Mounting Holes

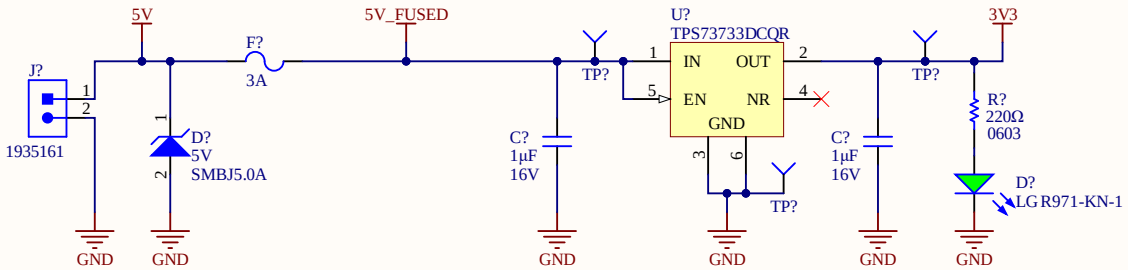
H? H?

H? H?

Need to make new mounting hole part depending on Andrew's fastener choice

Add eFuse for Rev 3

5V to 3.3V LDO (Max 1A)

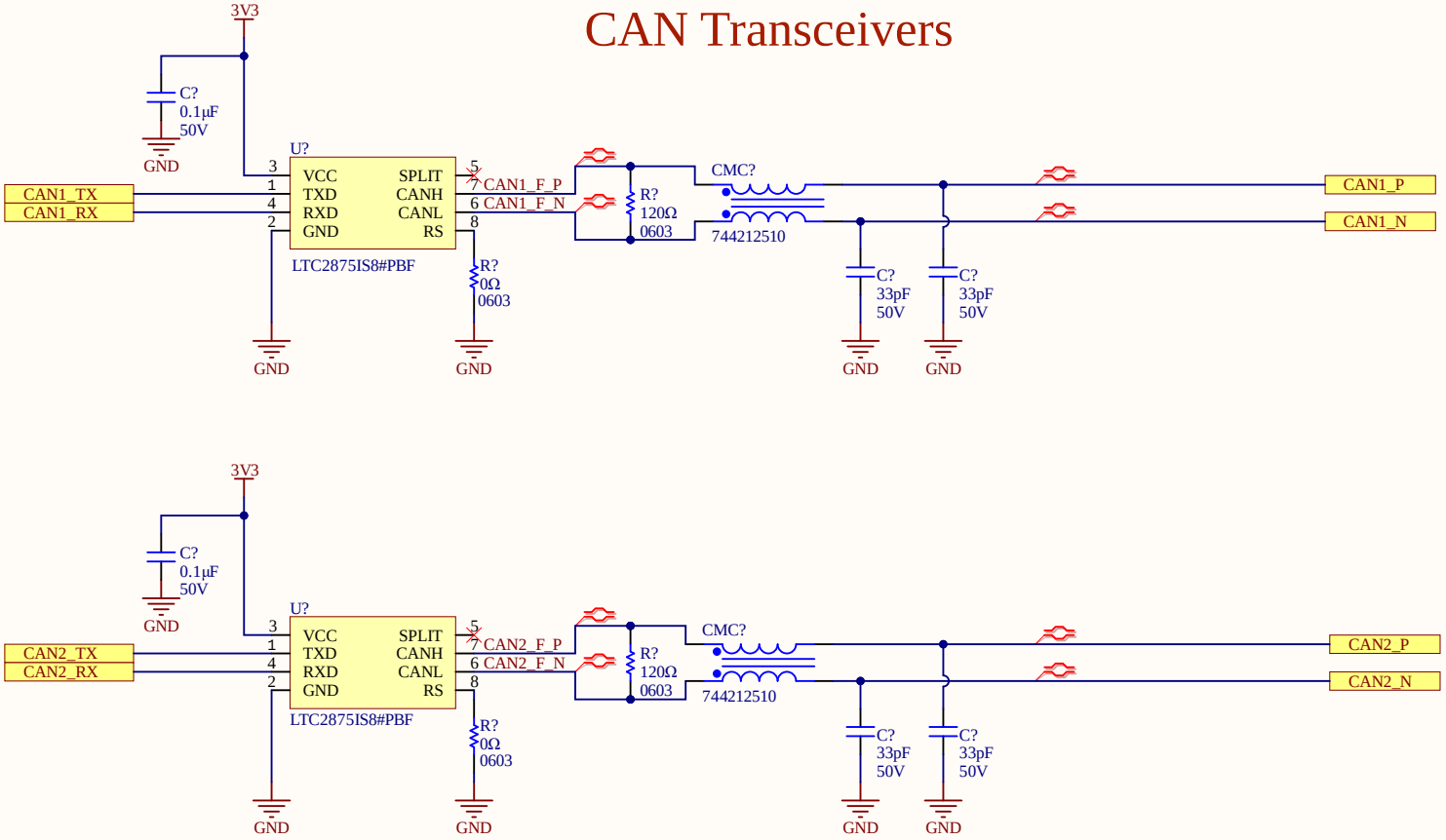


Current Calculations

Green LED voltage drop: 2.2V
- I = (3.3-2.2V)/220 = 5mA

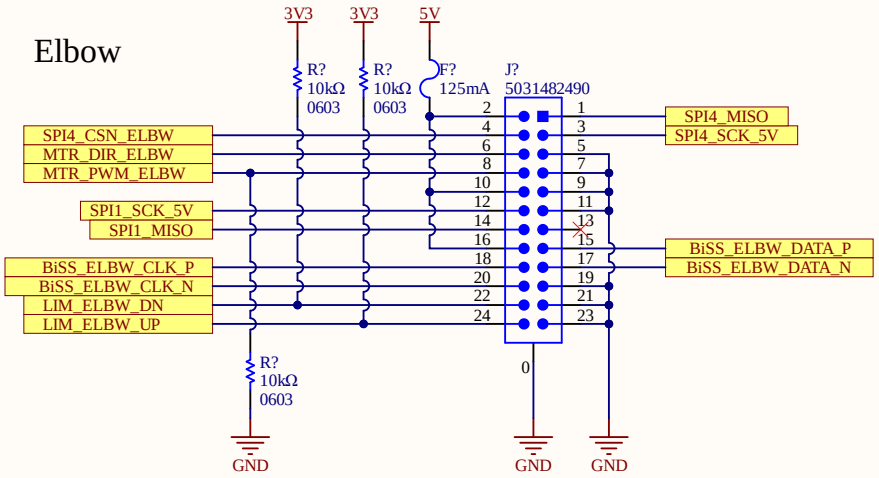
Title Arm - Power		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter	Drawn By: Kyle Hong, Lance Bantoto	
Date: 11/12/2020	Sheet 1 of 7	
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH1 - POWER.SchDoc		

CAN Transceivers

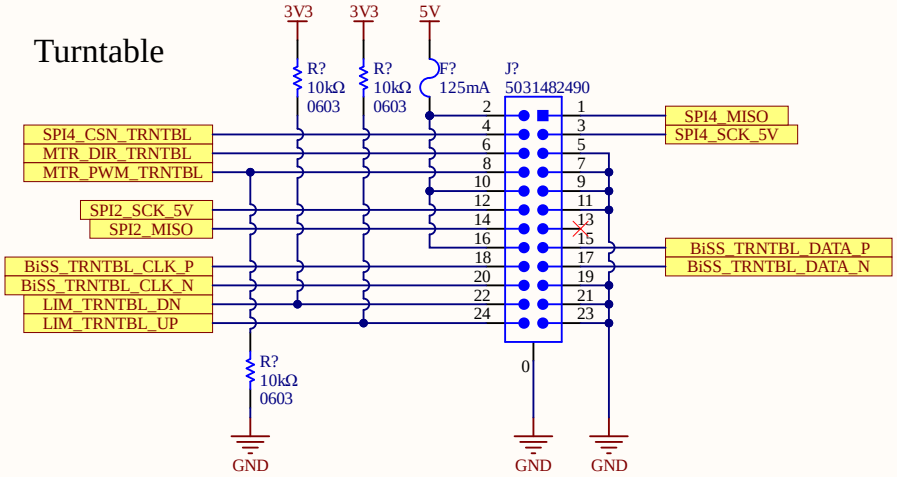


Title Arm - CAN Transcievers		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter	Drawn By: Kyle Hong, Lance Bantoto	
Date: 11/12/2020	Sheet 2 of 9	
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH7 - CAN.SchDoc		

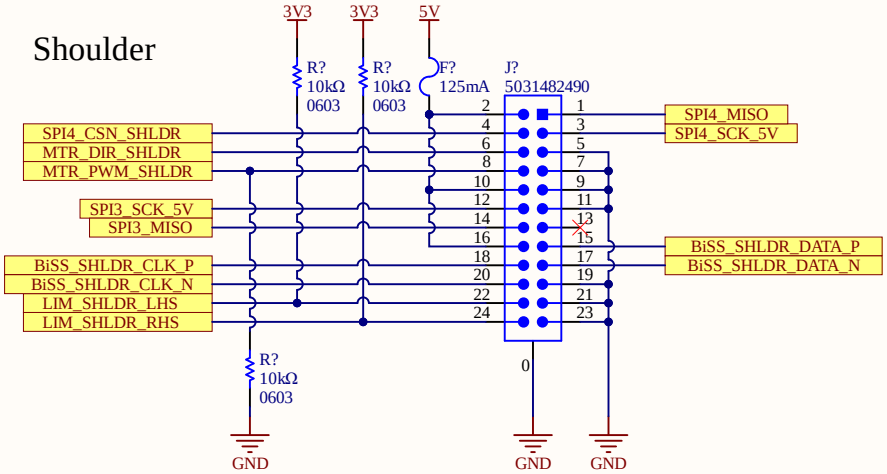
Elbow



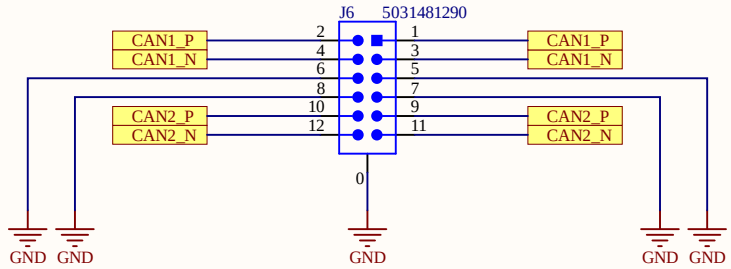
Turntable



Shoulder



CAN Connections



Acronyms Explained
FSR: Force Sensitive Resistor
CLAW: Claw
WRST: Wrist
SHLDR: Shoulder
ELBW: Elbow
TRNTBL: Turntable
DIR: Direction for motors
CS: Analog current sensor signal

Title Arm - Connectors			UW ROBOTICS TEAM
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Date: 11/12/2020	Sheet 2 of 7		
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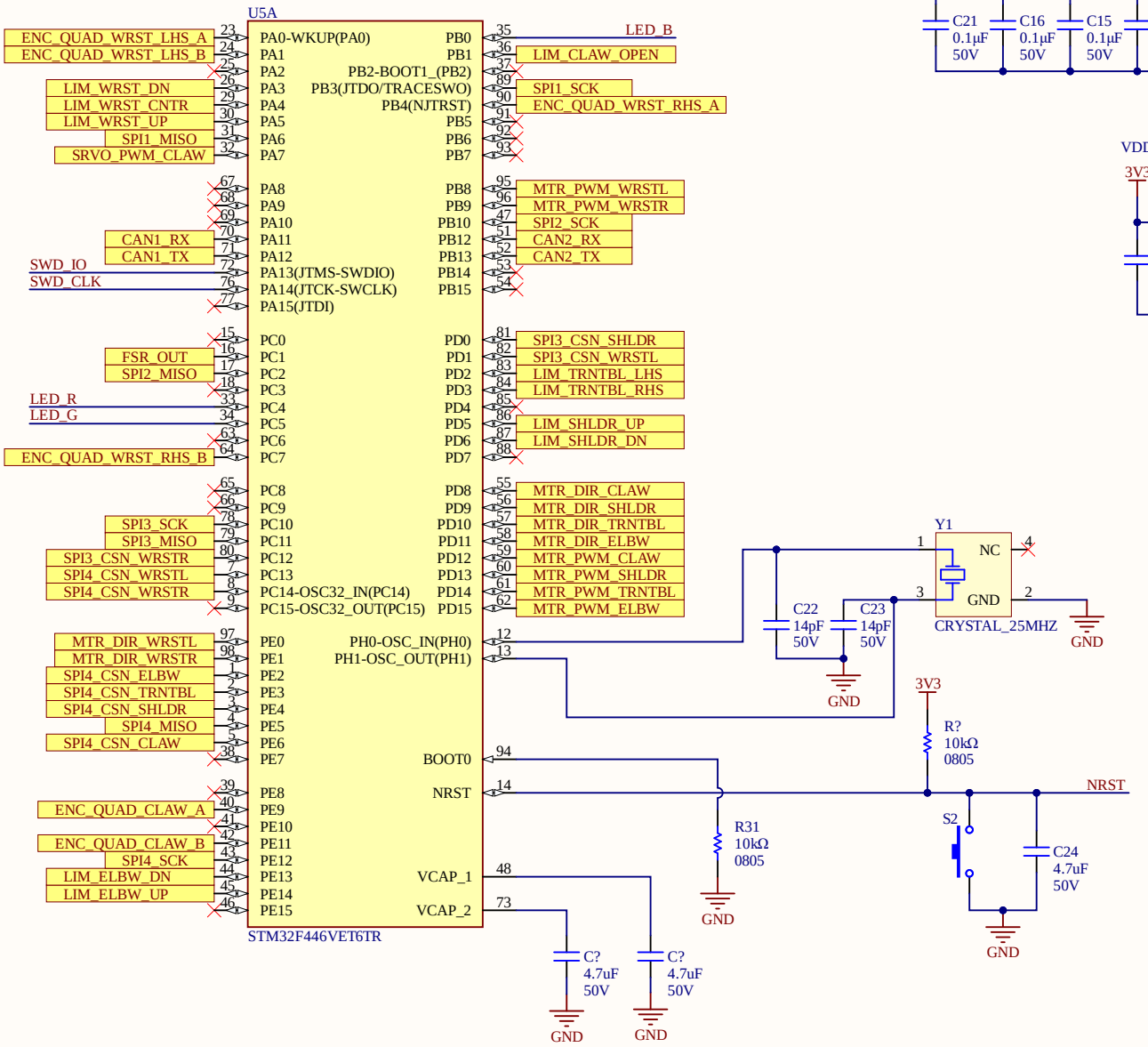
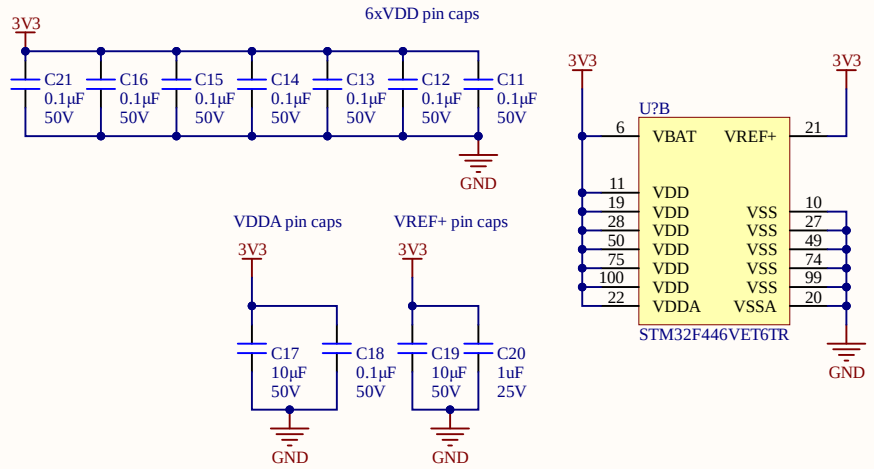
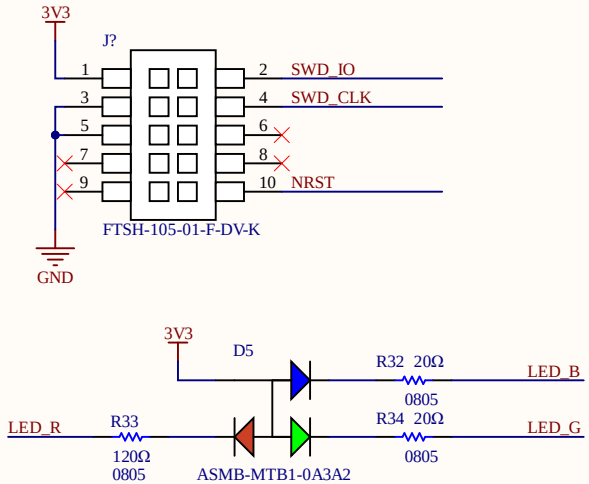
STM32F446VET7



Bypass Capacitors



Debug/Programming



Current Calculations

Green LED voltage drop: 2.2V
- I = (3.3-2.2V)/120 = 10.83mA

RGB LED voltage drops:
- Red: 2.1V: I = (3.3-2.1V)/120 = 10mA
- Blue: 3.1V: I = (3.3-3.1V)/20 = 10mA
- Green: 3.1V: I = (3.3-3.1V)/20 = 10mA

Title Arm - Microcontroller		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter	Drawn By: Kyle Hong, Lance Bantoto	
Date: 11/12/2020	Sheet 4 of 9	
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH6 - MICROCONTROLLER.S		

Force Sensitive Resistor

Sensor:
Manufactuer: Interlink Electronics
Manufacturer Part Number: 30-81794
Supplier: Digi-Key
Supplier Part Number: 1027-1001-ND
https://cdn.sparkfun.com/assets/8/a/1/2/0/2010-10-26-DataSheet-FSR402-Layout2.pdf

Resistance at 20N = 800 ohms
Resistance at 100N = 250 ohms

Differential amplifier gain:
Av = 825k/165k = 5

Wheatstone bridge voltage output values:
At 20N, Vout = 3.2V
At 100N, Vout = 0.5V

Low pass filter cutoff frequency:
fc = 1/(2*PI*14.3k*0.1u) = 111.30 Hz

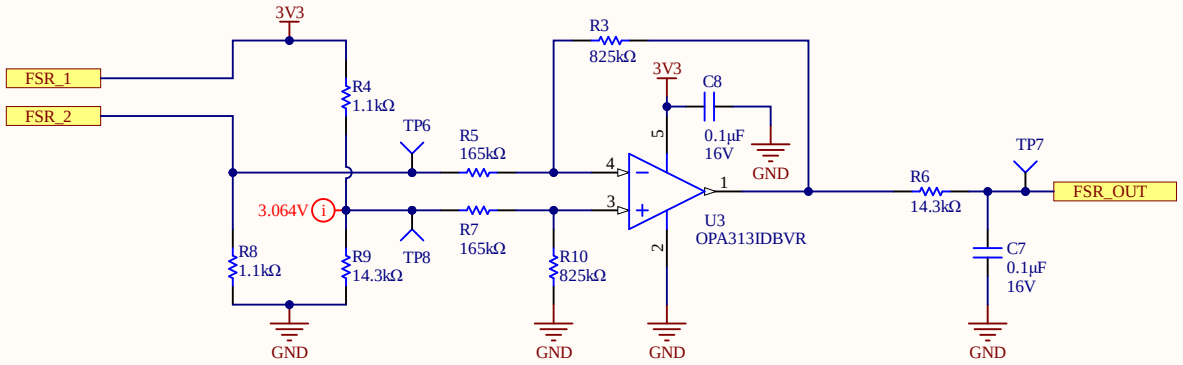
Links to differential amplifier calculations and documentation

https://docs.google.com/spreadsheets/d/1JzRwpCH-aMdlyAMp5zl6xFD8GIuJzvmOR8Y5Kzd1RN0/edit#gid=0

Gain = 5

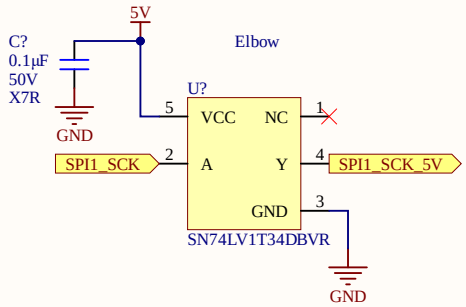
Wheatstone Bridge

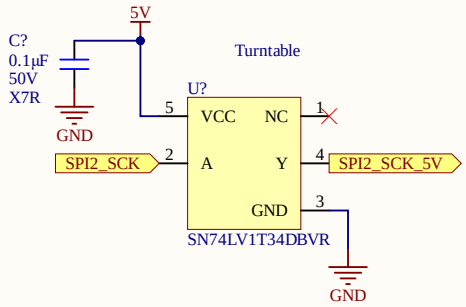
Differential Amplifier



Title Arm - Claw Sensor		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6	UW ROBOTICS TEAM
Size: Letter	Drawn By: Ayesha Ebrahim		
Date: 11/12/2020	Sheet 7 of 9		
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH8 - FORCE SENSITIVE R			

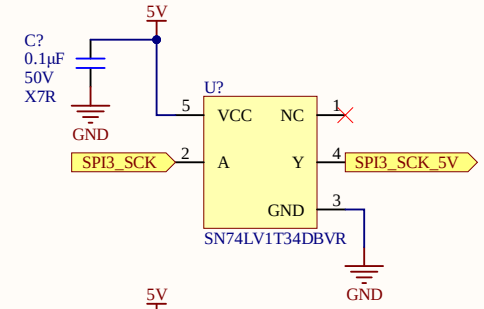
Encoder Level Shifter

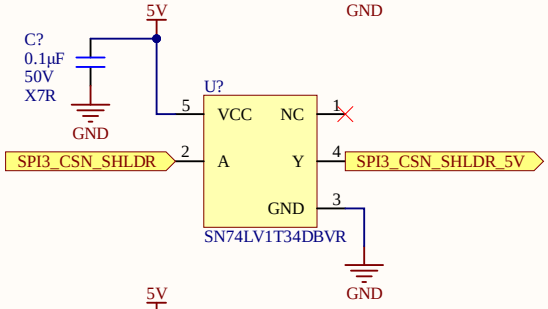


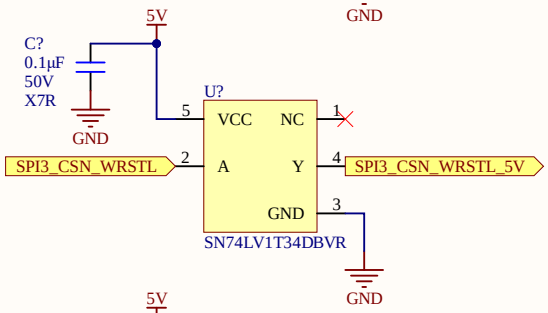


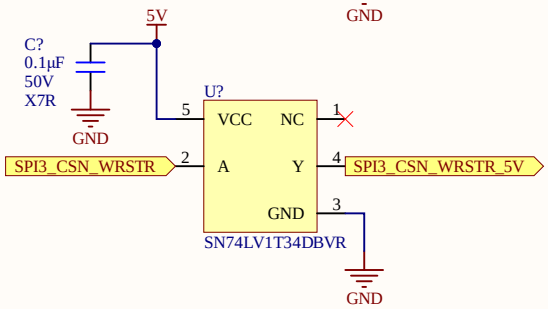
Encoder manufactuer: Broadcom
Encoder part number: AEAT-6012-A06

Did not level shift MISO signals since the STM32 SPI peripheral is 5V tolerant

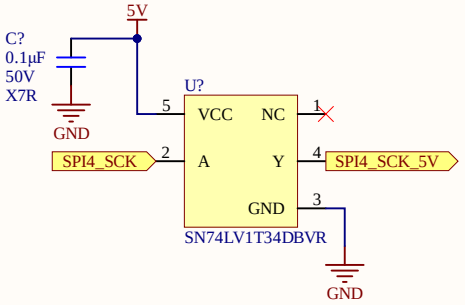




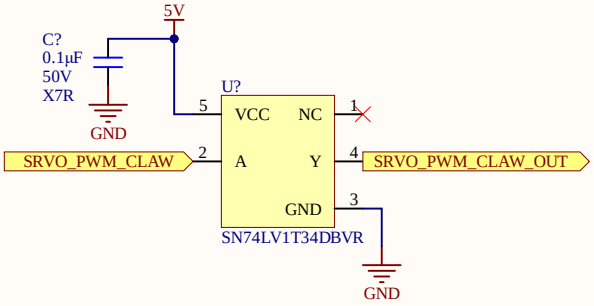




Current Sensor Level Shifter

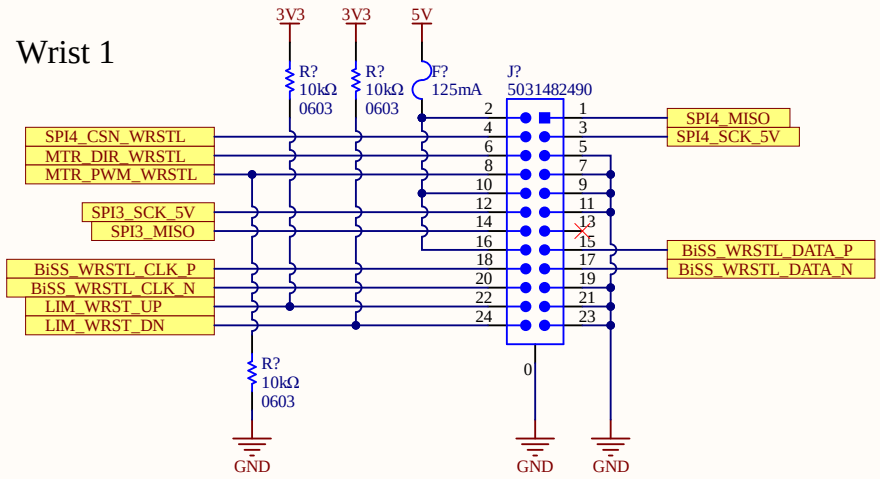


Servo Level Shifter

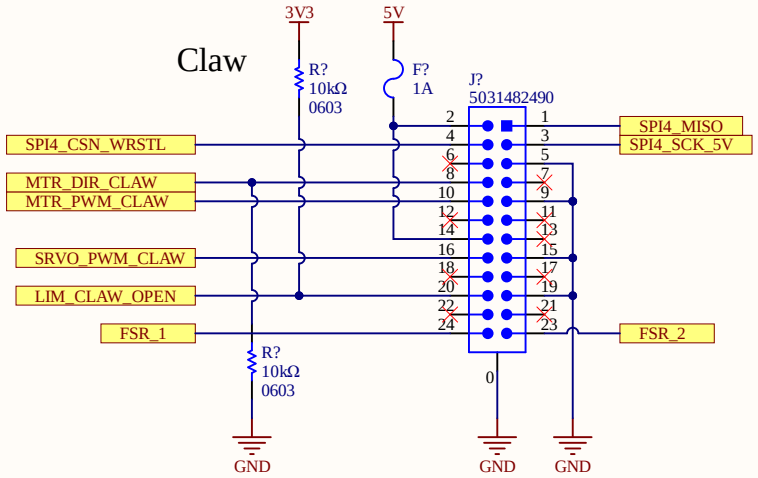


Title: Level Shifters			UW ROBOTICS TEAM
Size: Letter	Drawn By: Kyle Hong		
Date: 11/12/2020	Sheet 9 of 9		
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH4 - LEVEL SHIFTERS.Sc			

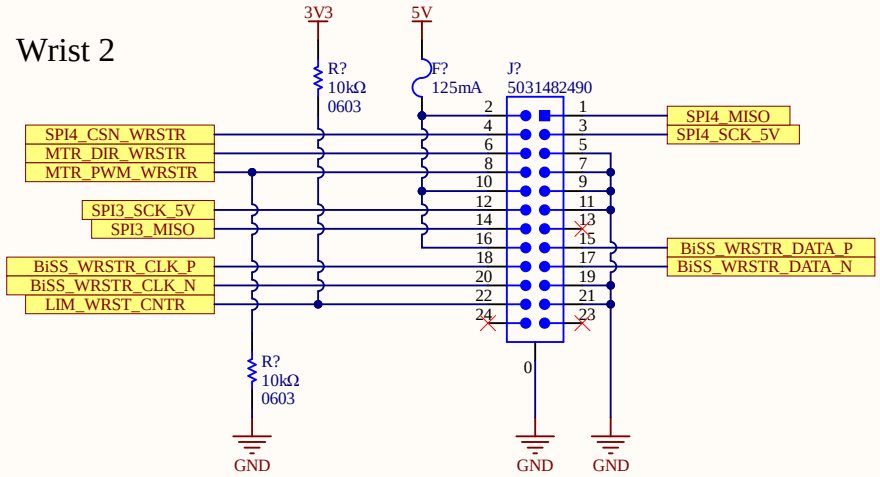
Wrist 1



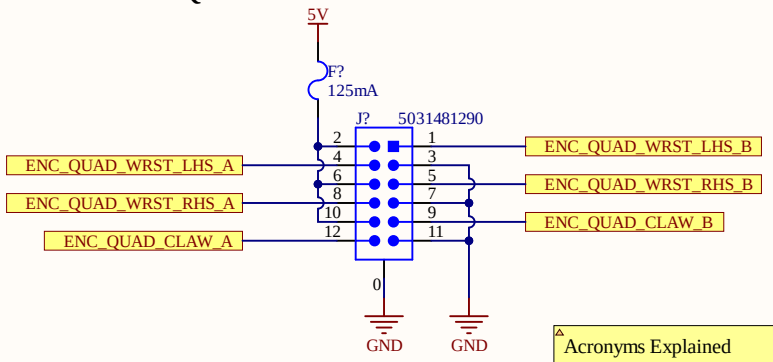
Claw



Wrist 2



Quadrature encoders



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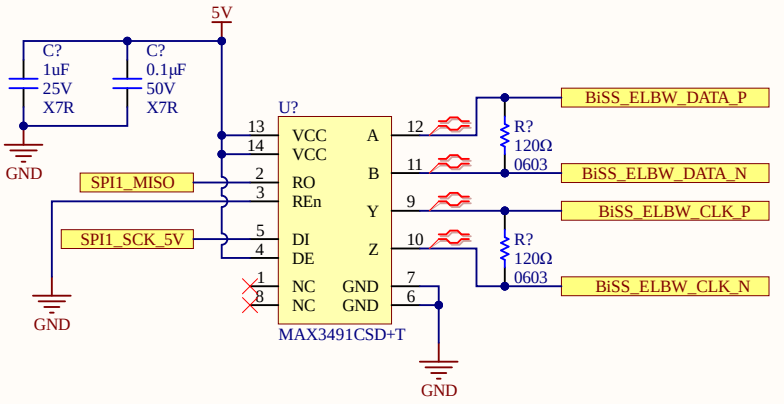
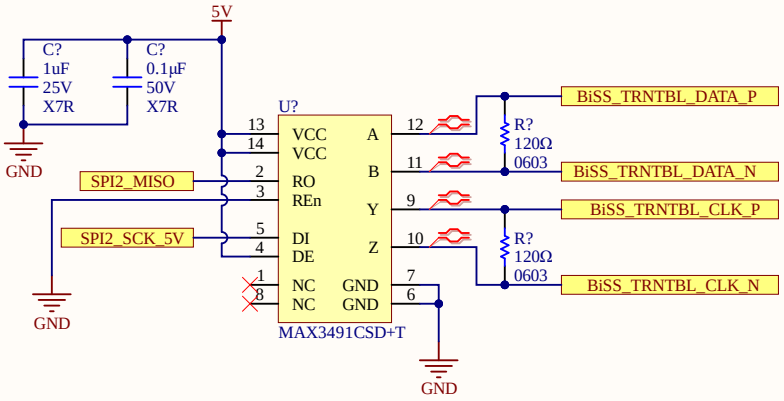
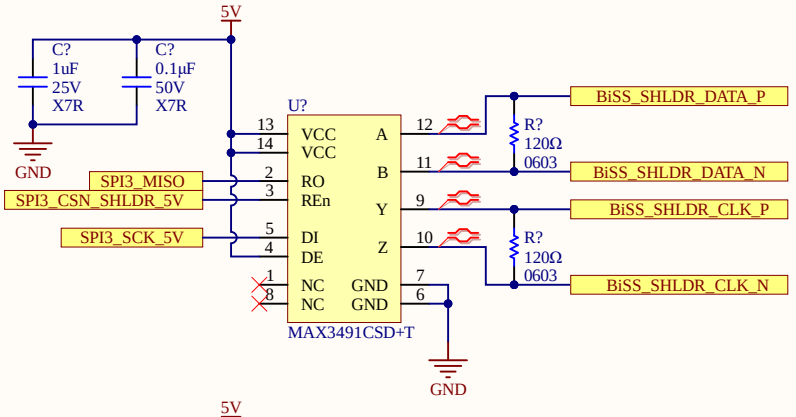
Title *		UW ROBOTICS TEAM
Size: Letter	Drawn By: *	
Date: 11/12/2020	Sheet * of *	
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH3 - CONNECTORS_2.SchDoc		

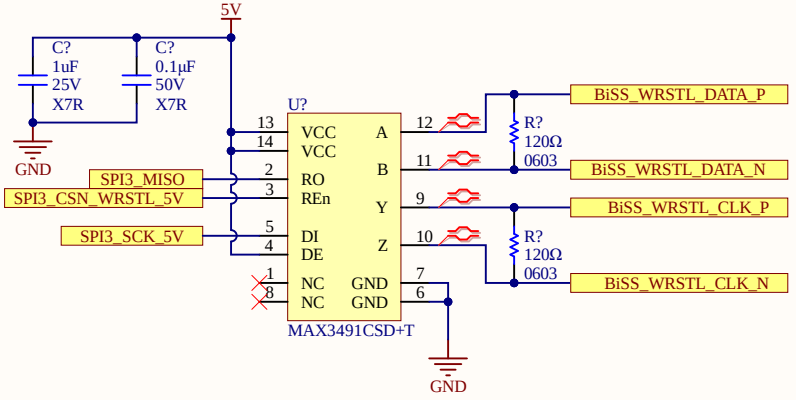
Add pull-ups

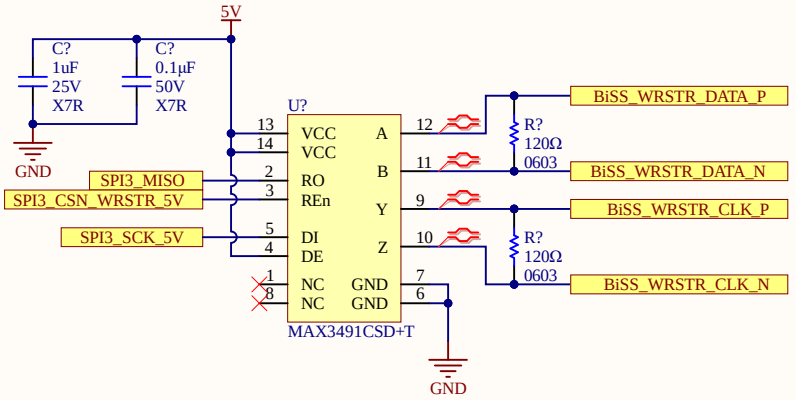
Netzer Encoders











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Size: Letter	Drawn By: *	
Date: 11/12/2020	Sheet * of *	
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH5 - NETZER ENCODERS.S		

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