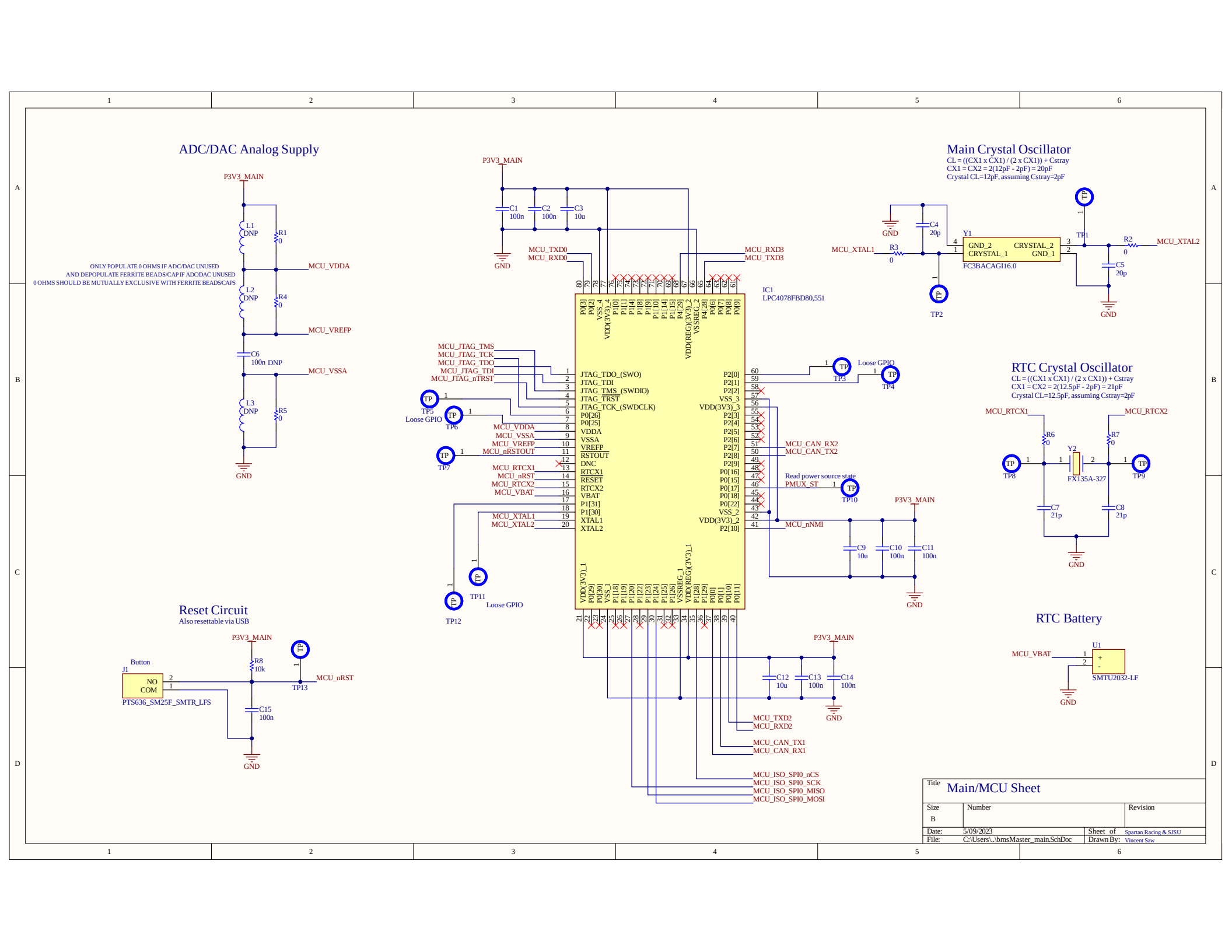
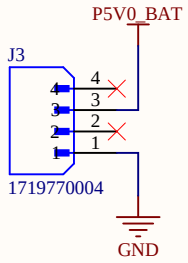
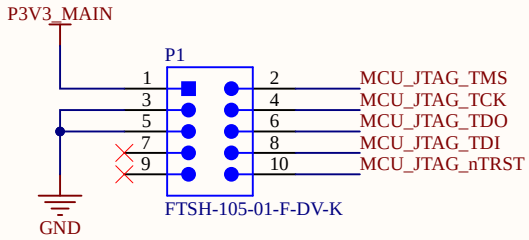

ADC/DAC Analog Supply
P3V3_MAIN
L1 DNP
R1 0
ONLY POPULATE 0 OHMS IF ADC/DAC UNUSED
AND DEPOPULATE FERRITE BEADS/CAP IF ADC/DAC UNUSED
0 OHMS SHOULD BE MUTUALLY EXCLUSIVE WITH FERRITE BEADS/CAPS
MCU_VDDA
L2 DNP
R4 0
MCU_VREFP
C6 100n DNP
MCU_VSSA
L3 DNP
R5 0
GND
P3V3_MAIN
C1 100n
C2 100n
C3 10u
GND
MCU_TXD0
MCU_RXD0
MCU_RXD3
MCU_TXD3
IC1
LPC4078FBD80,551
MCU_JTAG_TMS
MCU_JTAG_TCK
MCU_JTAG_TDO
MCU_JTAG_TDI
MCU_JTAG_nTRST
JTAG_TDO_(SWO)
JTAG_TDI
JTAG_TMS_(SWDIO)
JTAG_TRST
JTAG_TCK_(SWDCLK)
P0[26]
P0[25]
VDDA
VSSA
VREFP
RSTOUT
DNC
RTCX1
RESET
RTCX2
VBAT
P1[31]
P1[30]
XTAL1
XTAL2
MCU_VDDA
MCU_VSSA
MCU_VREFP
MCU_nRSTOUT
MCU_RTCX1
MCU_nRST
MCU_RTCX2
MCU_VBAT
MCU_XTAL1
MCU_XTAL2
TP5 Loose GPIO
TP6
TP7
TP11 Loose GPIO
TP12
P2[0]
P2[1]
P2[2]
VSS_3
VDD(3V3)_3
P2[3]
P2[4]
P2[5]
P2[6]
P2[7]
P2[8]
P2[9]
P0[16]
P0[15]
P0[17]
P0[18]
P0[22]
VSS_2
VDD(3V3)_2
P2[10]
TP3 Loose GPIO
TP4
MCU_CAN_RX2
MCU_CAN_TX2
Read power source state
PMUX_ST
TP10
MCU_nNMI
P3V3_MAIN
C9 10u
C10 100n
C11 100n
GND
P3V3_MAIN
C12 10u
C13 100n
C14 100n
GND
MCU_TXD2
MCU_RXD2
MCU_CAN_TX1
MCU_CAN_RX1
MCU_ISO_SPI0_nCS
MCU_ISO_SPI0_SCK
MCU_ISO_SPI0_MISO
MCU_ISO_SPI0_MOSI
Main Crystal Oscillator
CL = ((CX1 x CX1) / (2 x CX1)) + Cstray
CX1 = CX2 = 2(12pF - 2pF) = 20pF
Crystal CL=12pF, assuming Cstray=2pF
GND
C4 20p
MCU_XTAL1
R3 0
Y1
GND_2
CRYSTAL_2
CRYSTAL_1
GND_1
FC3BACAGI16.0
TP2
TP1
R2 0
MCU_XTAL2
C5 20p
GND
RTC Crystal Oscillator
CL = ((CX1 x CX1) / (2 x CX1)) + Cstray
CX1 = CX2 = 2(12.5pF - 2pF) = 21pF
Crystal CL=12.5pF, assuming Cstray=2pF
MCU_RTCX1
MCU_RTCX2
R6 0
R7 0
Y2
FX135A-327
TP8
TP9
C7 21p
C8 21p
GND
Reset Circuit
Also resettable via USB
P3V3_MAIN
Button
J1
NO
COM
PTS636_SM25F_SMTR_LFS
R8 10k
TP13
MCU_nRST
C15 100n
GND
RTC Battery
MCU_VBAT
U1
SMTU2032-LF
GND
Title
Main/MCU Sheet
Size
B
Number
Revision
Date: 5/09/2023
File: C:\Users\..\bmsMaster_main.SchDoc
Sheet of
Drawn By:
Spartan Racing & SJSU
Vincent Saw

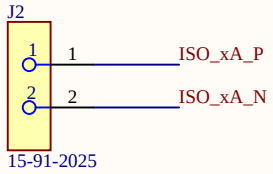
Power Connector



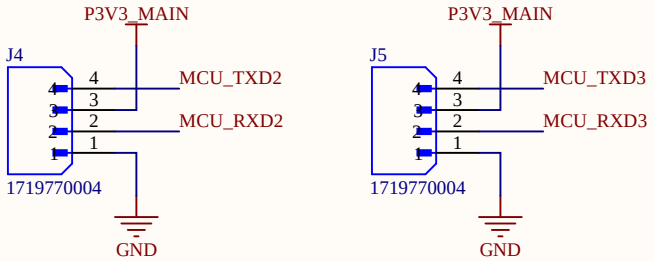
JTAG Debug Connector



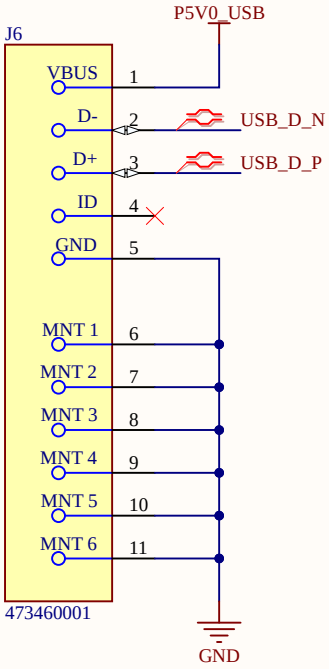
isoSPI Connector (to 1st Slave)



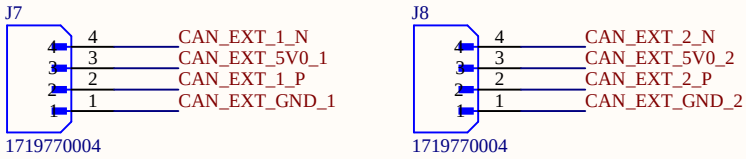
UART/Serial Connectors



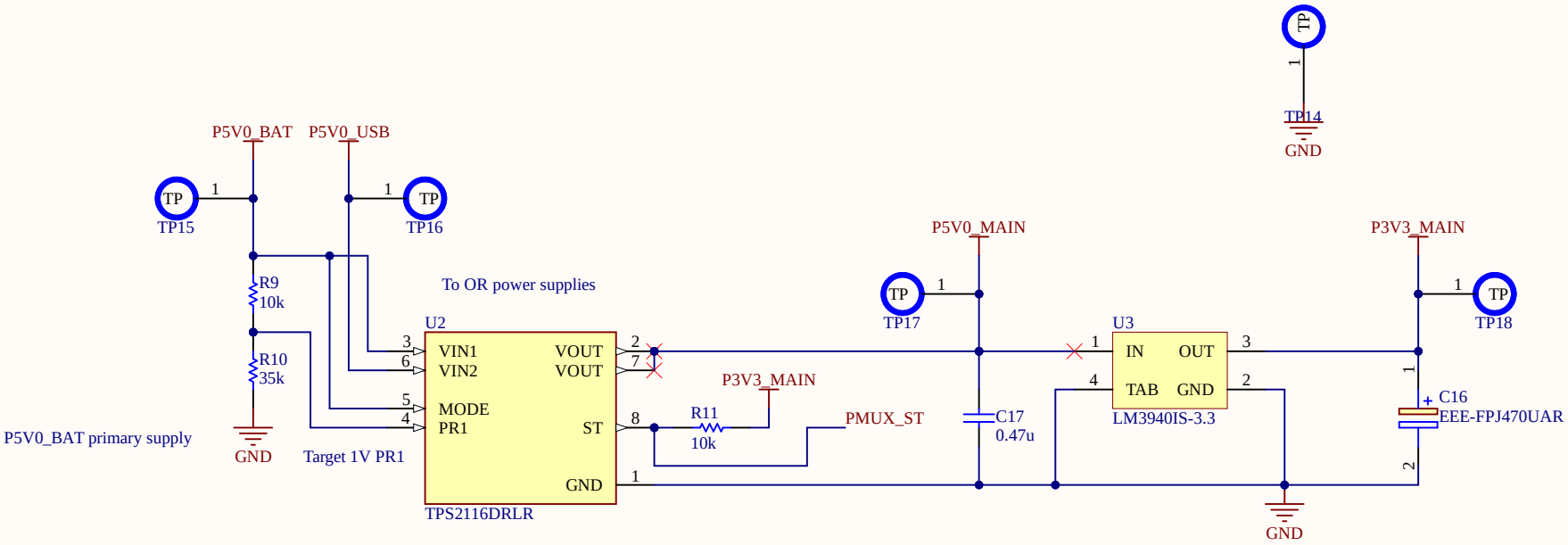
microUSB Type B Connector



CAN Connectors

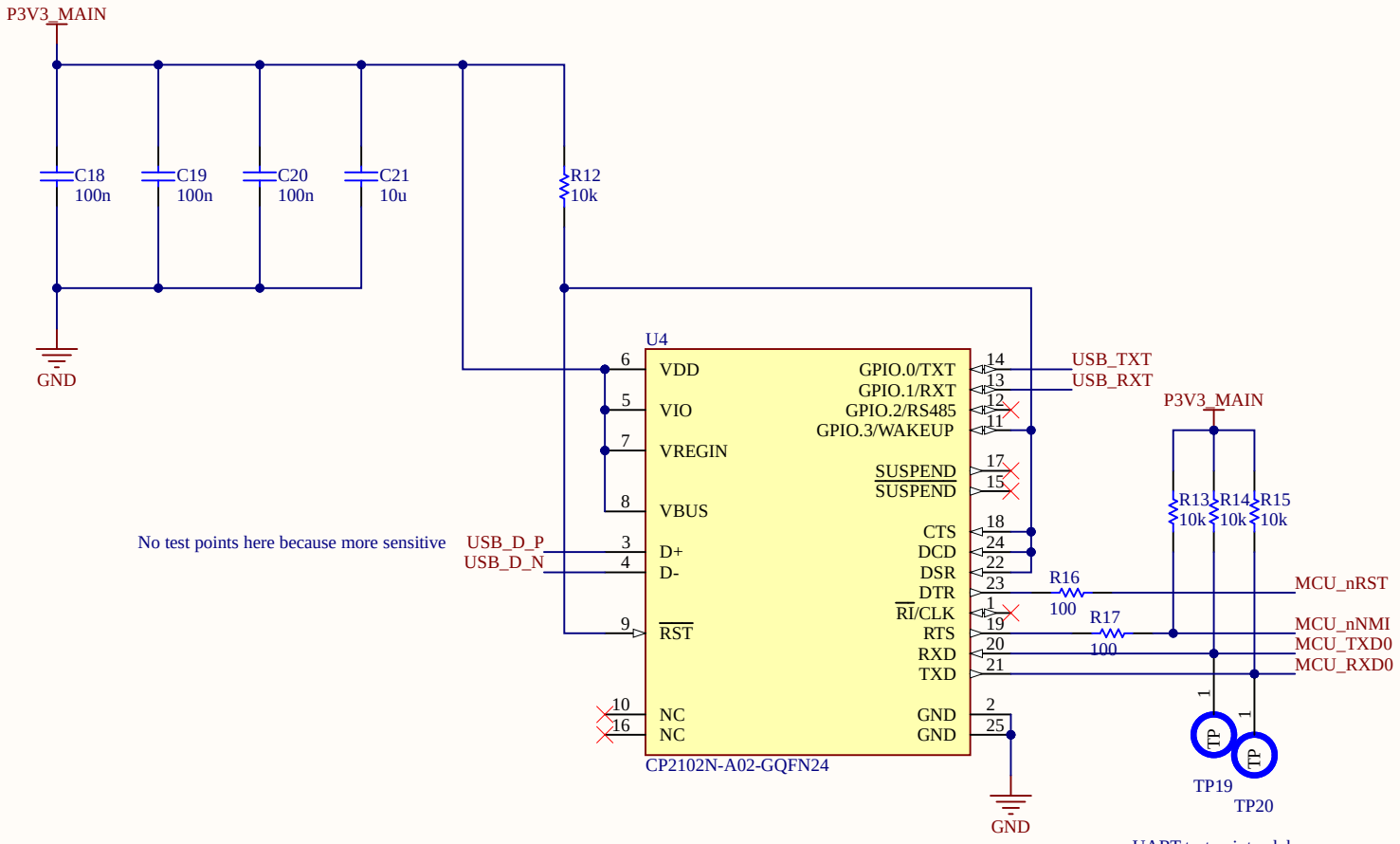


Title: Connector Sheet		
Size: A	Number:	Revision:
Date: 5/09/2023		Sheet of Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_conn.SchDoc		Drawn By: Vincent Saw



V_{REF}	PR1 reference voltage		-40°C to 105°C	0.92	1	1.08	V

Title	Power Sheet		
Size: A	Number:	Revision:	
Date: 5/09/2023		Sheet of	Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_power.SchDoc		Drawn By:	Vincent Saw



Title	USB Sheet	
Size: A	Number:	Revision:
Date: 5/09/2023	Sheet of	Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_usb.SchDoc	Drawn By:	Vincent Saw

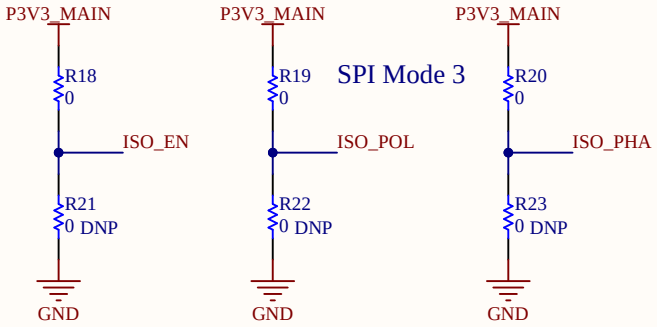
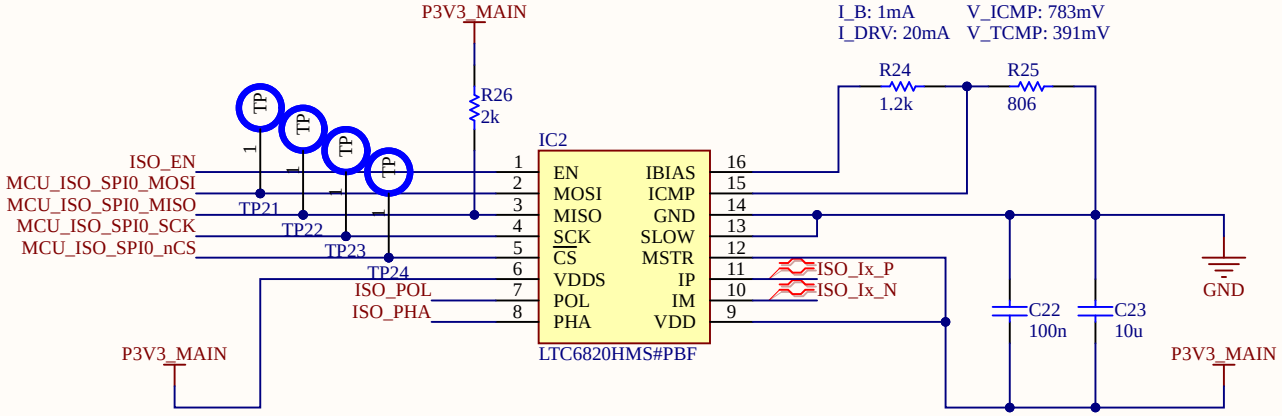
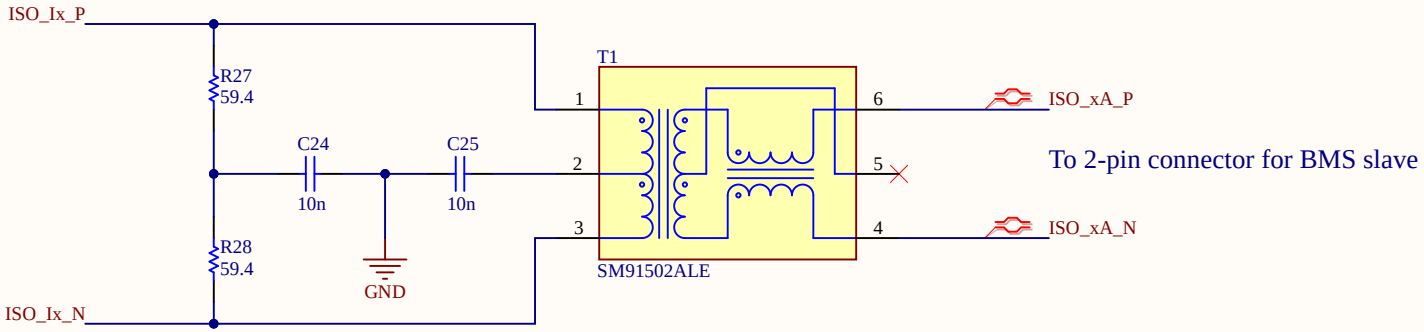


Table 4. SPI Modes

MODE	POL	PHA	DESCRIPTION
0	0	0	SCK Idles Low, Latches on Rising (1st) Edge
1	0	1	SCK Idles Low, Latches on Falling (2nd) Edge
2	1	0	SCK Idles High, Latches on Falling (1st) Edge
3	1	1	SCK Idles High, Latches on Rising (2nd) Edge

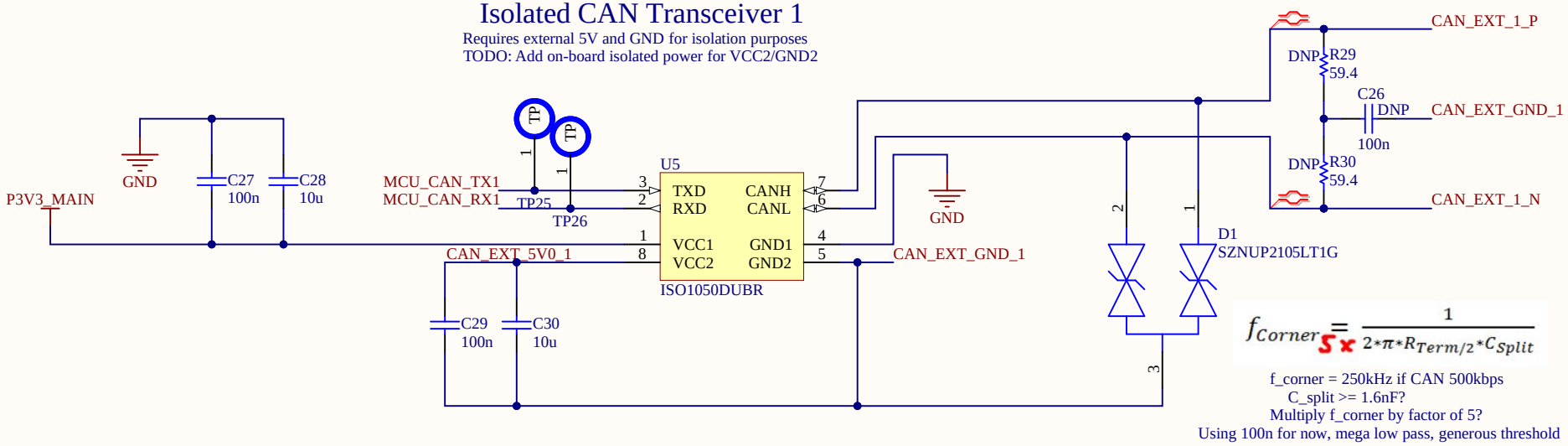




Title: IsoSPI Sheet		
Size: A	Number:	Revision:
Date: 5/09/2023	Sheet of	Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_isospi.SchDoc	Drawn By:	Vincent Saw

Isolated CAN Transceiver 1

Requires external 5V and GND for isolation purposes
TODO: Add on-board isolated power for VCC2/GND2

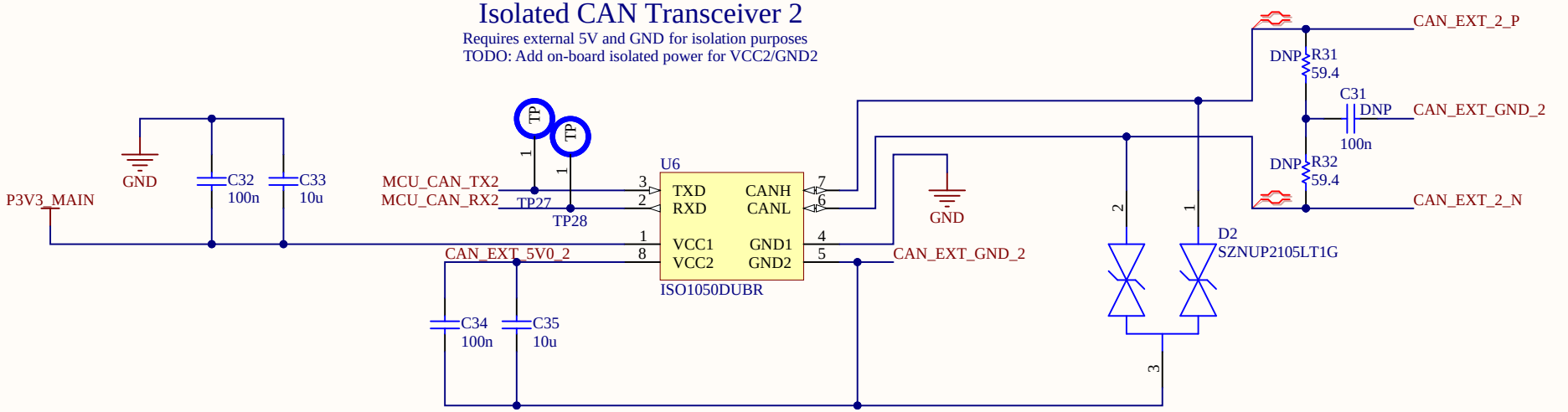


$$f_{Corner} = \frac{1}{2*\pi*R_{Term/2}*C_{Split}}$$

f_corner = 250kHz if CAN 500kbps
C_split >= 1.6nF?
Multiply f_corner by factor of 5?
Using 100n for now, mega low pass, generous threshold

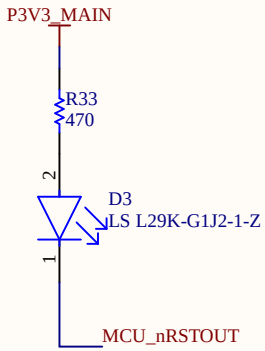
Isolated CAN Transceiver 2

Requires external 5V and GND for isolation purposes
TODO: Add on-board isolated power for VCC2/GND2

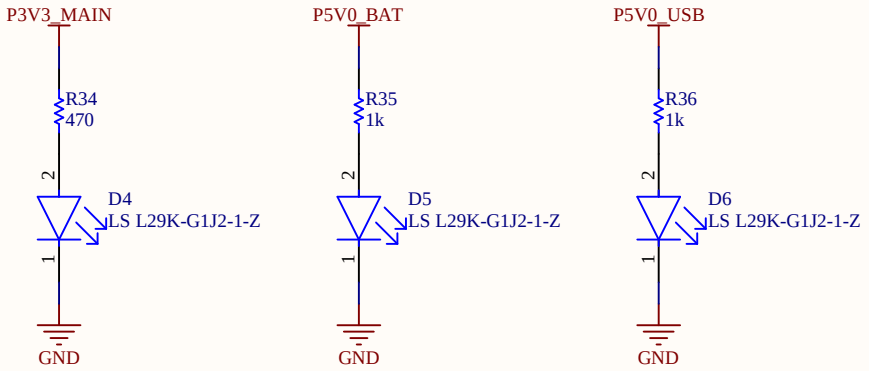


Title	CAN Bus Sheet		
Size: A	Number:	Revision:	
Date: 5/09/2023		Sheet of	Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_can.SchDoc		Drawn By:	Vincent Saw

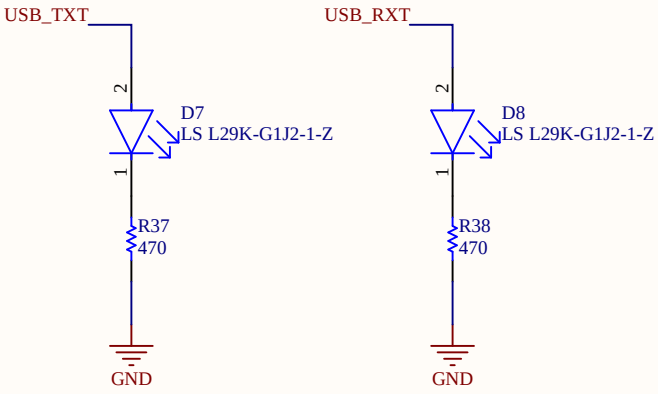
Reset Indicator LED (nRSTOUT)



Power Debug LEDs



USB/UART0 Activity Indication LEDs



Title: LED Sheet		
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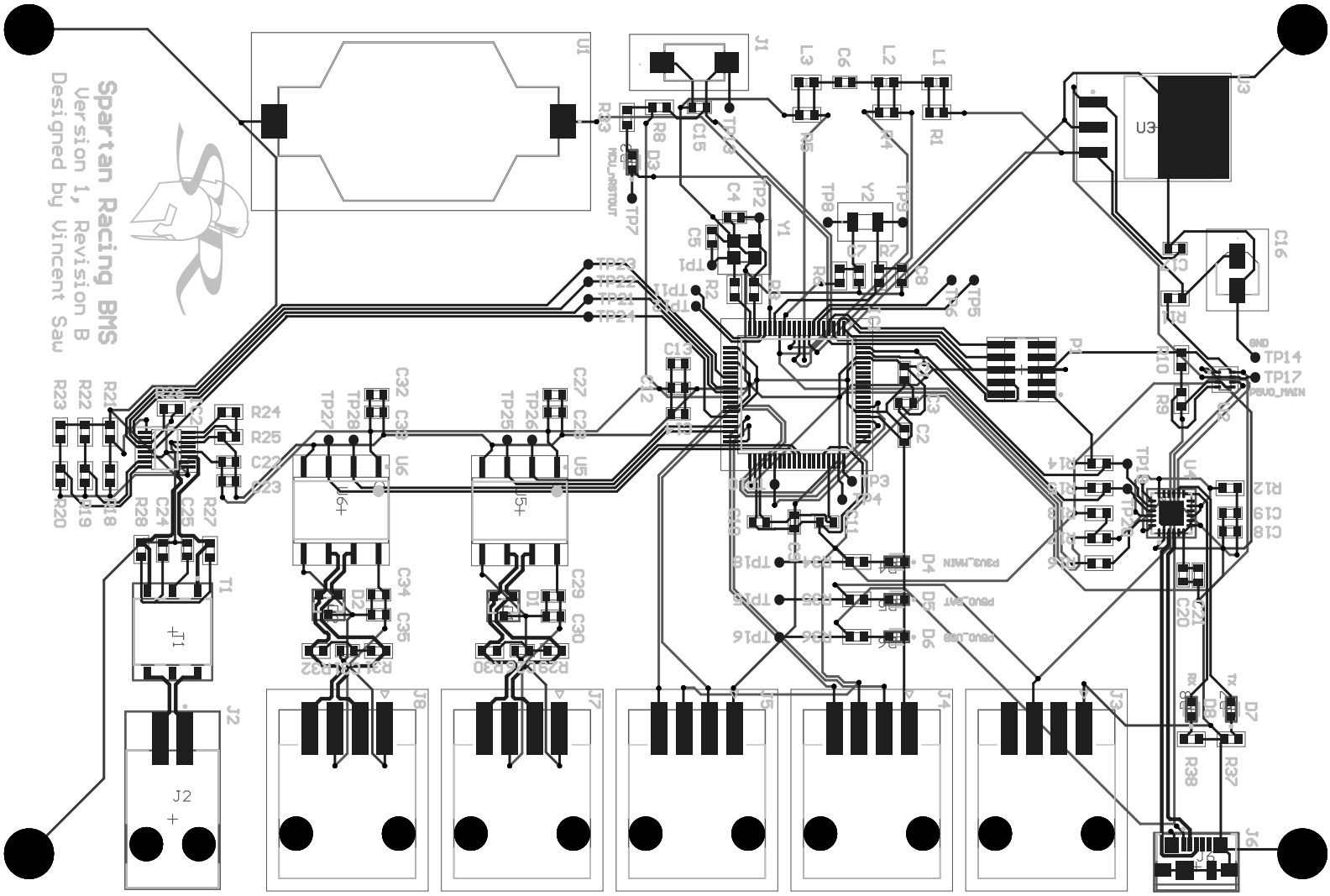
Date: 5/09/2023	Sheet of	Spartan Racing & SJSU
File: C:\Users\..\bmsMaster_led.SchDoc	Drawn By:	Vincent Saw


Spartan Racing BMS
Version 1, Revision B
Designed by Vincent Saw
NPTH D3.4 +/-0.05 NPTH D3.4 +/-0.05 NPTH D3.4 +/-0.05 NPTH D3.4 +/-0.05 NPTH D3.4 +/-0.05

Board Stack Report