

Mounting Holes

H?

H?

H?

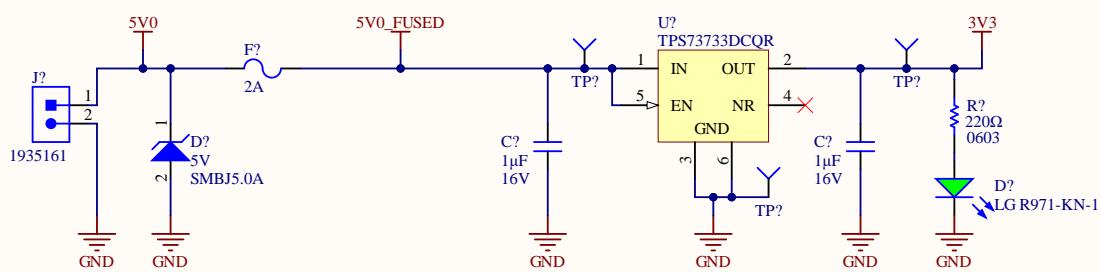
H?

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

B

Add eFuse for Rev 3

5V to 3.3V LDO (Max 1A)



Current Calculations

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

C

D

Title: Arm - Power		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6	
Size: Letter	Drawn By: Kyle Hong, Lance Bantoto		
Date: 2020-11-05	Sheet 1 of 7		
File: C:\Users\lance\GitHub\MarsRover2020-PCB\Projects\Arm\Rev2\SH1 - POWER.SchDoc			

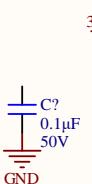
A

A

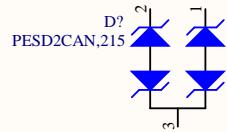
CAN Transceivers

B

B



CAN1_TX
CAN1_RX
CAN2_TX
CAN2_RX



R?
120Ω
0603

CAN1_P
CAN1_N

D

D

CAN2_P
CAN2_N

Title: Arm - CAN Transceivers

Size: Letter Drawn By: Kyle Hong, Lance Bantoto

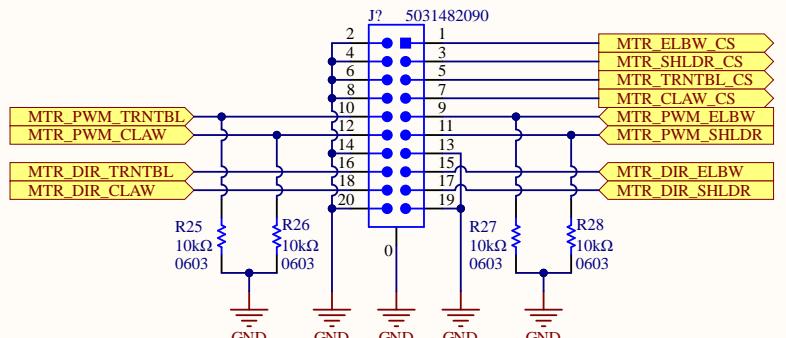
Date: 2020-11-05 Sheet 1 of 9

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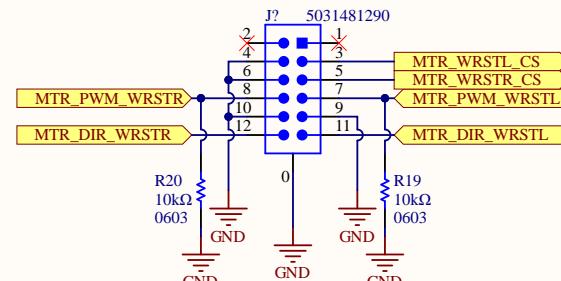
UW Robotics
200 University Avenue
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Canada N2L 3G6

UW
ROBOTICS
TEAM

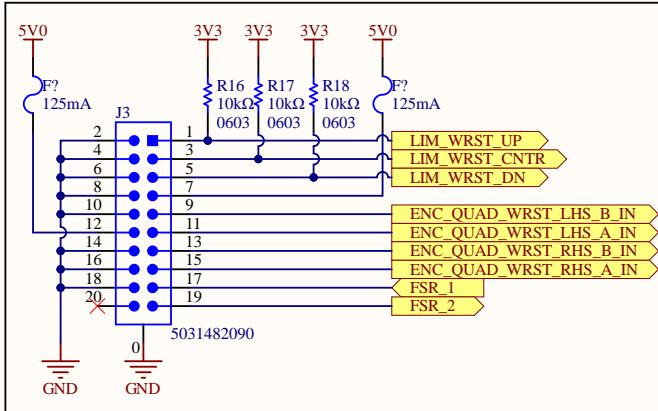
Motor Driver and Current Sensor



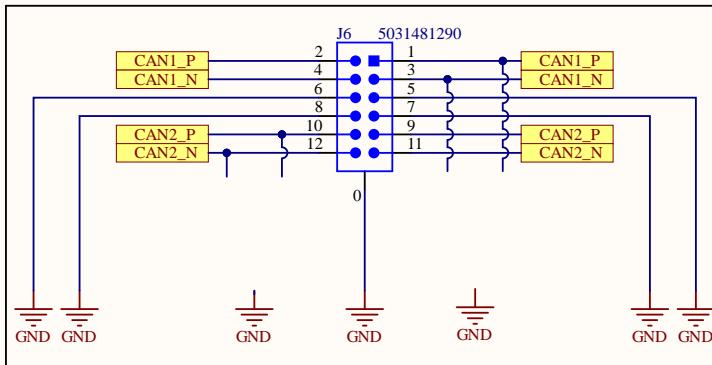
Wrist Motor Driver and Current Sensor



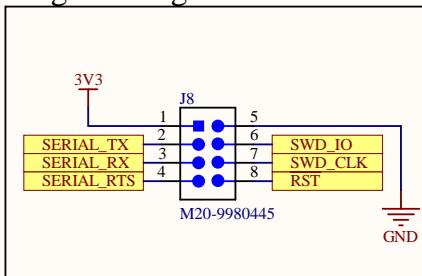
FSR and Wrist



CAN Connections



Programming Connector

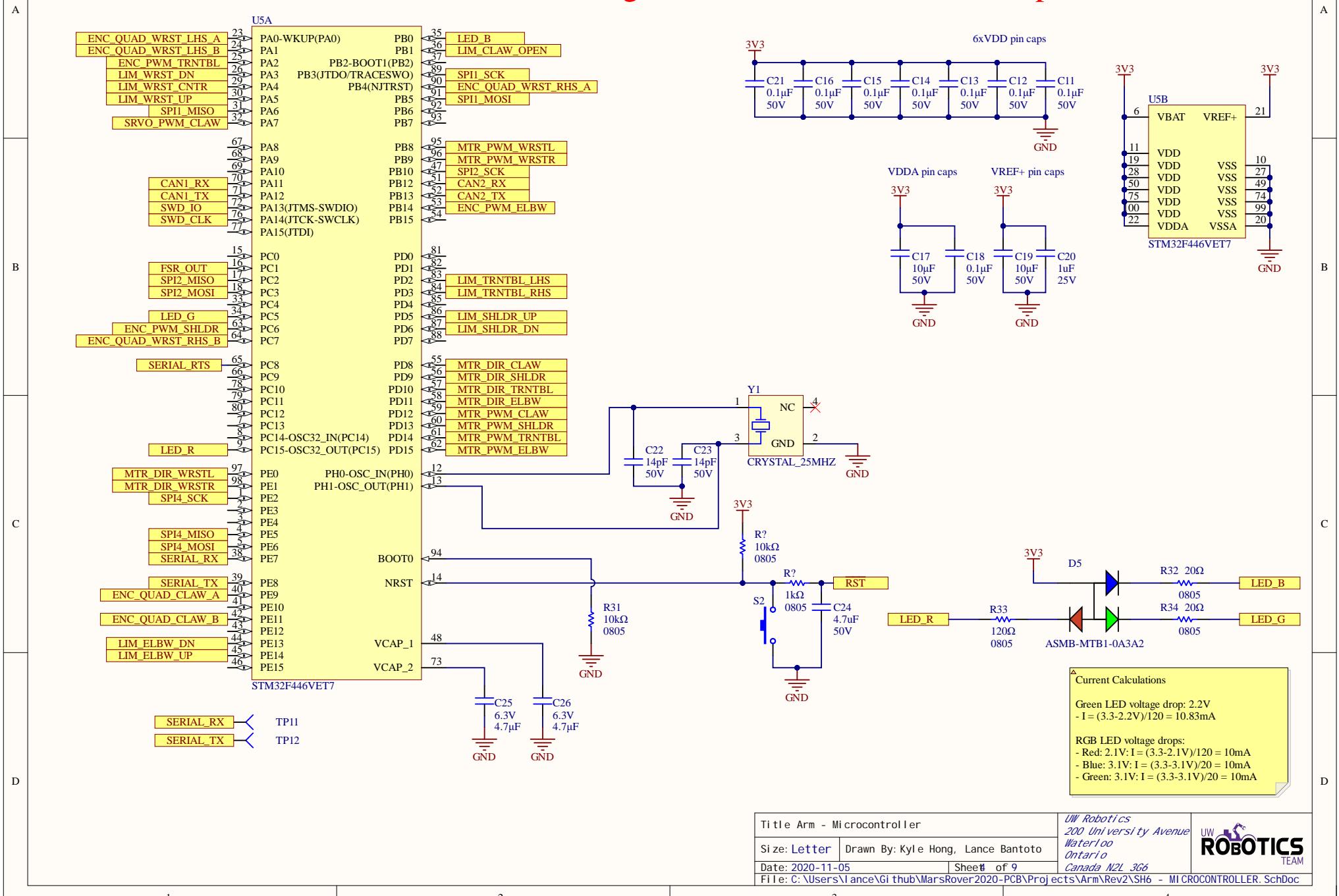


[△] Acronyms Explained
 FSR: Force Sensitive Resistor
 CLAW: Claw
 WRST: Wrist
 SHLDR: Shoulder
 ELBW: Elbow
 TRNTBL: Turntable
 DIR: Direction for motors
 CS: Analog current sensor signal

Bypass Capacitors

STM32F446VET7

Configure one more SPI bus and CS pins



Force Sensitive Resistor

A

[△]Sensor:
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

[△]Differential amplifier gain:
 $A_v = 825k/165k = 5$

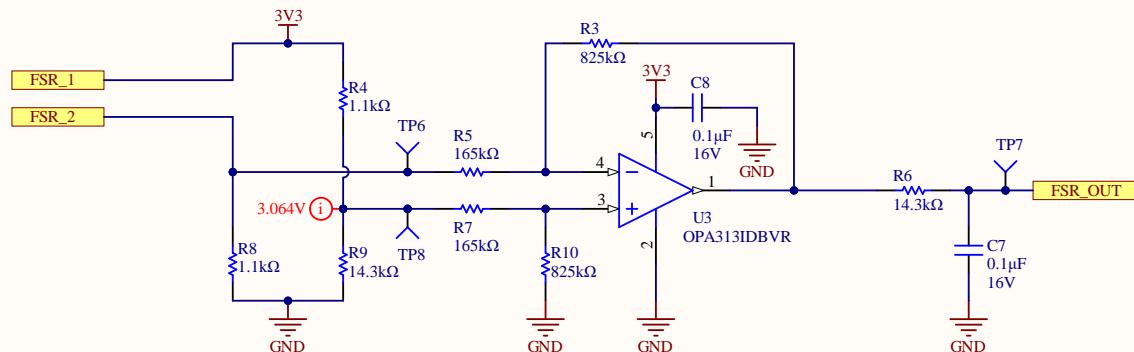
Wheatstone bridge voltage output values:
At 20N, $V_{out} = 3.2V$
At 100N, $V_{out} = 0.5V$

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-aMdlyAMP5zl6xFD8GluJzvmOR8Y5Kzd1RN0/edit#gid=0>

B

Wheatstone Bridge



Differential Amplifier

C

1

2

3

4

Title: Arm - Claw Sensor

Size: Letter Drawn By: Ayesha Ebrahim

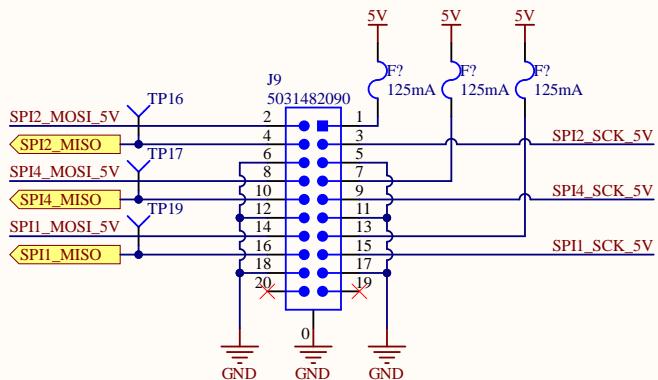
Date: 2020-11-05 Sheet of 9 Canada N2L 3G6

File: C:\Users\lance\GitHub\MarsRover2020-PCB\Projects\Arm\Rev2\SH8 - FORCE SENSITIVE RESISTOR SchDoc

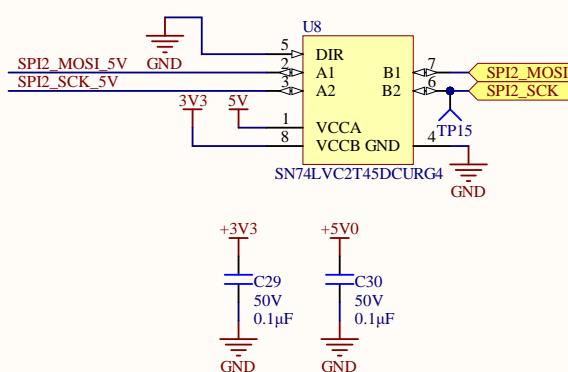


A

Broadcom Encoders



B

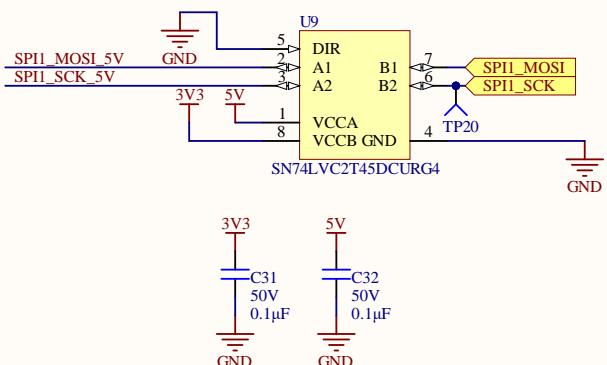


Encoder manufacturer: Broadcom
Encoder part number: AEAT-6012-A06
Did not level shift MISO signals since the STM32 SPI peripheral is 5V tolerant

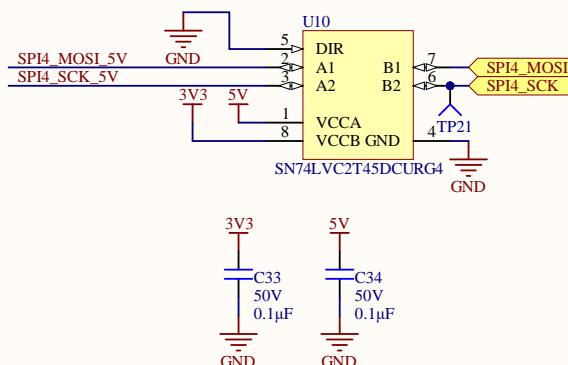
A

C

Change level shifters and remove MOSI



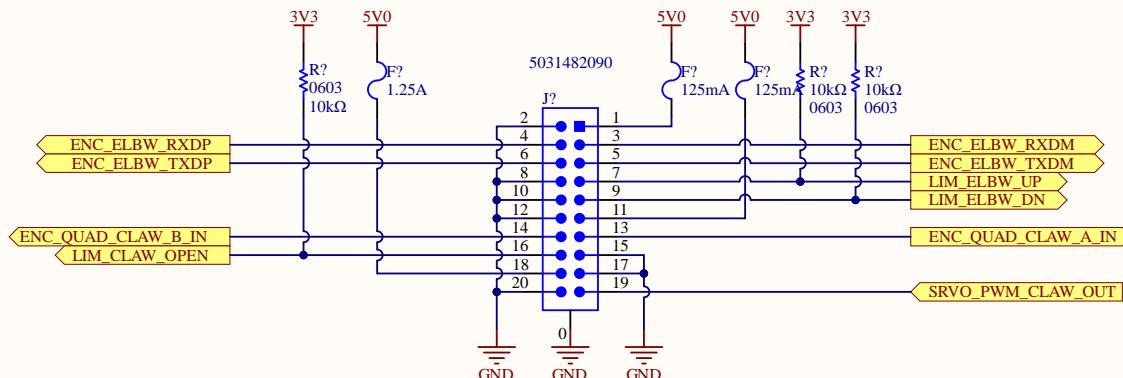
D



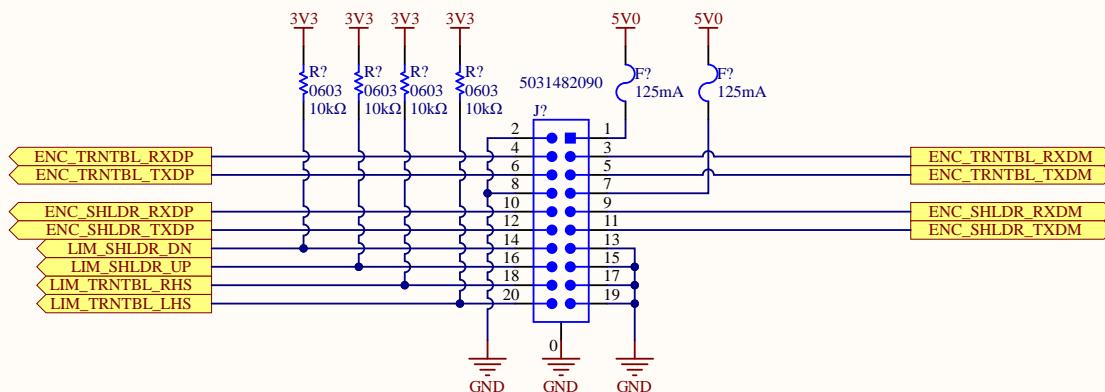
C

D

Elbow and Claw



Shoulder and Turntable



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File: C:\Users\lance\GitHub\MarsRover2020-PCB\Projects\Arm\Rev2\SH3 - CONNECTORS_2.SchDoc	*

A

A

Netzer Encoders

B

B

Add transceivers and level shifters and pull-ups

C

C

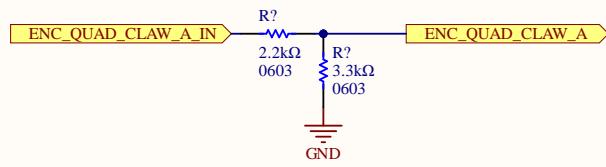
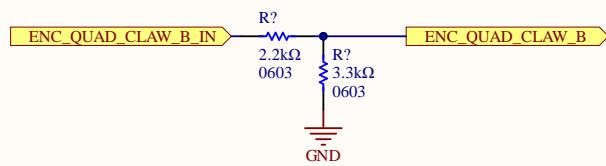
D

D

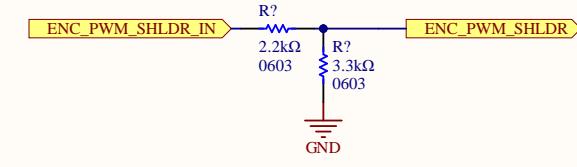
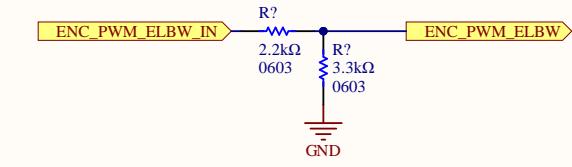
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A

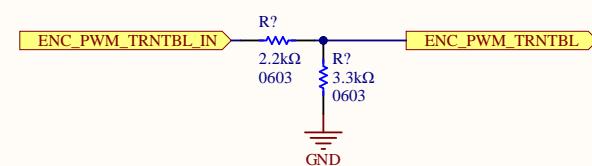
5V-3V Voltage Dividers



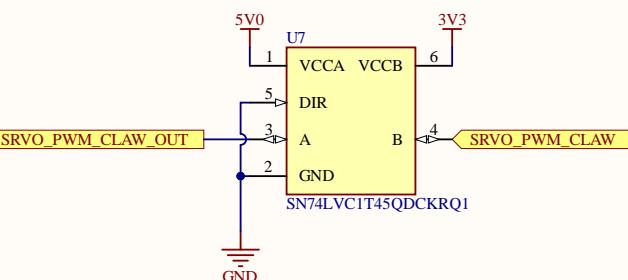
B



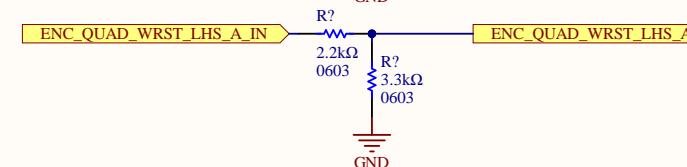
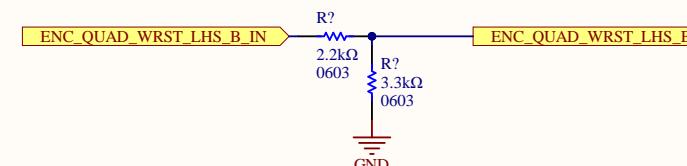
C



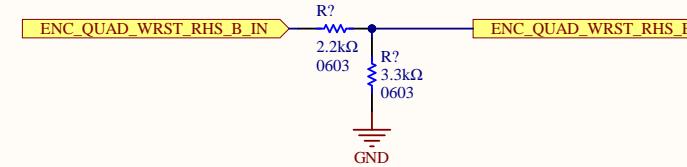
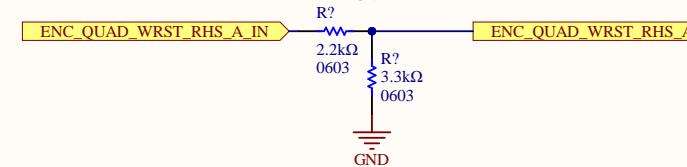
D



A



B



C

Title *	*	*
Size: Letter	Drawn By: Kyle Hong, Lance Bantoto	*
Date: 2020-11-05	Sheet of *	*
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