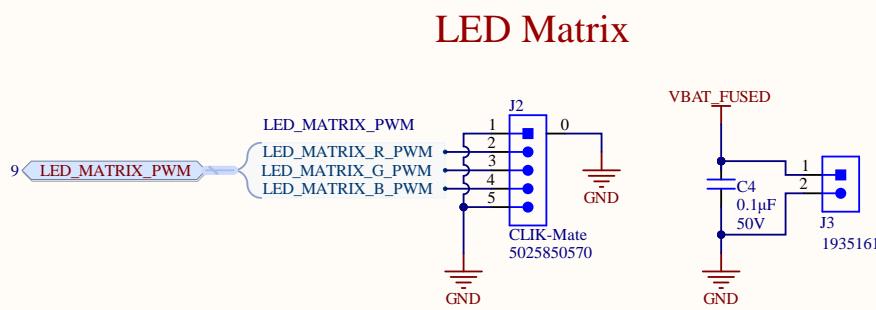
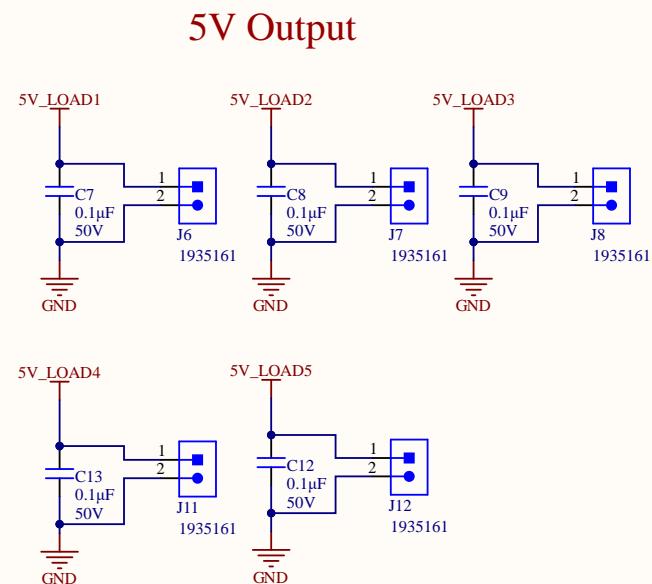


A



B



D

### Mounting Holes

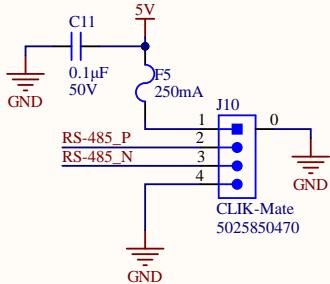
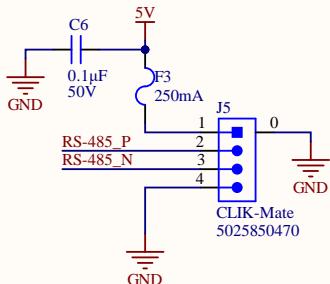
MH1  
MOUNTING\_HOLE\_5/32

MH3  
MOUNTING\_HOLE\_5/32

MH2  
MOUNTING\_HOLE\_5/32

MH4  
MOUNTING\_HOLE\_5/32

### URM04 Ultrasonic Sensors

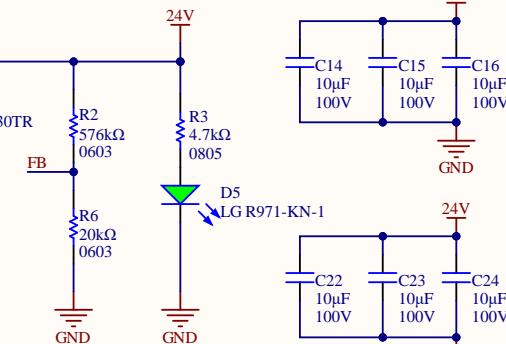
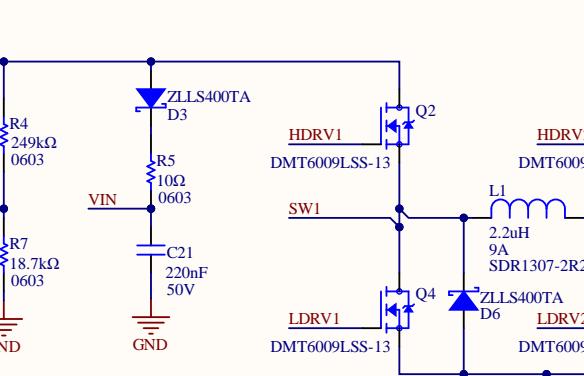
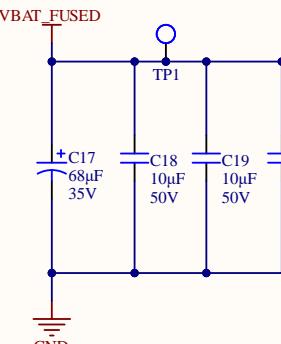


Input voltage range: 18-25.8V

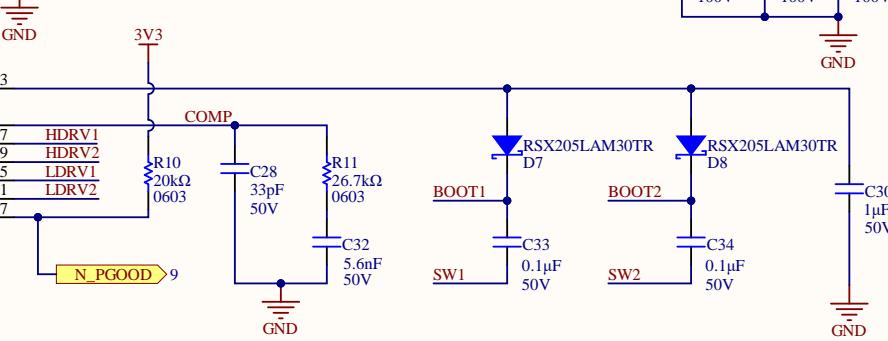
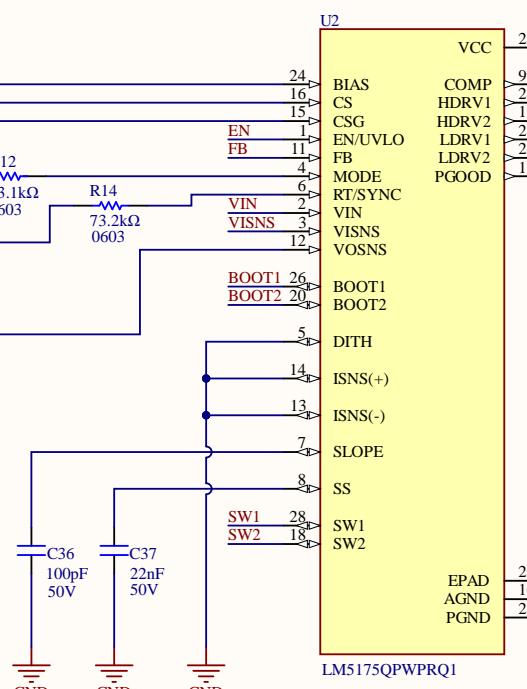
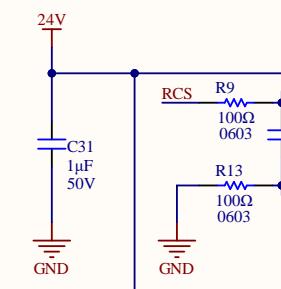
## 24V Buck-Boost Converter @ 3A Max

LED forward drop = 2.0V

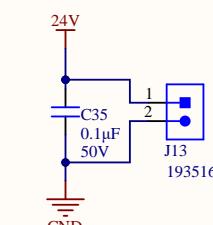
LED current =  $(24-2)/4700 = 4.7mA$



Inductor: SDR1307-2R2ML  
20%, 6mΩ DCR  
9A (rms), 18A (sat), 7mm tall



## 24V Output



Title PDB Rev2 - 24V Buck-Boost Converter

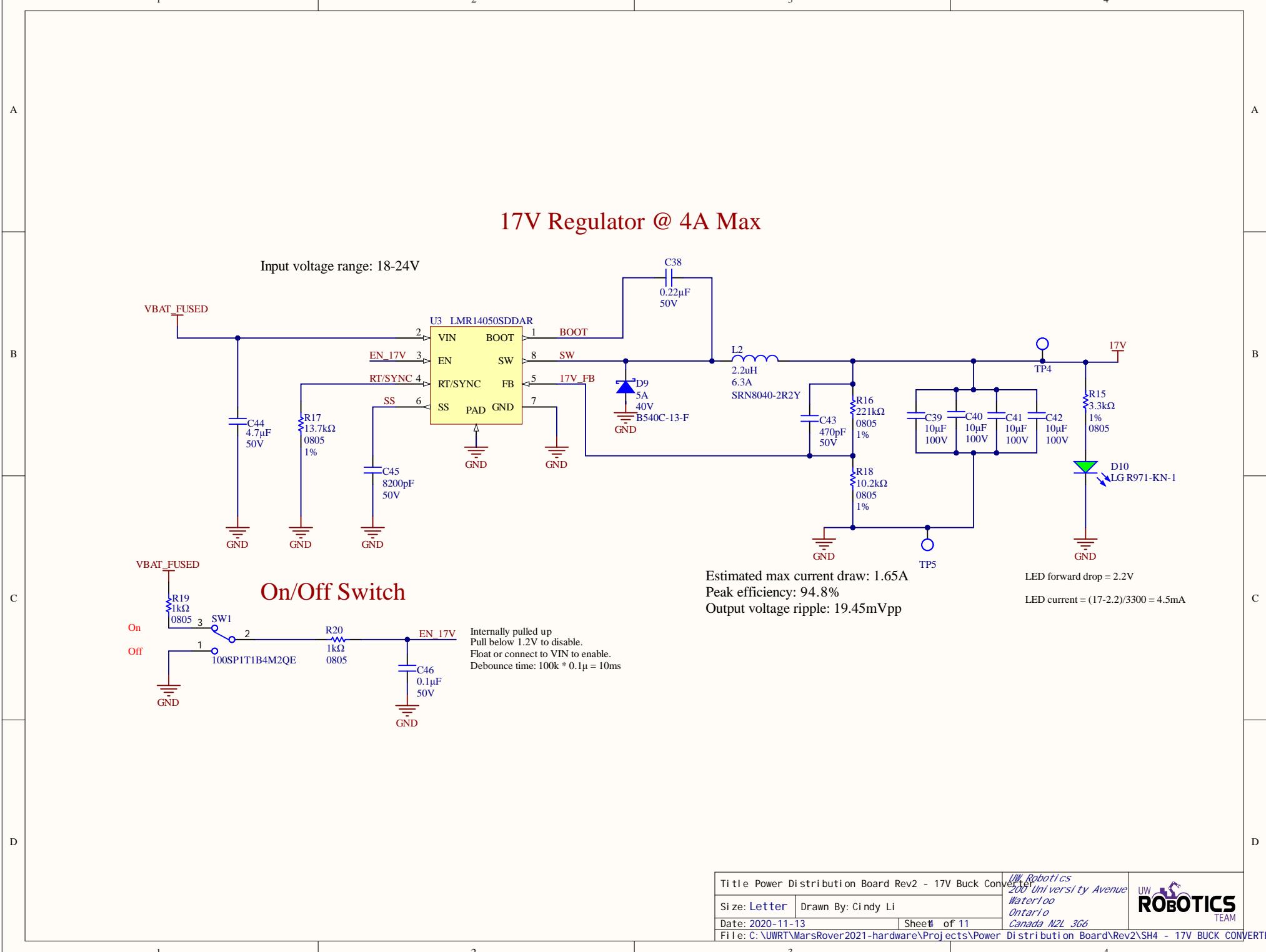
Size: Letter Drawn By: Cindy Li

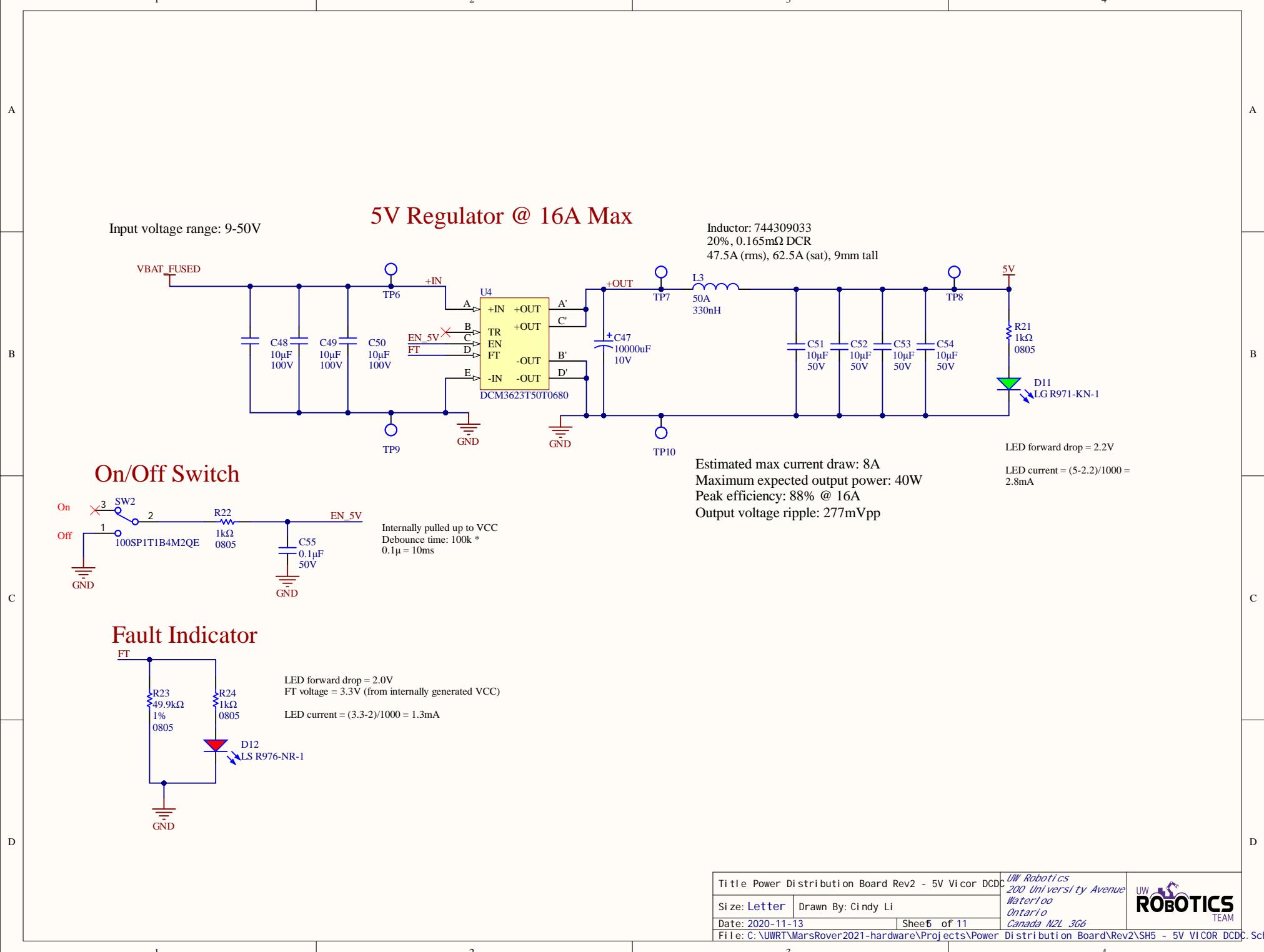
Date: 2020-11-13 Sheet 8 of 11

File: C:\UWRT\MarsRover2021-hardware\Projects\Power

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A

A

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B

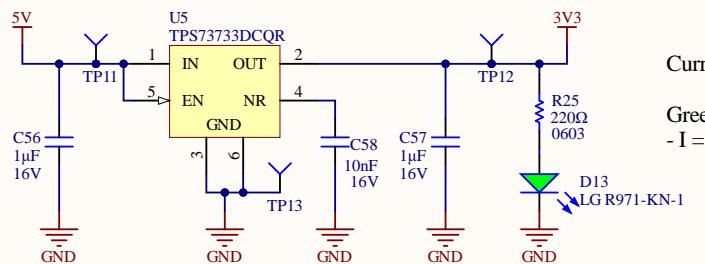
C

C

D

D

## 5V to 3.3V LDO @ 1A Max



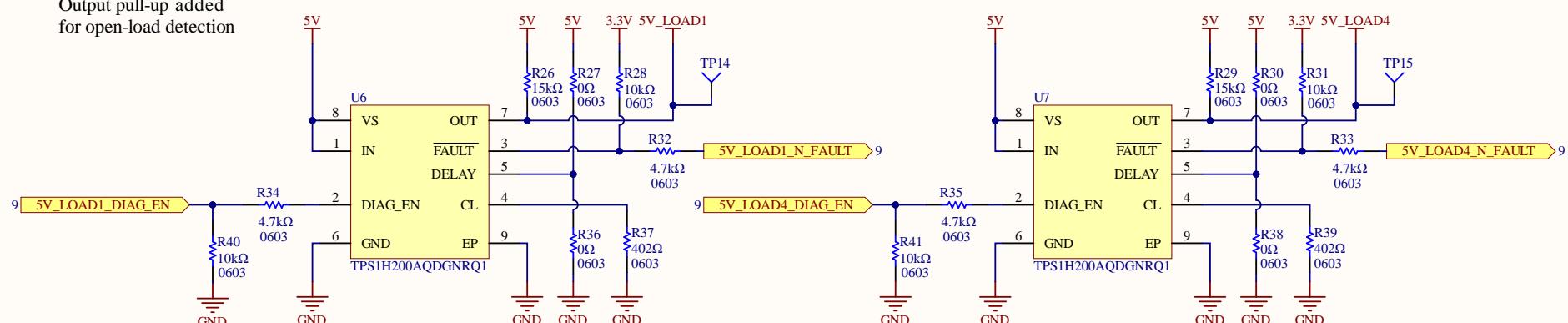
### Current Calculations

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

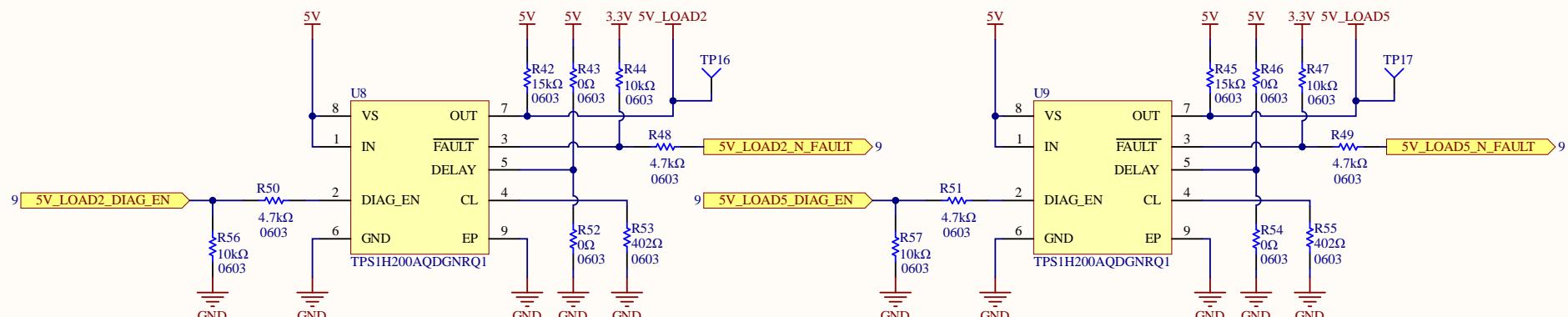
Title Power Distribution Board Rev2 - 3.3V Linear		<i>UW Robotics</i> 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter	Drawn By: Cindy Li	
Date: 2020-11-13	Sheet 6 of 11	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH6 - 3.3V LINEAR REGULATOR.SchDoc		<b>UW ROBOTICS TEAM</b>

## 5V Loads Smart Switches

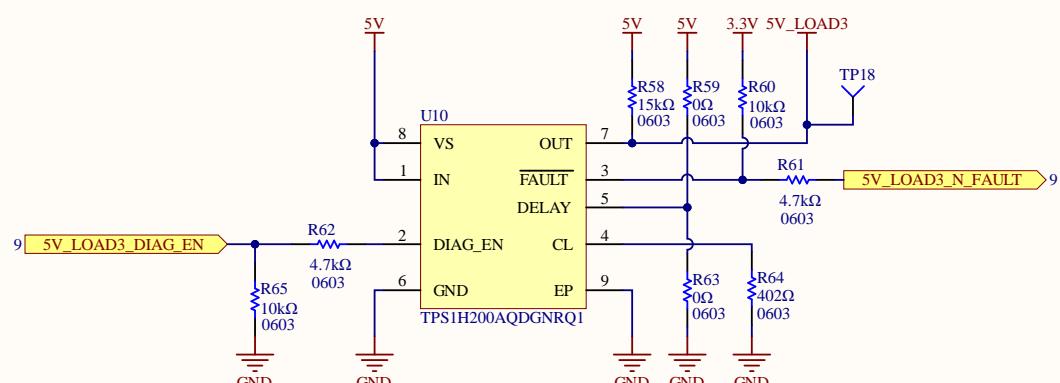
A  
Output pull-up added for open-load detection



B



C



### Smart Switch Current Limited to 5A

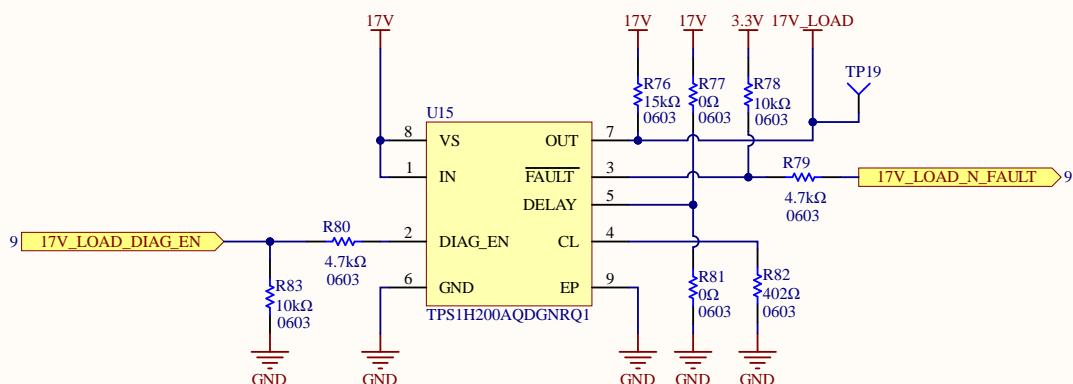
- $I_{out} = 5A$ ,  $V_{CL(th)} = 0.8V$ ,  $K_{CL} = 2500$  (values from datasheet)
- $R_{CL} = V_{CL(th)} * K_{CL} / I_{out} = 0.8 * 2500 / 5 = 400\Omega \rightarrow$  use  $R_{CL} = 402\Omega$

### Current Limit Configurations - Refer to DELAY Pin

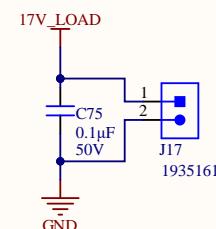
- Holding mode: depopulate pull-up and populate pull-down with a  $0\Omega$  resistor
- Latch-off mode: depopulate pull-up and populate pull-down with a capacitor or (calculated based on required delay time)
- Auto-retry mode: populate pull-up with a pull-up resistor and depopulate pull-down

A

## 17V Load Smart Switch

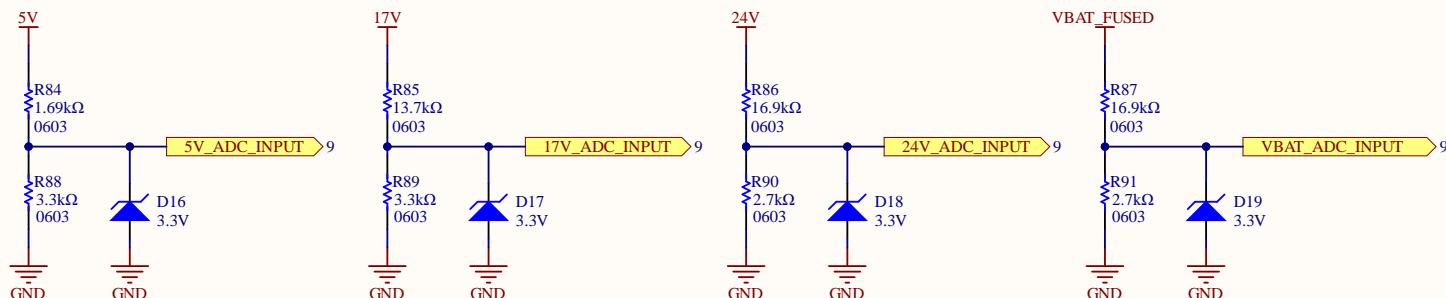


## 17V Output



B

## Power Rail Voltage Monitoring



Divides 5V to 3.3V

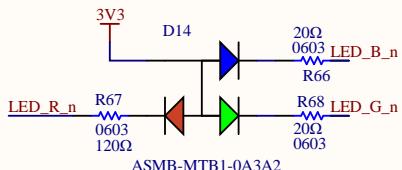
Divides 17V to 3.3V

Divides 24V to 3.3V

Divides 24V to 3.3V

D

## Status LED

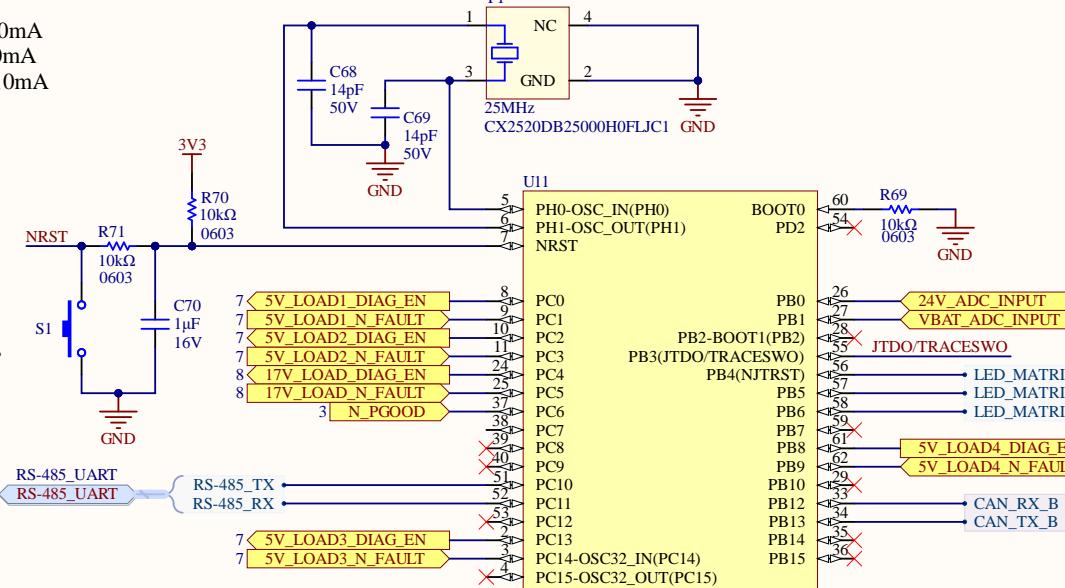


## Current Calculations

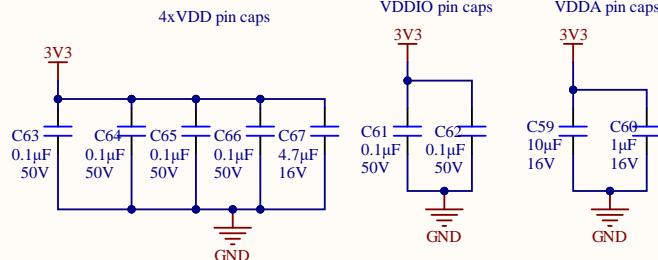
### RGB LED voltage drops:

- Red: 2.1V:  $I = (3.3 - 2.1V) / 120 = 10mA$
- Blue: 3.1V:  $I = (3.3 - 3.1V) / 20 = 10mA$
- Green: 3.1V:  $I = (3.3 - 3.1V) / 20 = 10mA$

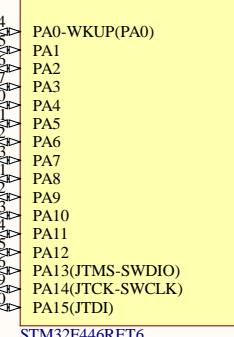
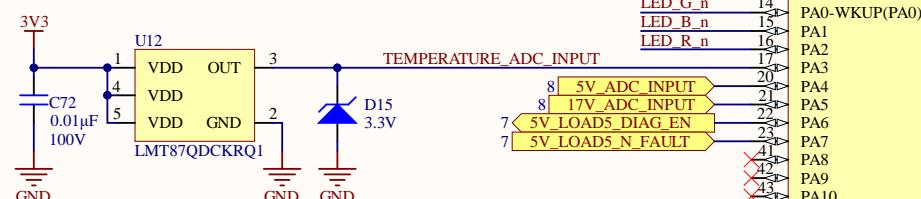
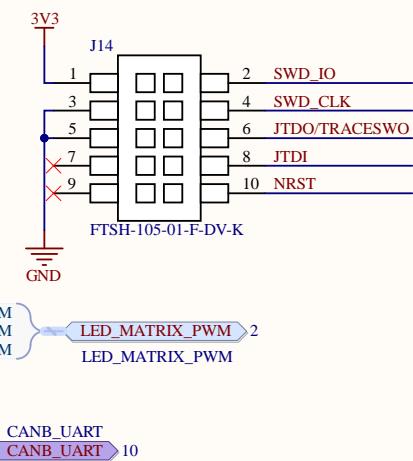
## STM32F446RET6



## Decoupling Caps



## Debug/Programming



Title Power Distribution Board Rev2 - MCU

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Date: 2020-11-13 Sheet 9 of 11

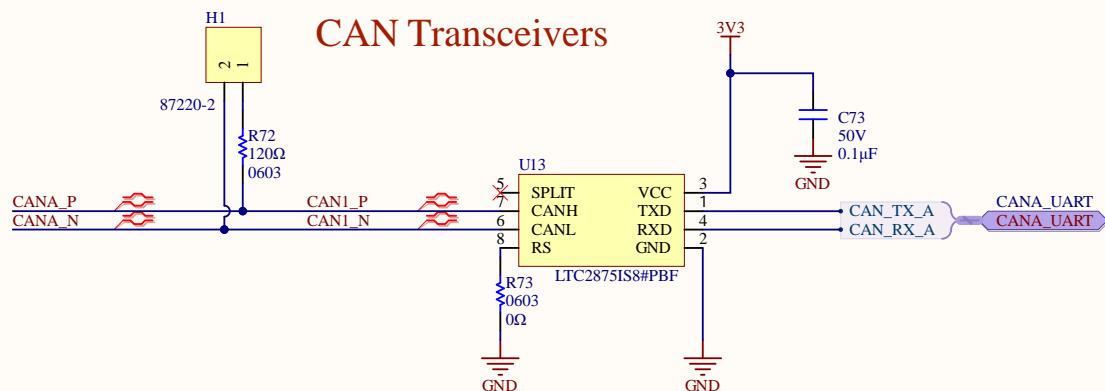
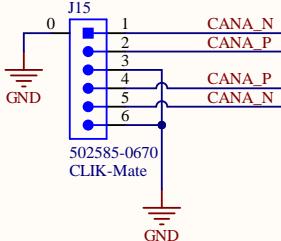
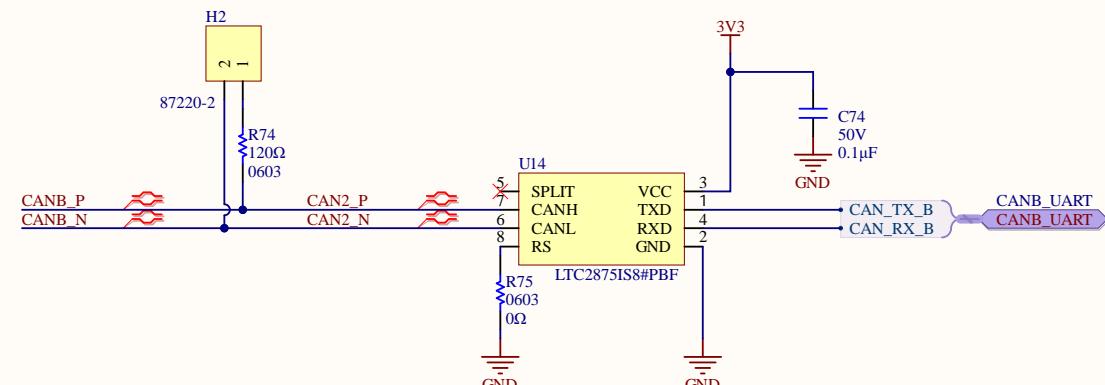
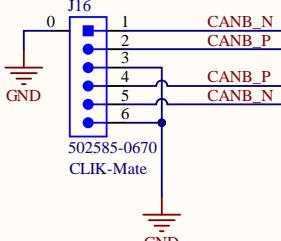
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**CAN BUS A****CAN BUS B**

A

A

B

B

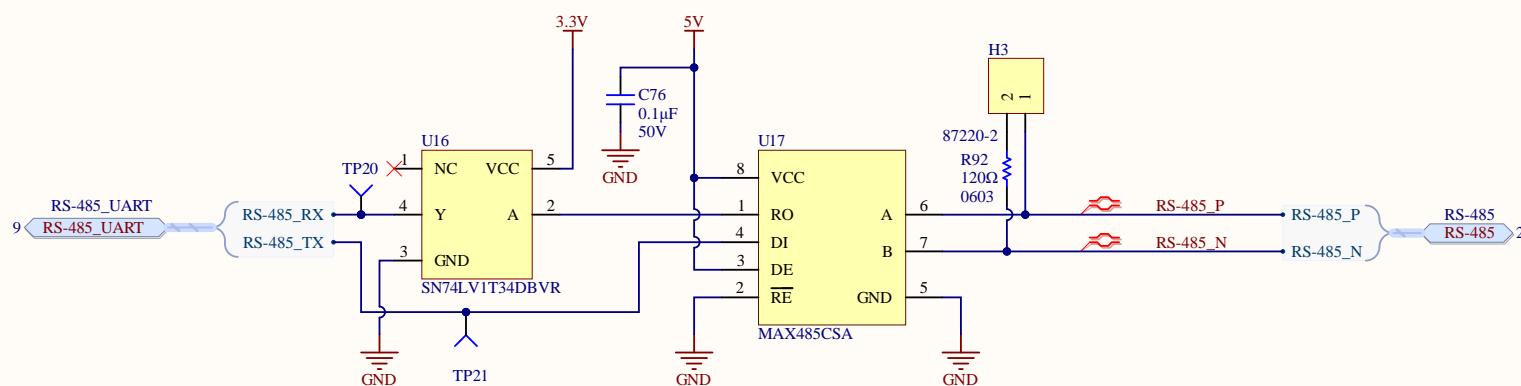
C

C

D

D

## RS-485 Transceiver



Title Power Distribution Board Rev2 - RS-485		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6	<b>UW</b> <b>ROBOTICS</b> TEAM
Size: Letter	Drawn By: Cindy Li		
Date: 2020-11-13	Sheet 1 of 11		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH11 - RS-485.SchDoc			

