

Mounting Holes

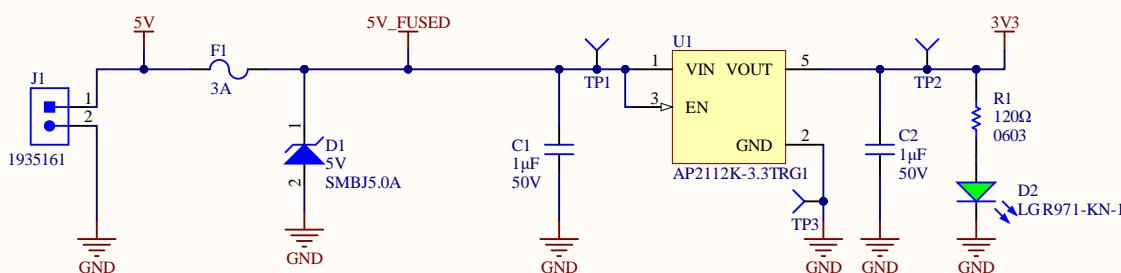
^{H1}^{H2}

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

^{H3}^{H4}

Add eFuse for Rev 3

5V to 3.3V LDO (Max 1A)



Current Calculations

Green LED voltage drop: 2.2V
 $- I = (3.3 - 2.2V) / 120 = 9.17mA$

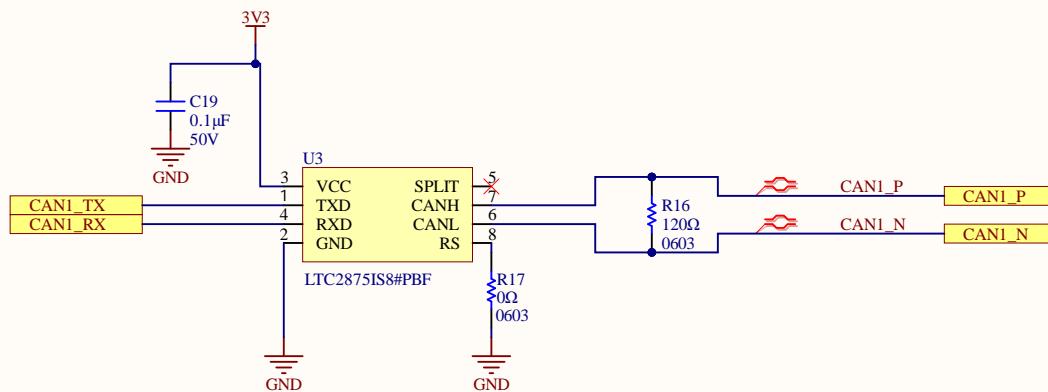
A

A

CAN Transceivers

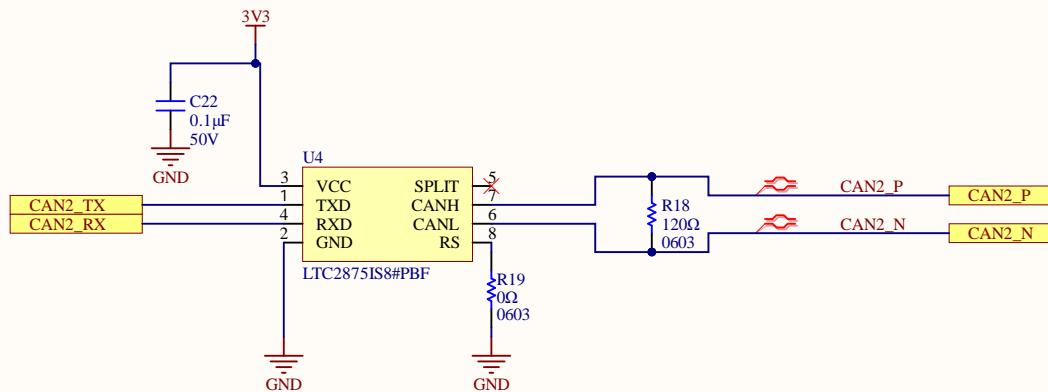
B

B



C

C



D

D

Title: Arm - CAN Transceivers

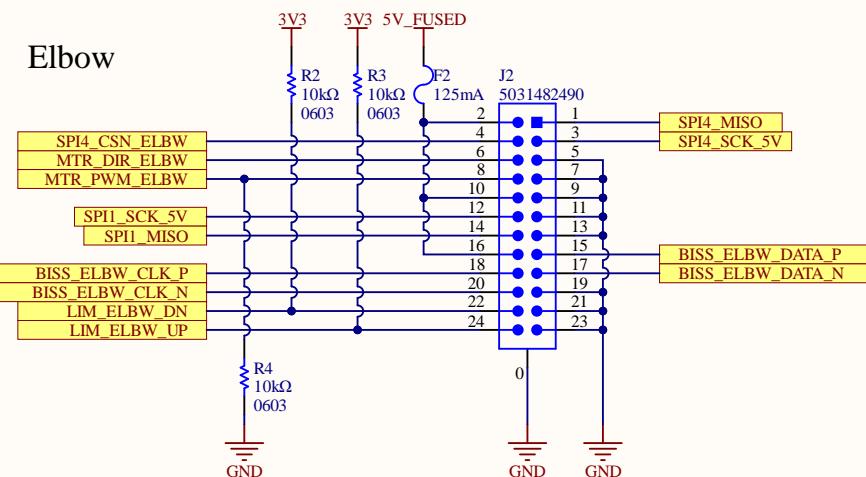
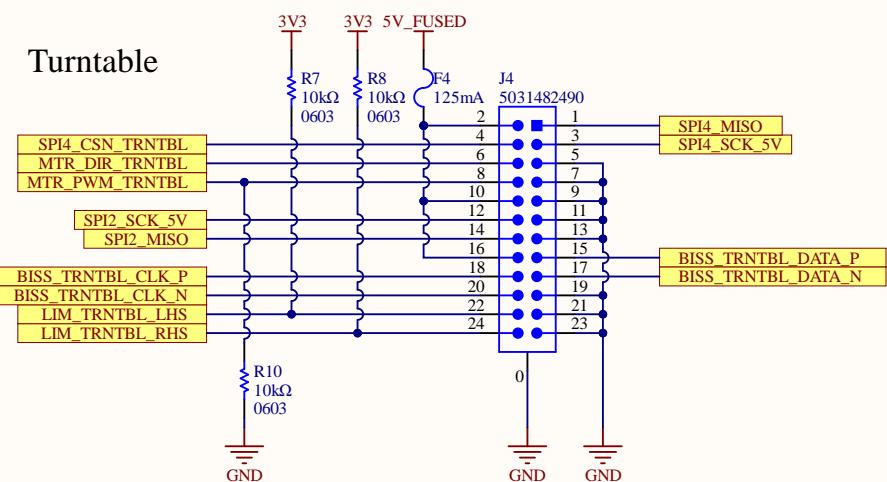
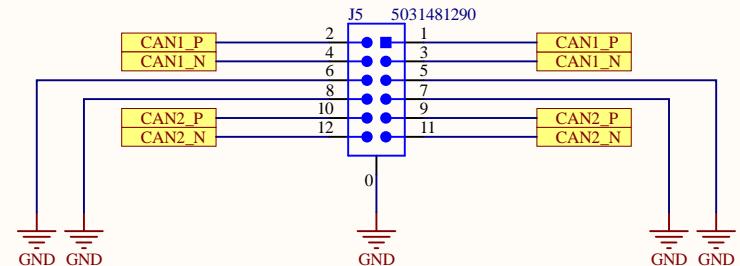
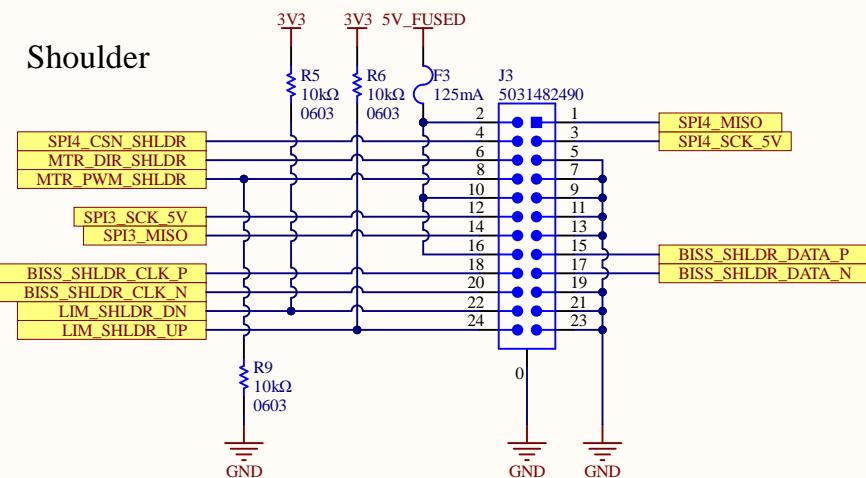
Size: Letter | Drawn By: Kyle Hong, Lance Bantoto

Date: 11/14/2020

UW Robotics
200 University Avenue
Waterloo
Ontario
Canada N2L 3G6



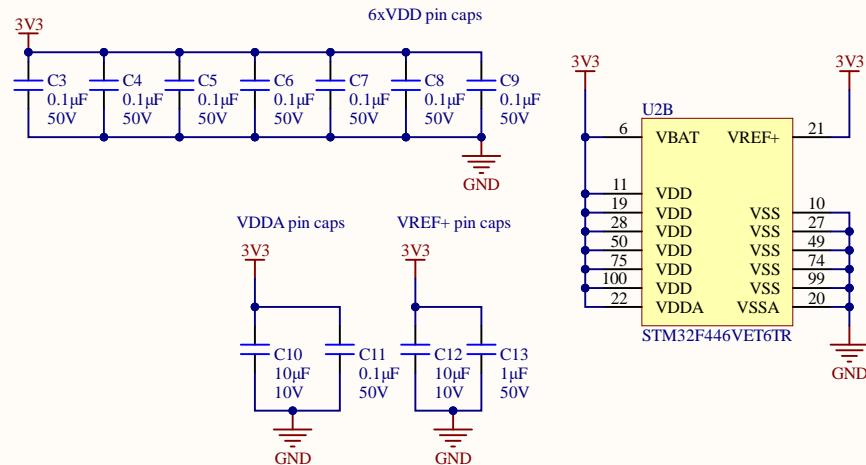
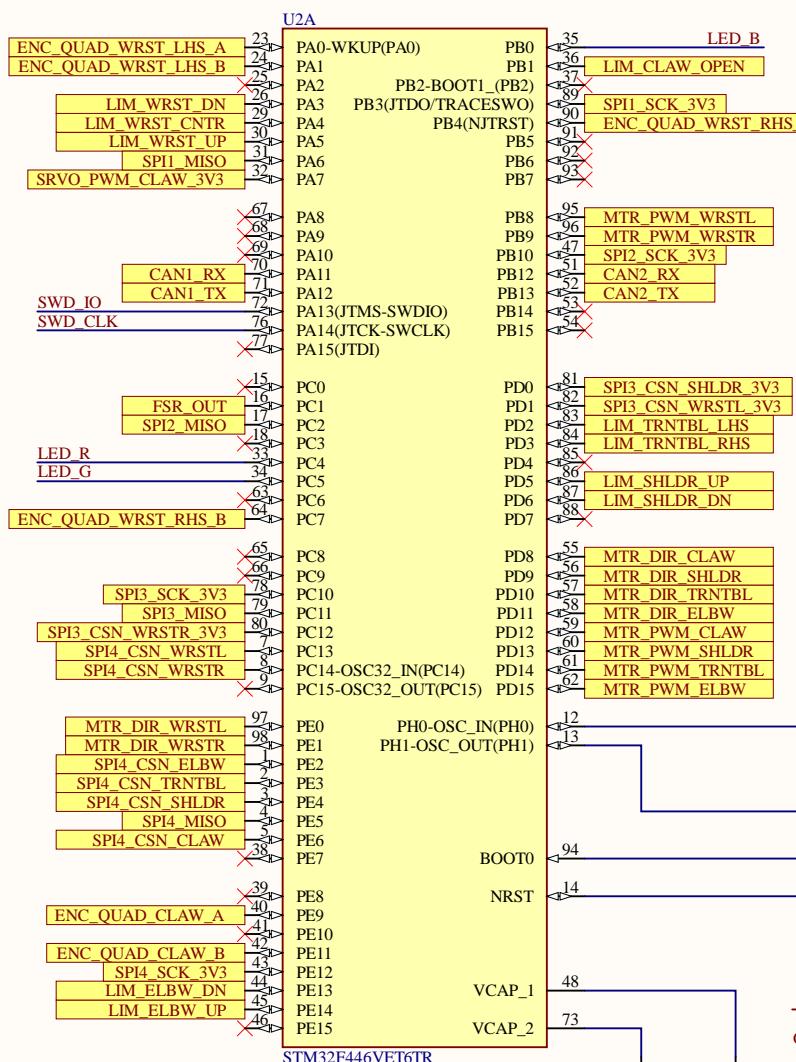
File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH7 - CAN.SchDoc

Elbow**Turntable****CAN Connections****Shoulder**

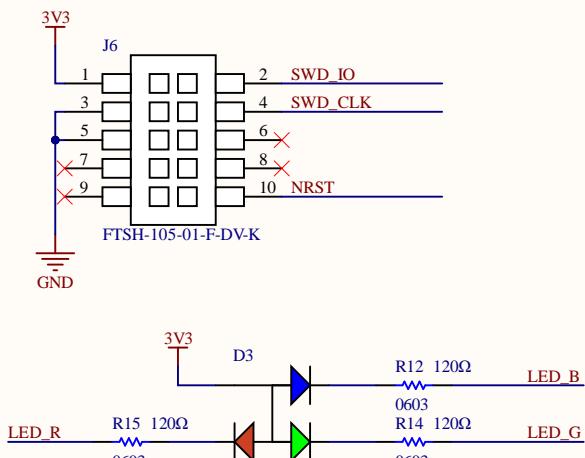
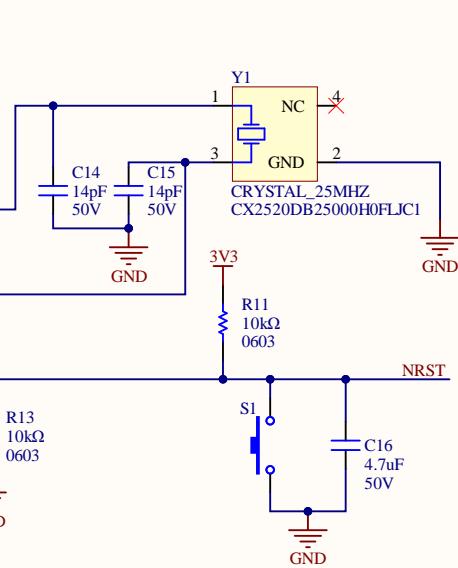
Acronyms Explained
 FSR: Force Sensitive Resistor
 CLAW: Claw
 WRST: Wrist
 SHLDR: Shoulder
 ELBW: Elbow
 TRNTBL: Turntable
 DIR: Direction for motors
 MTR: motor

Bypass Capacitors

STM32F446VET7



Debug/Programming



Current Calculations

RGB LED voltage drops:

- Red: $2.1V: I = (3.3-2.1V)/120 = 10mA$
- Blue: $3.1V: I = (3.3-3.1V)/120 = 1.67mA$
- Green: $3.1V: I = (3.3-3.1V)/120 = 1.67mA$

Force Sensitive Resistor

^ASensor:
Manufacturer: 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

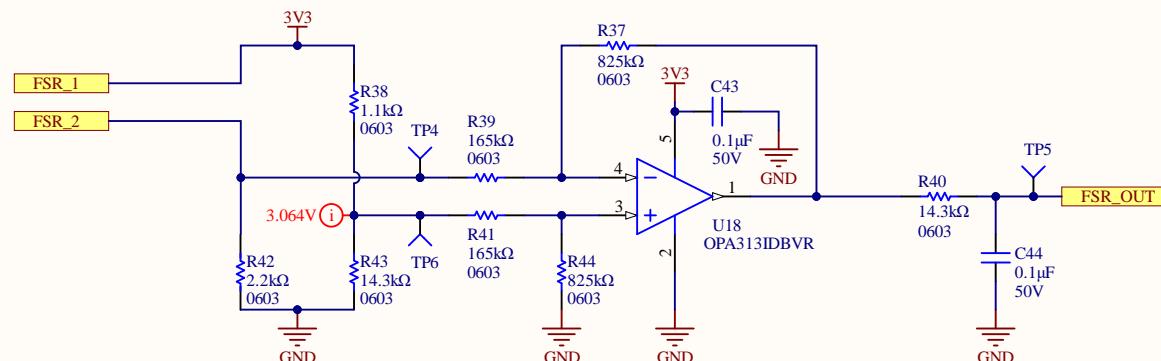
^ADifferential amplifier gain:
 $A_v = 825k/165k = 5$

Wheatstone bridge voltage output values:
At 20N, $V_{out} = 3.2V$
At 100N, $V_{out} = 0.5V$

Low pass filter cutoff frequency:
 $f_c = 1/(2\pi \cdot 14.3k \cdot 0.1\mu F) = 111.30 \text{ Hz}$

Links to differential amplifier calculations and documentation
<https://docs.google.com/spreadsheets/d/1JzRwpCH-aMdlyAMp5zl6xFD8GIuJzvmOR8Y5Kzd1RN0/edit#gid=0>

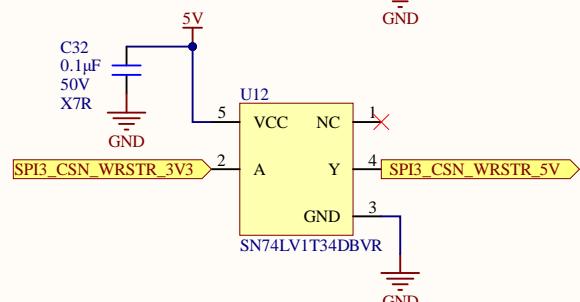
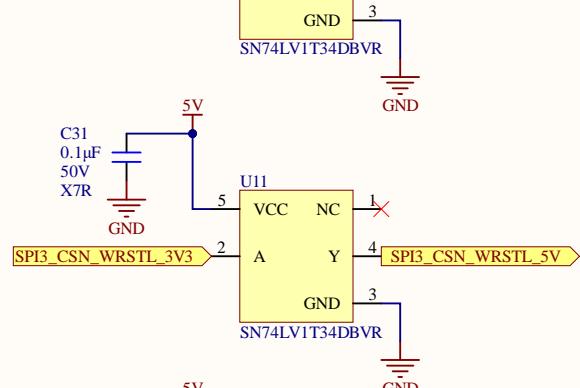
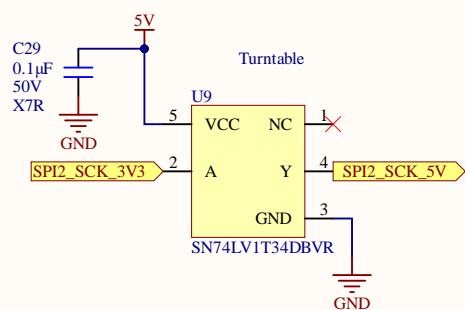
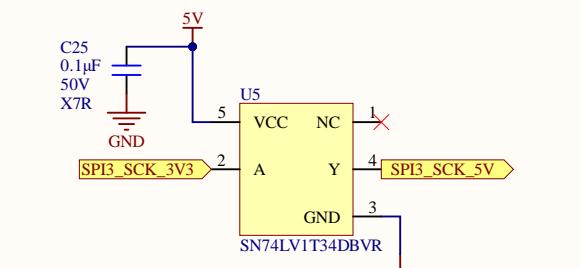
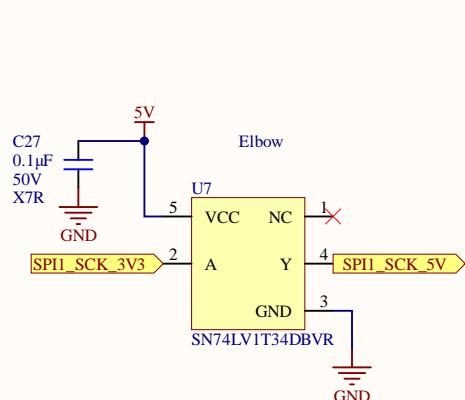
Wheatstone Bridge



Differential Amplifier

Title: Arm - Claw Sensor		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter		Drawn By: Ayesha Ebrahim
Date: 11/14/2020	Sheet 7 of 9	File: C:\Users\kyleh\Desktop\Works\UWRT\MarsRover2021-hardware\Projects\Arm\Rev2\SH8 - FORCE SENSITIVE F
		ROBOTICS TEAM

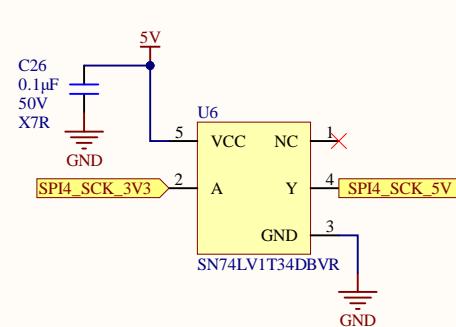
A Encoder Level Shifter



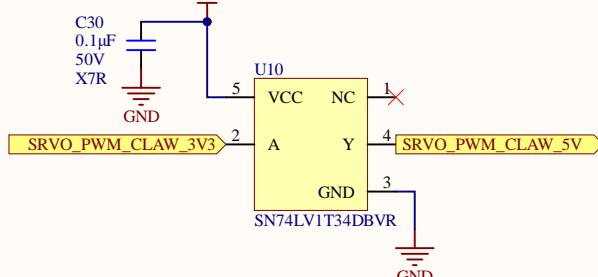
Encoder manufacturer: Broadcom
Encoder part number: AEAT-6012-A06

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

B Current Sensor Level Shifter



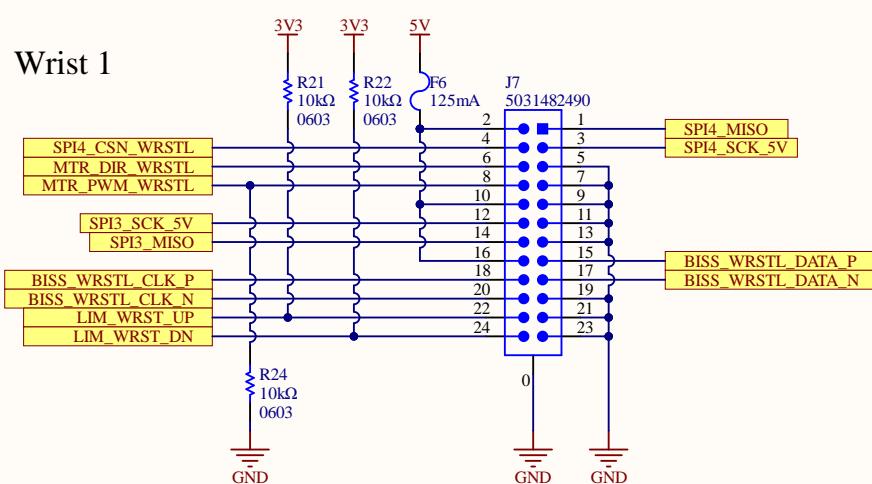
C Servo Level Shifter



Title	Level Shifters	*
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Date:	11/14/2020	Sheet 9 of 9
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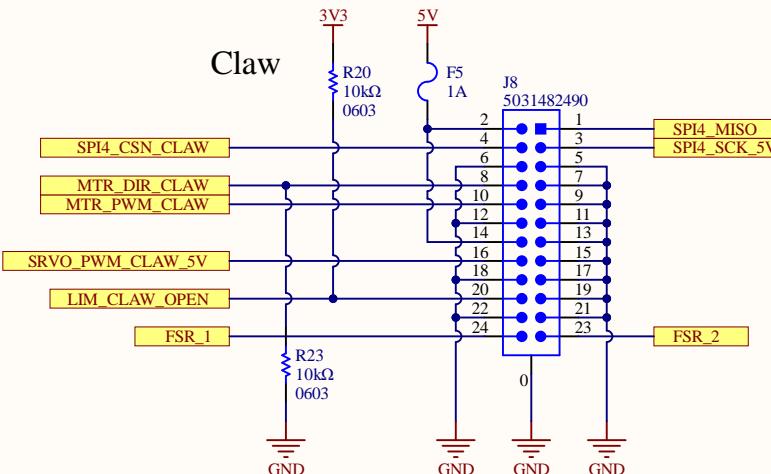
A

Wrist 1



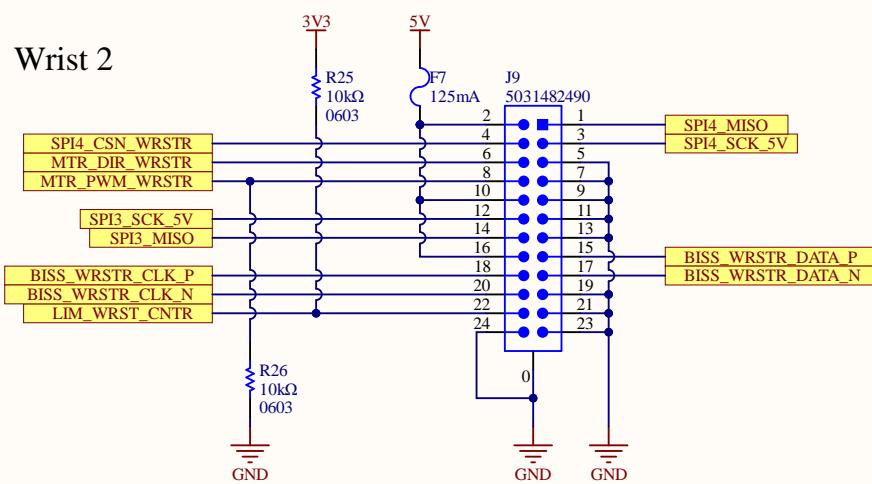
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Claw



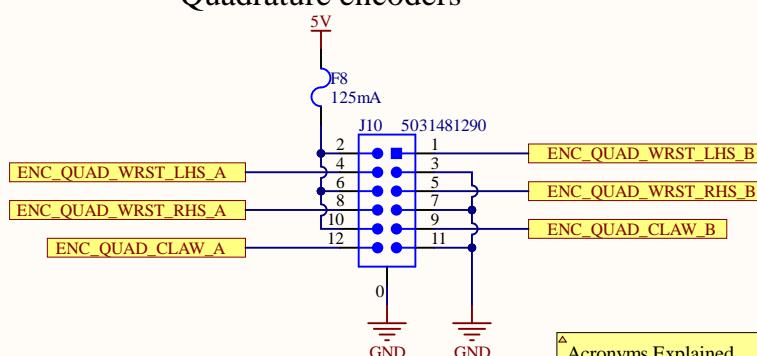
A

Wrist 2



C

Quadrature encoders



D

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Add pull-ups

Netzer Encoders

