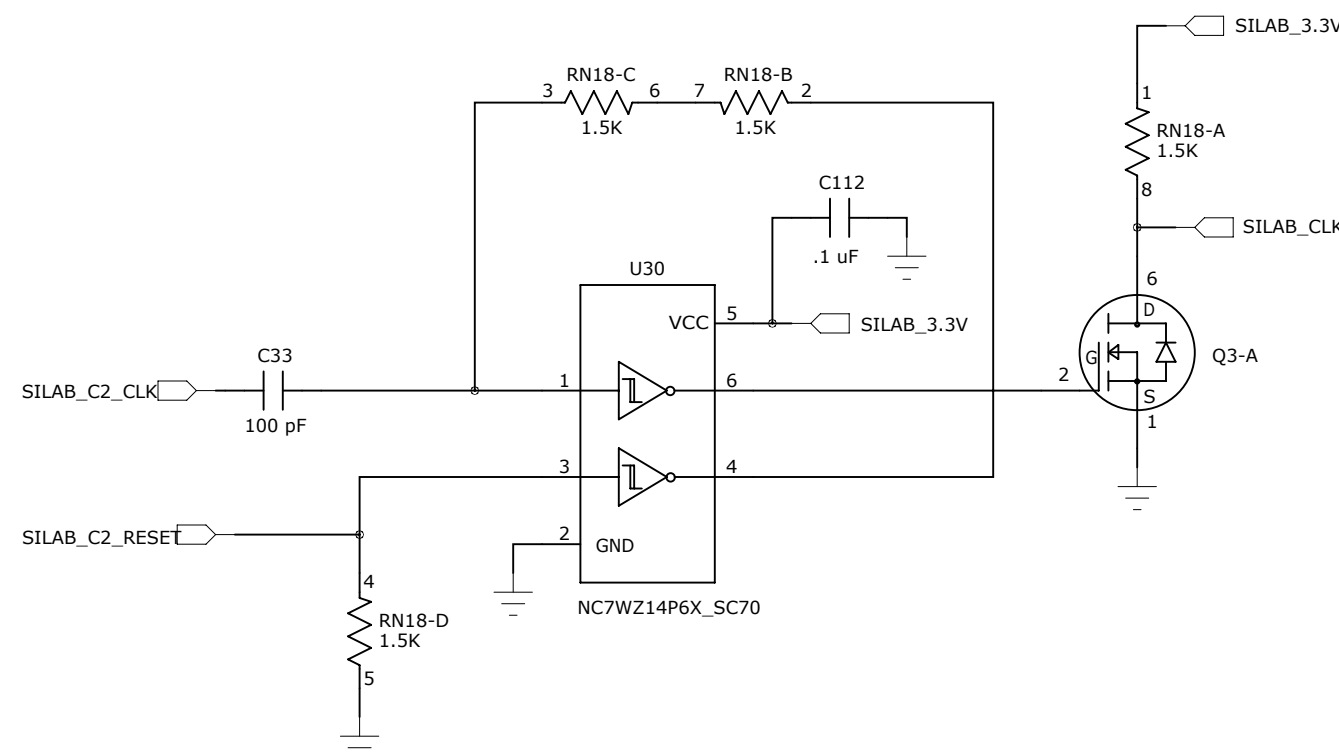
## Micro SD Card Sockets



## eMMC 4GB



## Factory Programing Interface

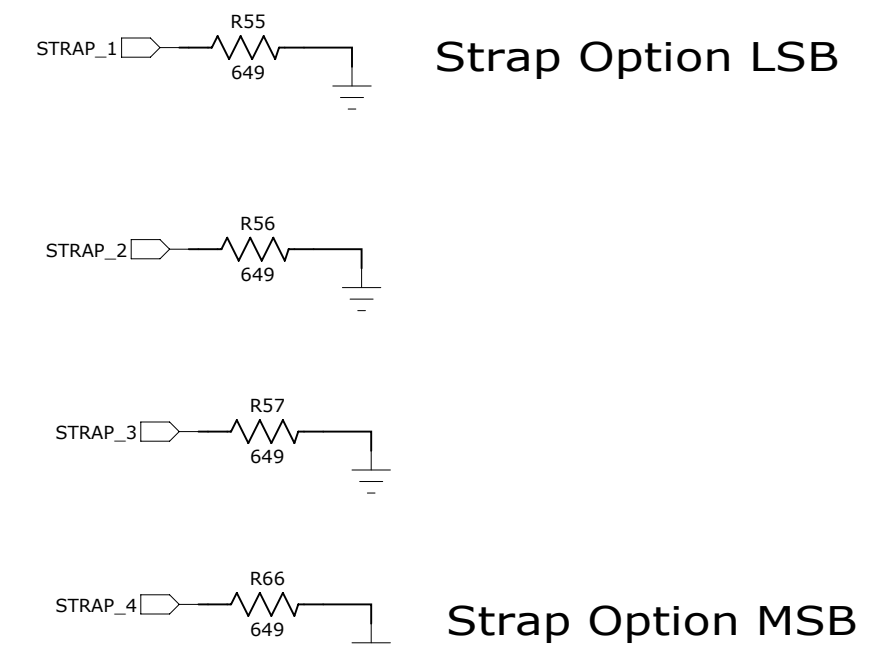


## Resistor Strapping Table

0 = POP, 1 = DNP

R66	R57	R56	R55	Part Number
0	0	0	1	TS-7670-128-2048F-I
0	0	1	0	TS-7670-256-2048F-2CAN-I
0	0	1	1	TS-7670-256-2048F-I-DEV

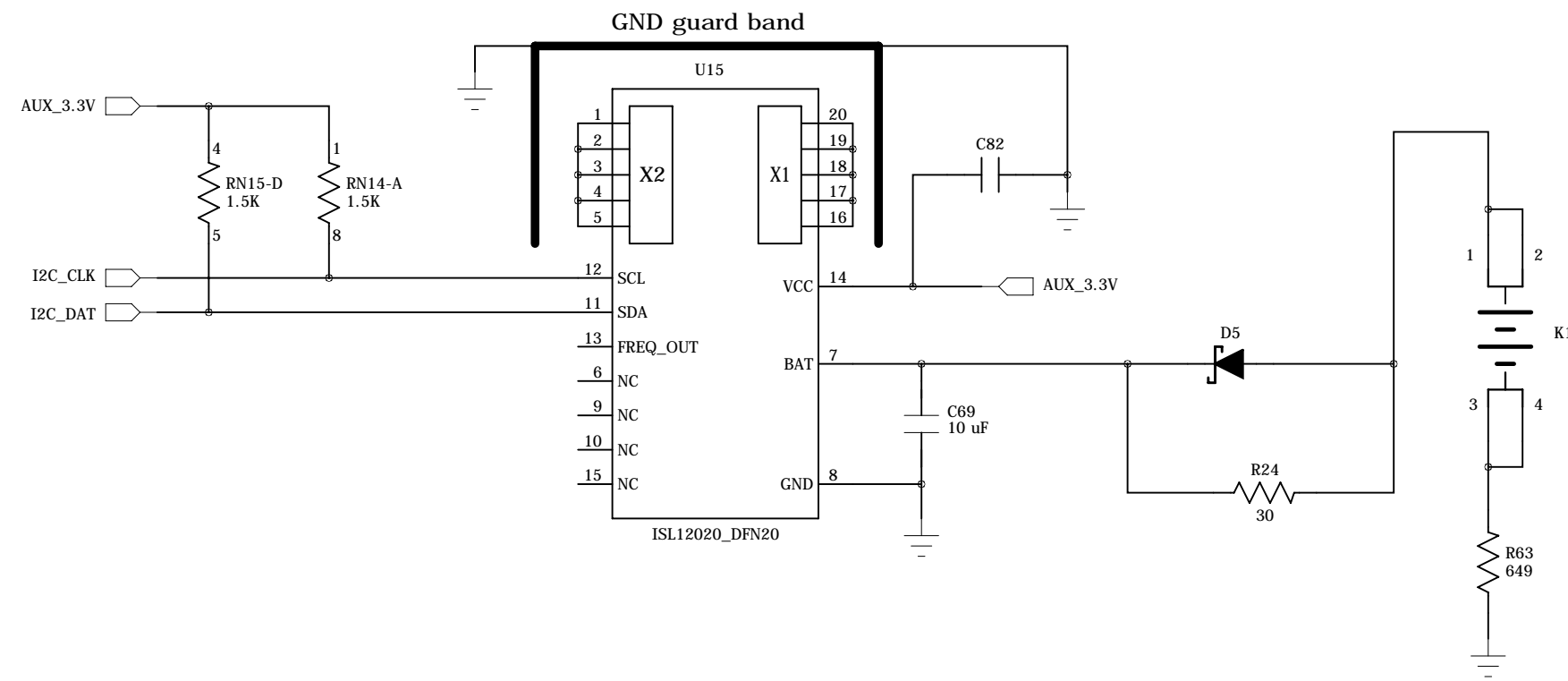
## Res. Straps



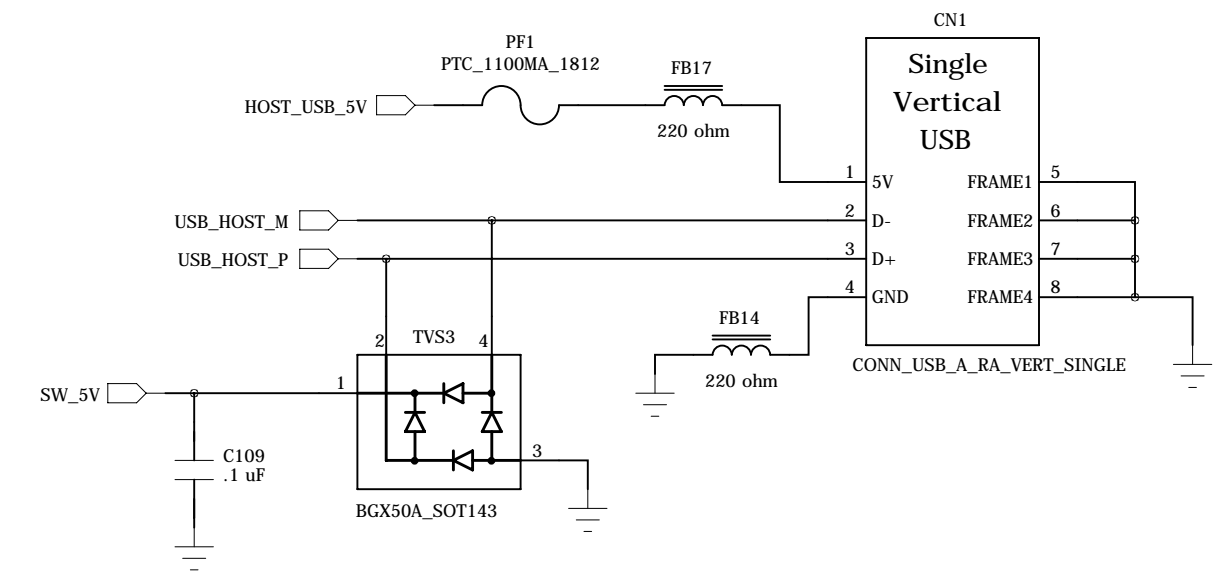
x options are set internally as per table

# RTC and Host USB

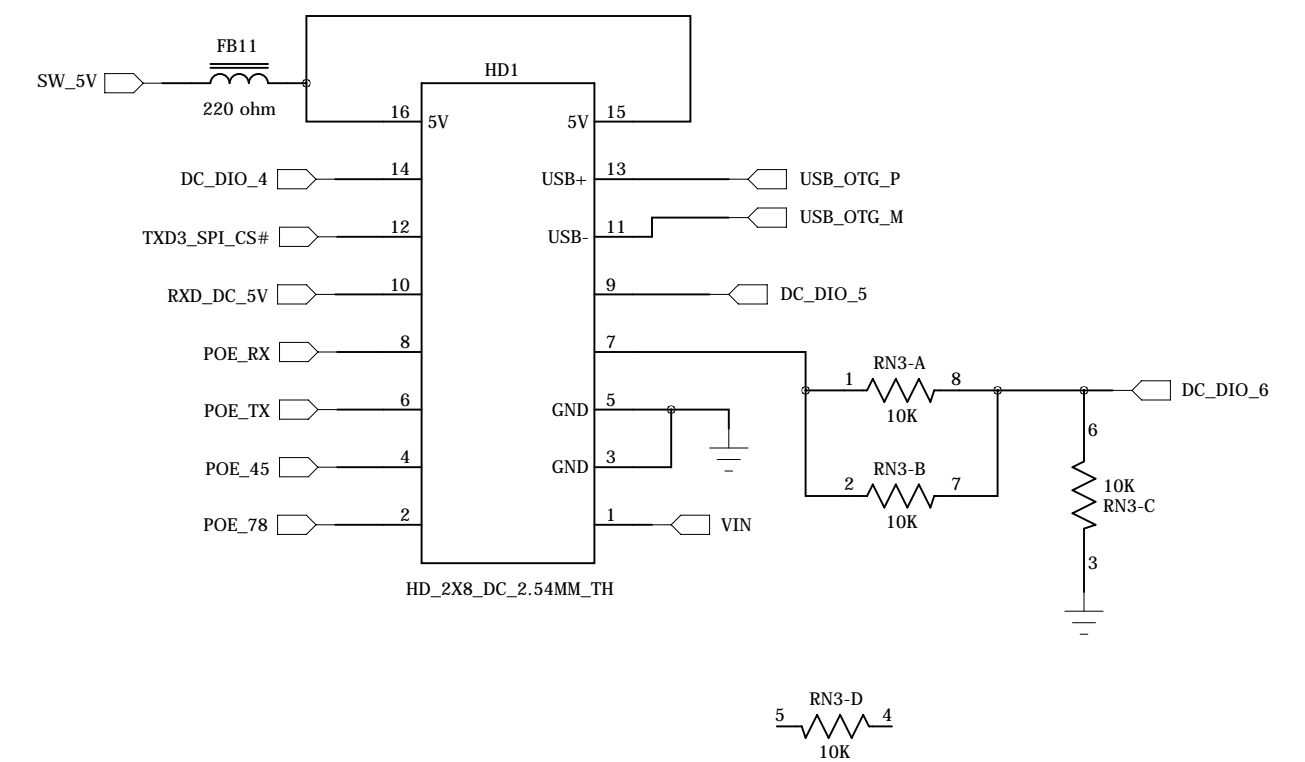
## RTC and Temp. Sensor



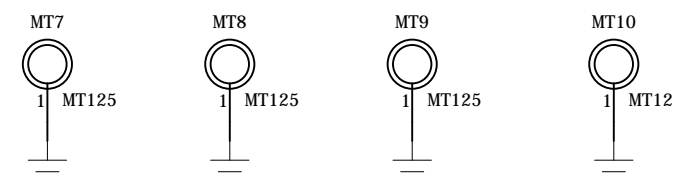
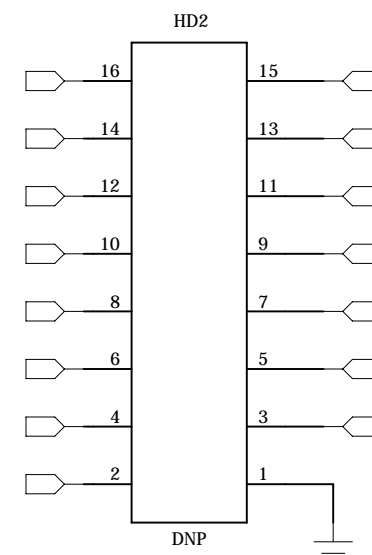
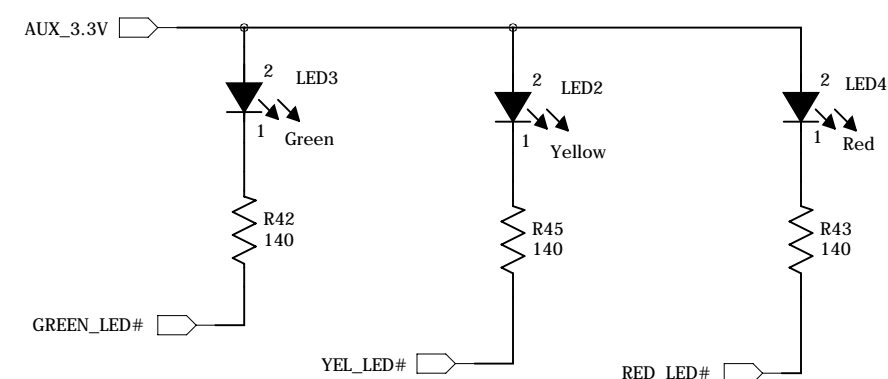
## External Host USB Port



## Daughter Card Interface



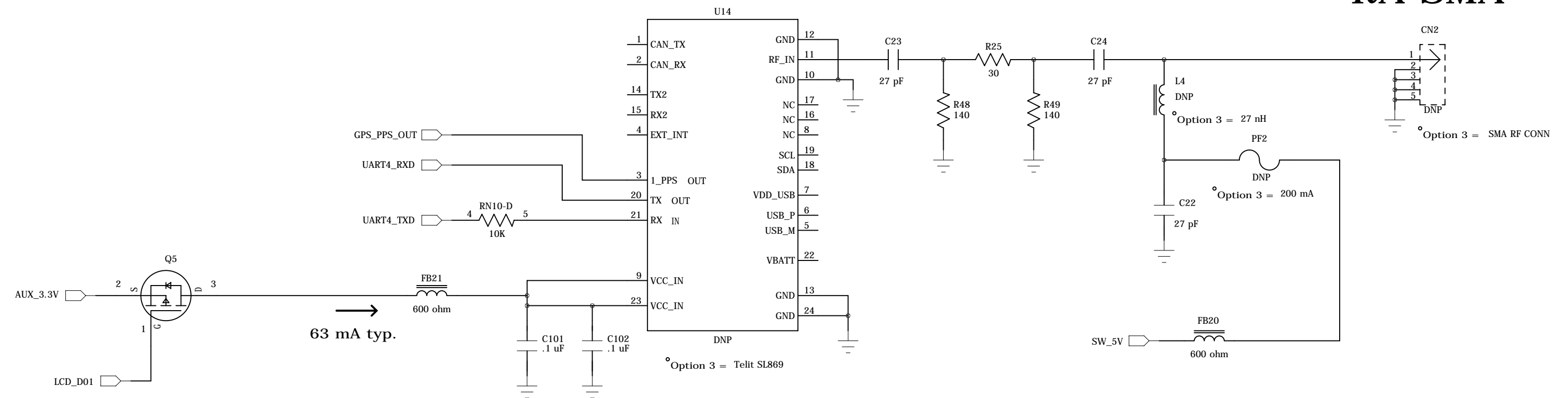
## SMT RA LEDs



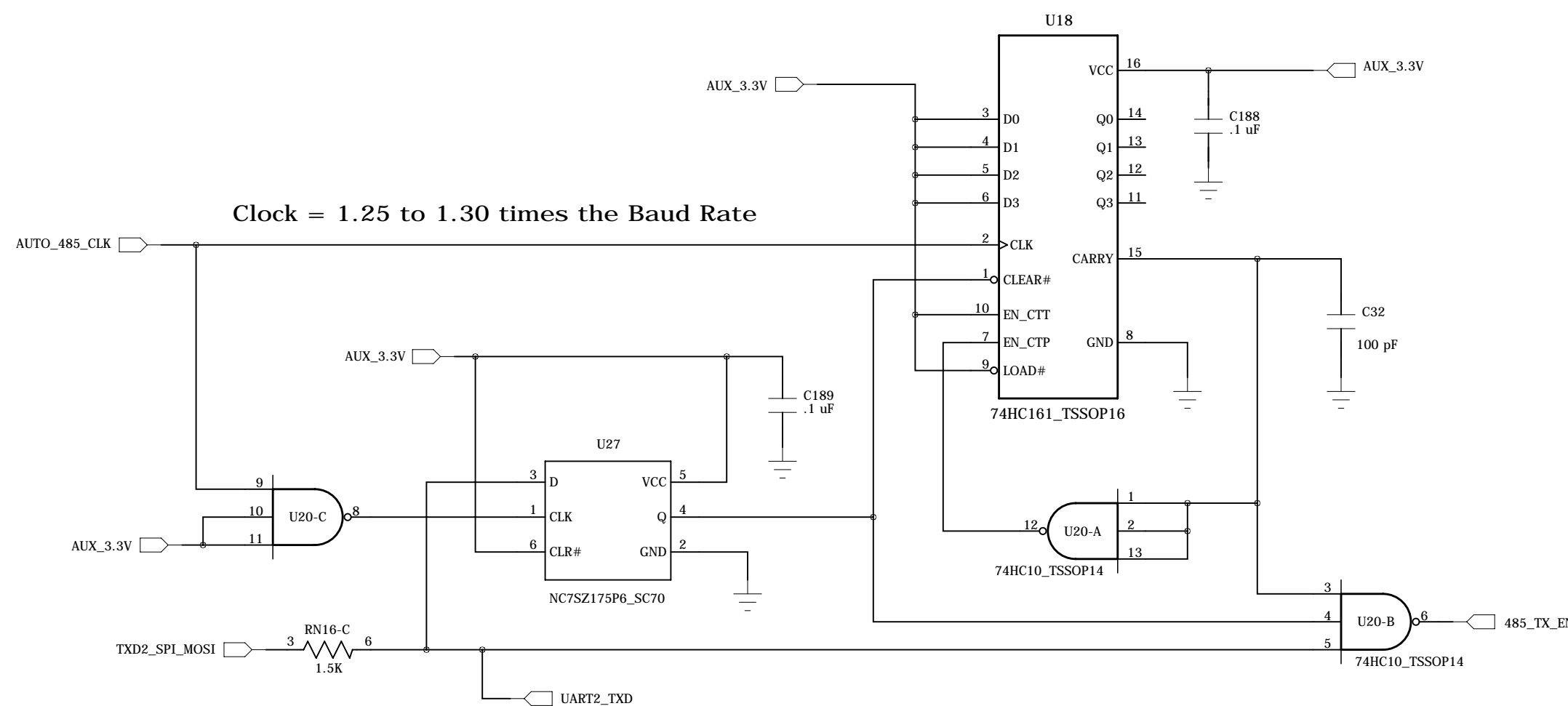
# GPS Radio and Auto RS-485

## Telit SL869 GPS Radio

RF Conn.  
RA SMA



## Modbus Auto 485 TX Enable



## Auto RS-485 Enable

Counter asserts TX\_EN for 14.5 clocks after Clear removed  
 Assuming the clock is 1.28 times the Baud rate, this is 11.3 data bits  
 Worst case (bit 7 = 0 of last data byte in packet),  
 TX\_EN asserted about 11 bit times past end of packet  
 Quickest Turn off of TX\_EN occurs when last packet byte is FF  
 Then TX\_EN turns off about 2 bit times after end of packet

**Max Baud Rate supported is 1042 Kbaud**

Clock for this baud rate is 1.33 MHz

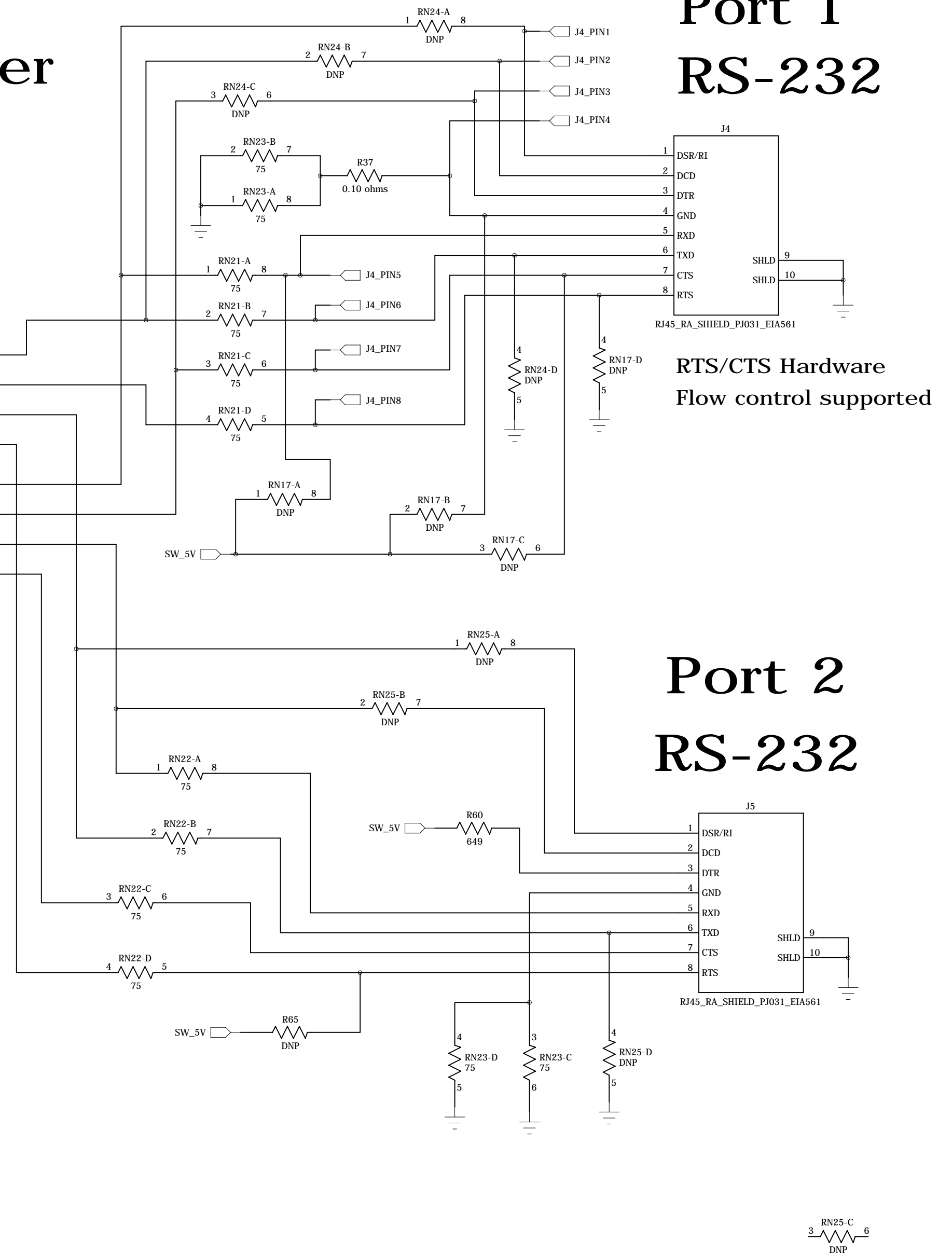
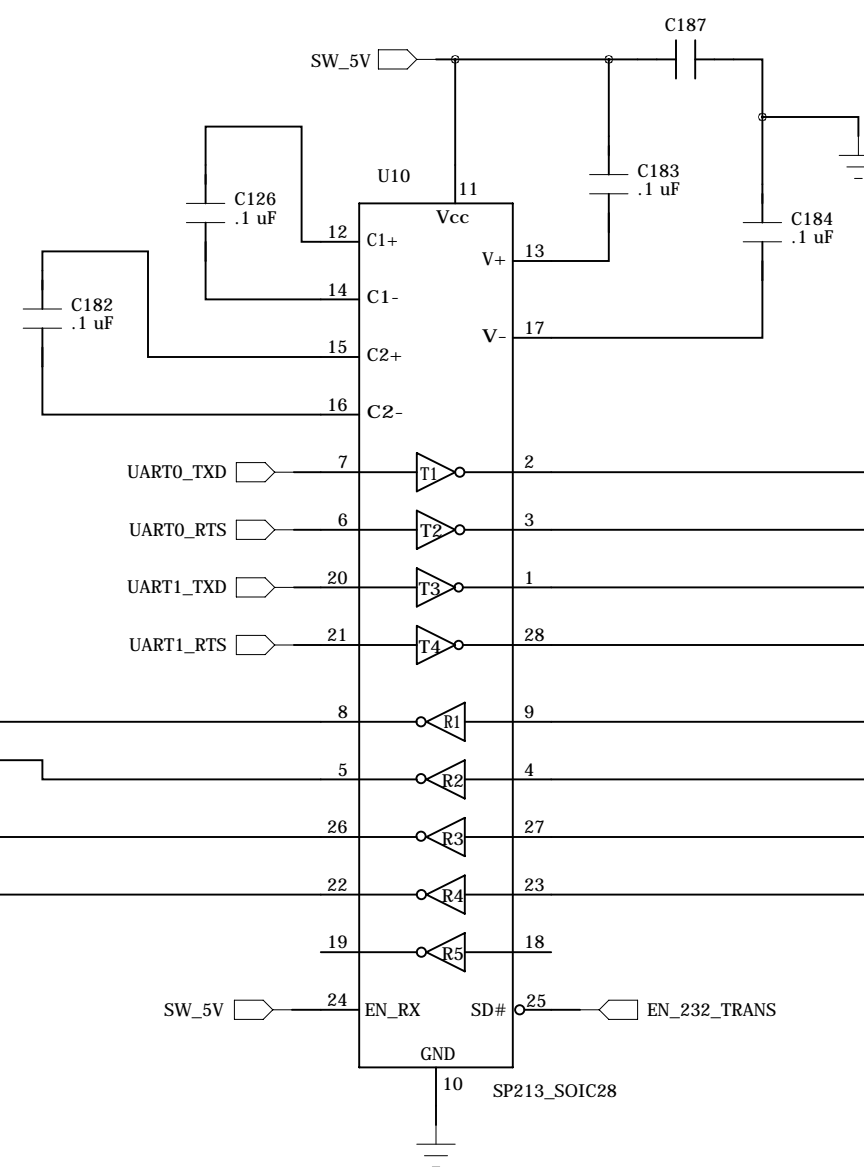
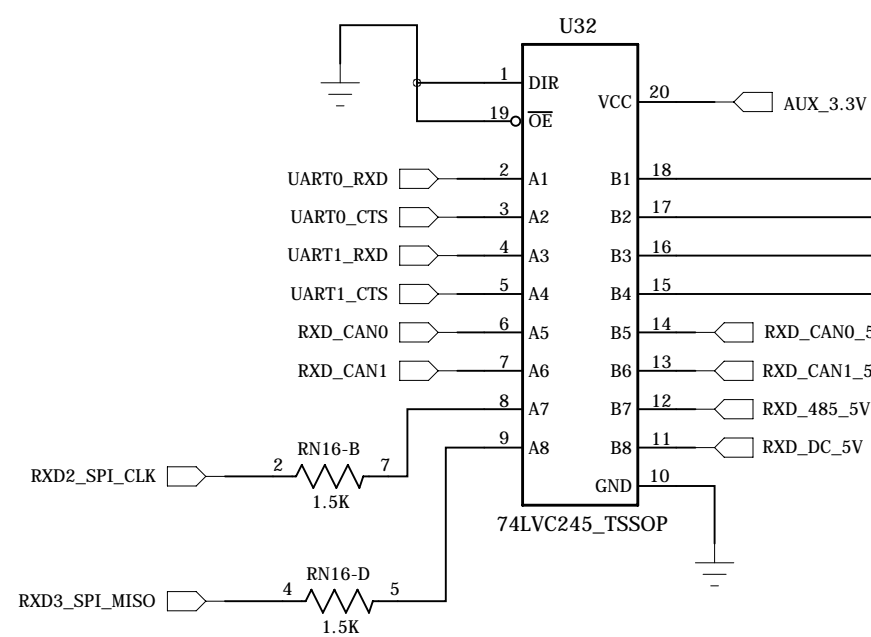
Technologic Systems	Date May 8, 2017
Title: TS-7670 GPS Radio	
Rev: E	Designer
Sheet 13 of 15	

# RS-232 Ports and Daughter Card Headers

## RS-232 Transceiver

3.3V <-- 5V

Level shifter



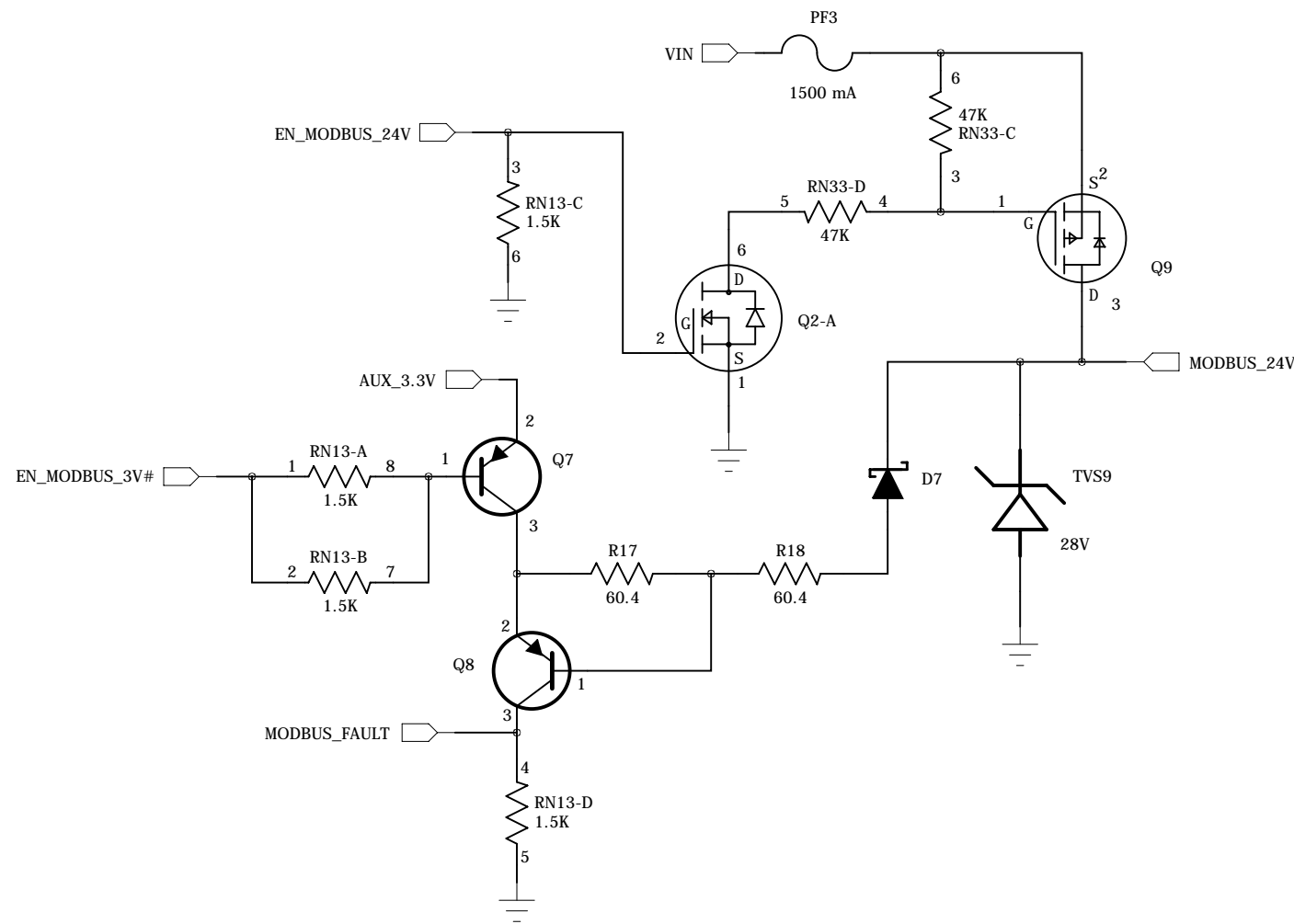
Port 1  
RS-232

Port 2  
RS-232

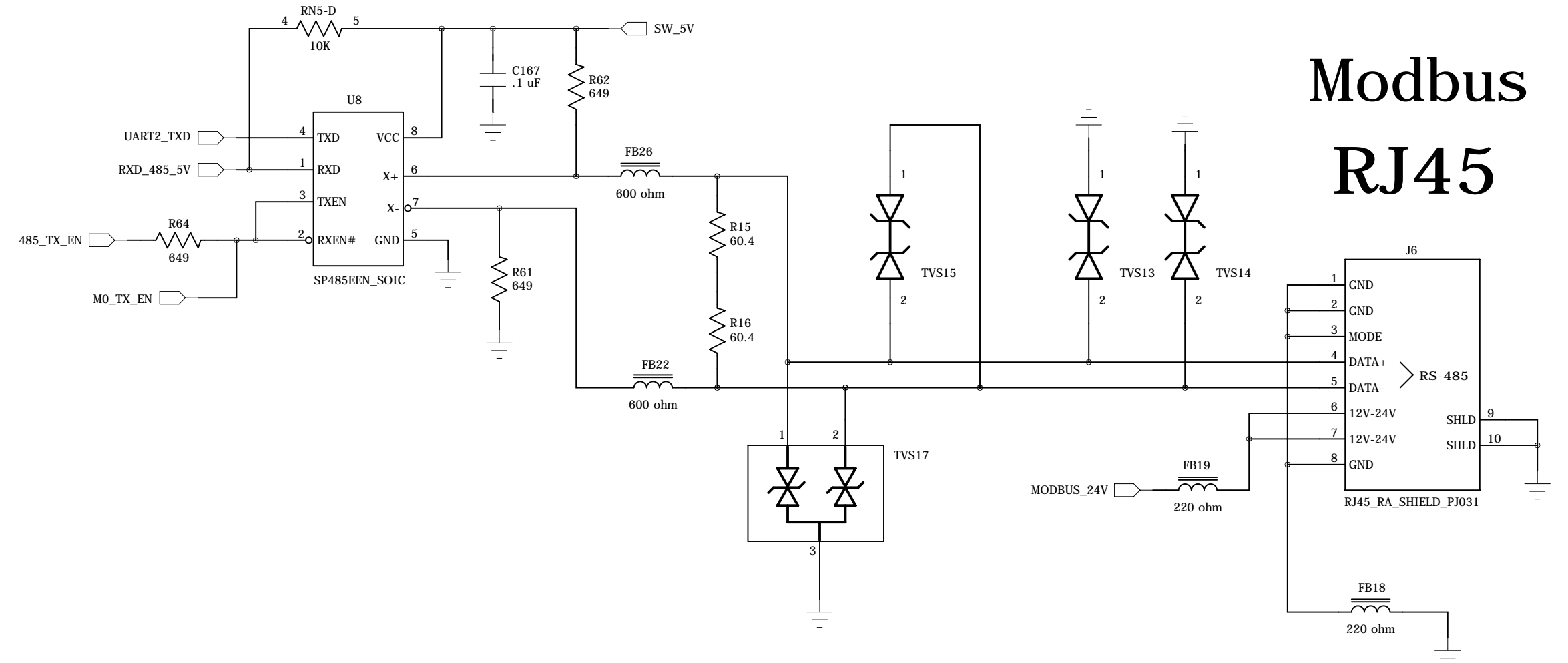
RTS/CTS Hardware  
Flow control supported

# Mod Bus RS-485 and CAN Port

## Modbus Power Switch

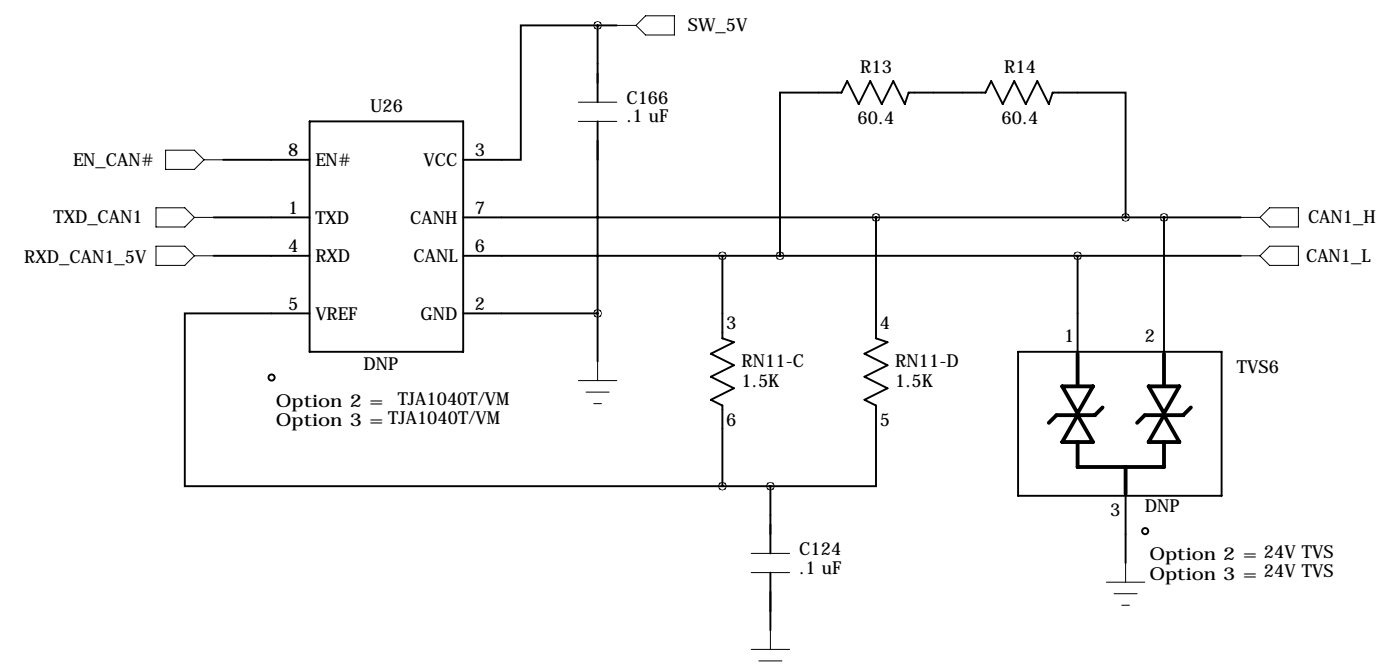


## RS-485 Driver

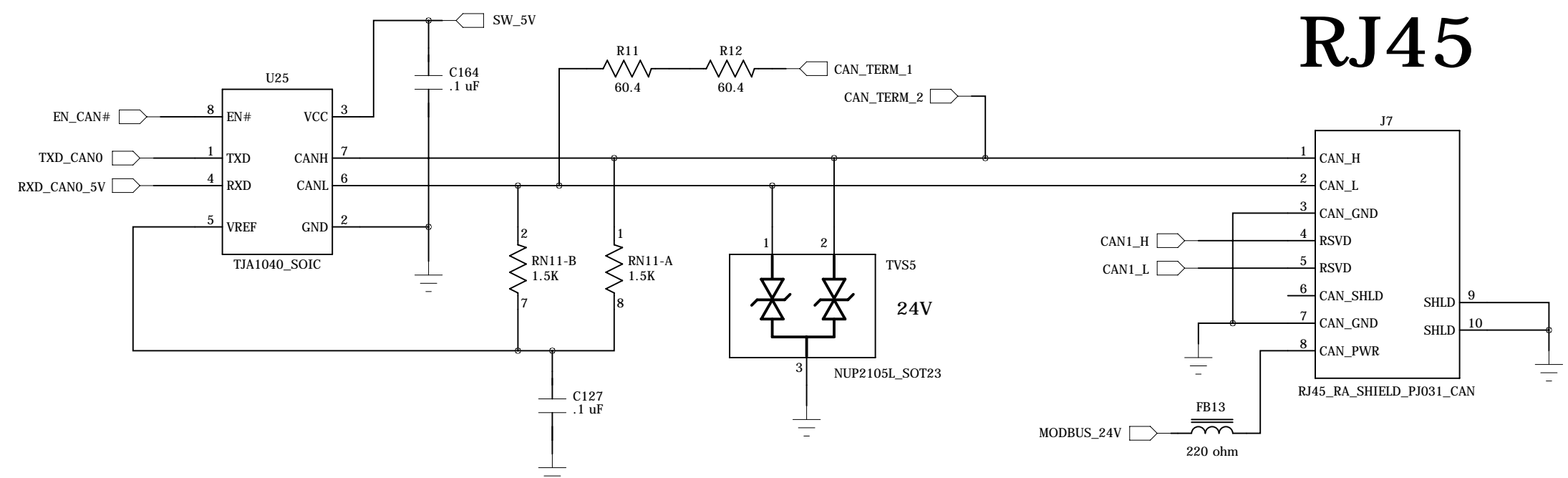


## Modbus RJ45

## CAN\_1 Tranceiver



## CAN\_0 Tranceiver



## CAN RJ45

Technologic Systems	Date May 8, 2017
Title: TS-7670 Modbus and CAN	
Rev: E	Designer
Sheet 15 of 15	