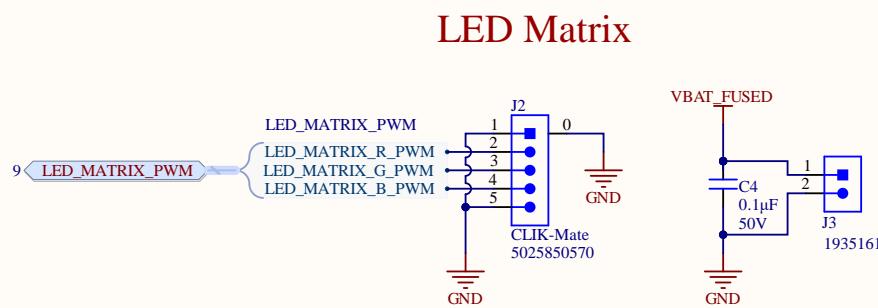
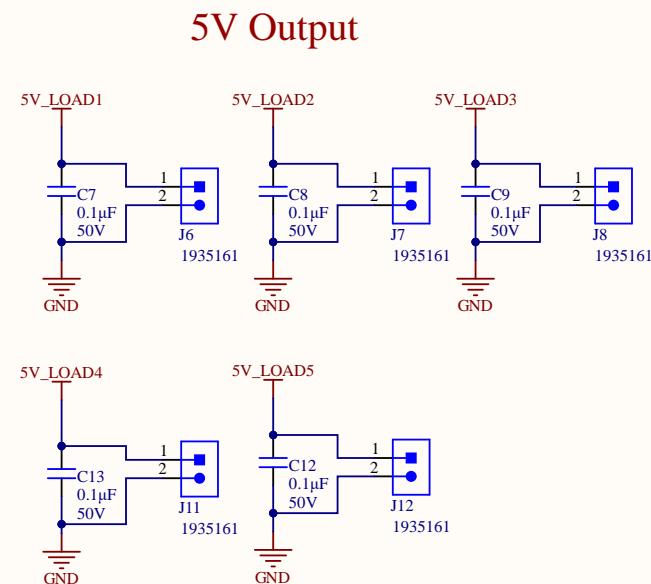


A



B



D

Mounting Holes

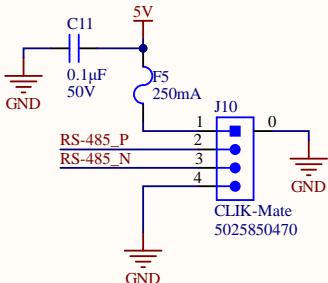
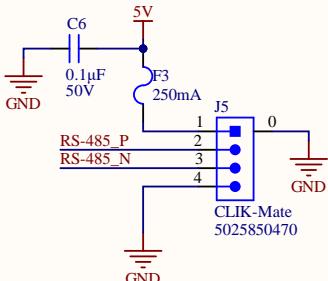
MH1
MOUNTING_HOLE_5/32

MH3
MOUNTING_HOLE_5/32

MH2
MOUNTING_HOLE_5/32

MH4
MOUNTING_HOLE_5/32

URM04 Ultrasonic Sensors



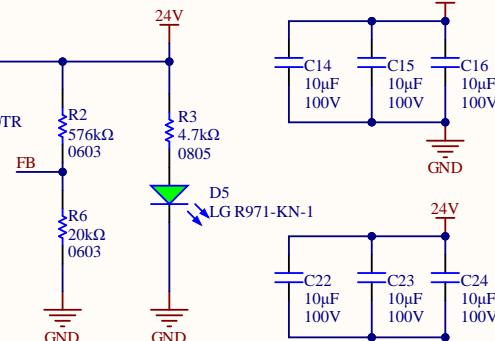
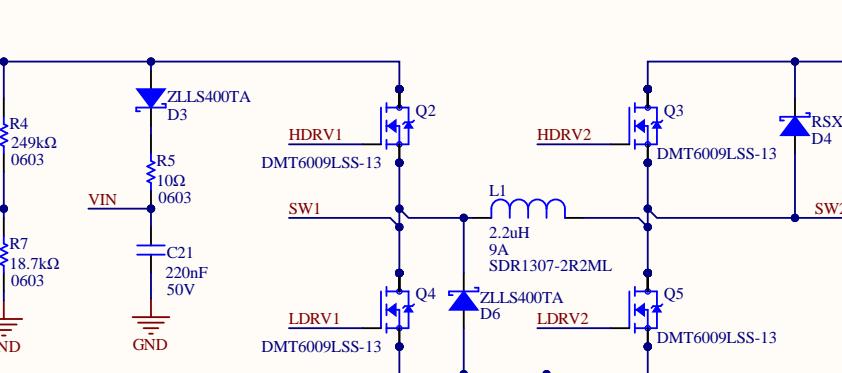
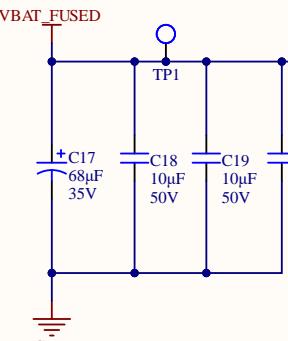
RS-485
11 ────────── RS-485_P ────────── RS-485_P
 RS-485_N ────────── RS-485_N

Input voltage range: 18-25.8V

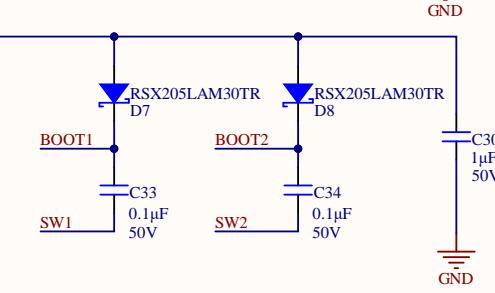
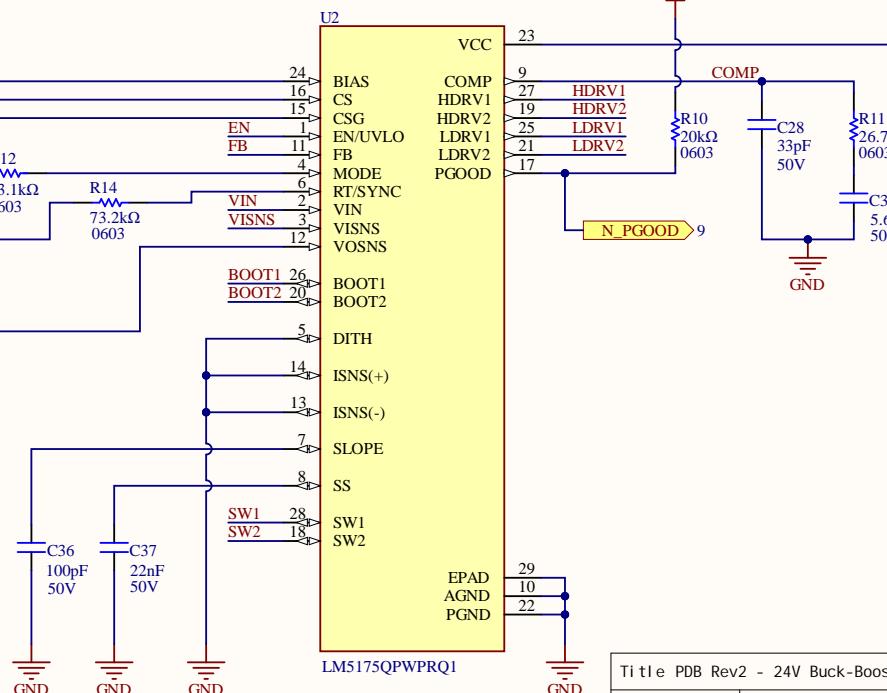
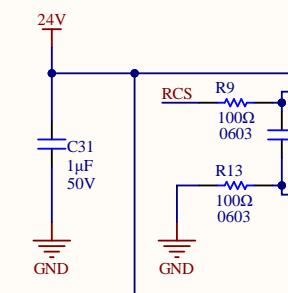
24V Buck-Boost Converter @ 3A Max

LED forward drop = 2.0V

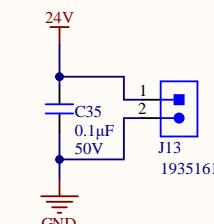
LED current = $(24-2)/4700 = 4.7mA$



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



24V Output



Title PDB Rev2 - 24V Buck-Boost Converter

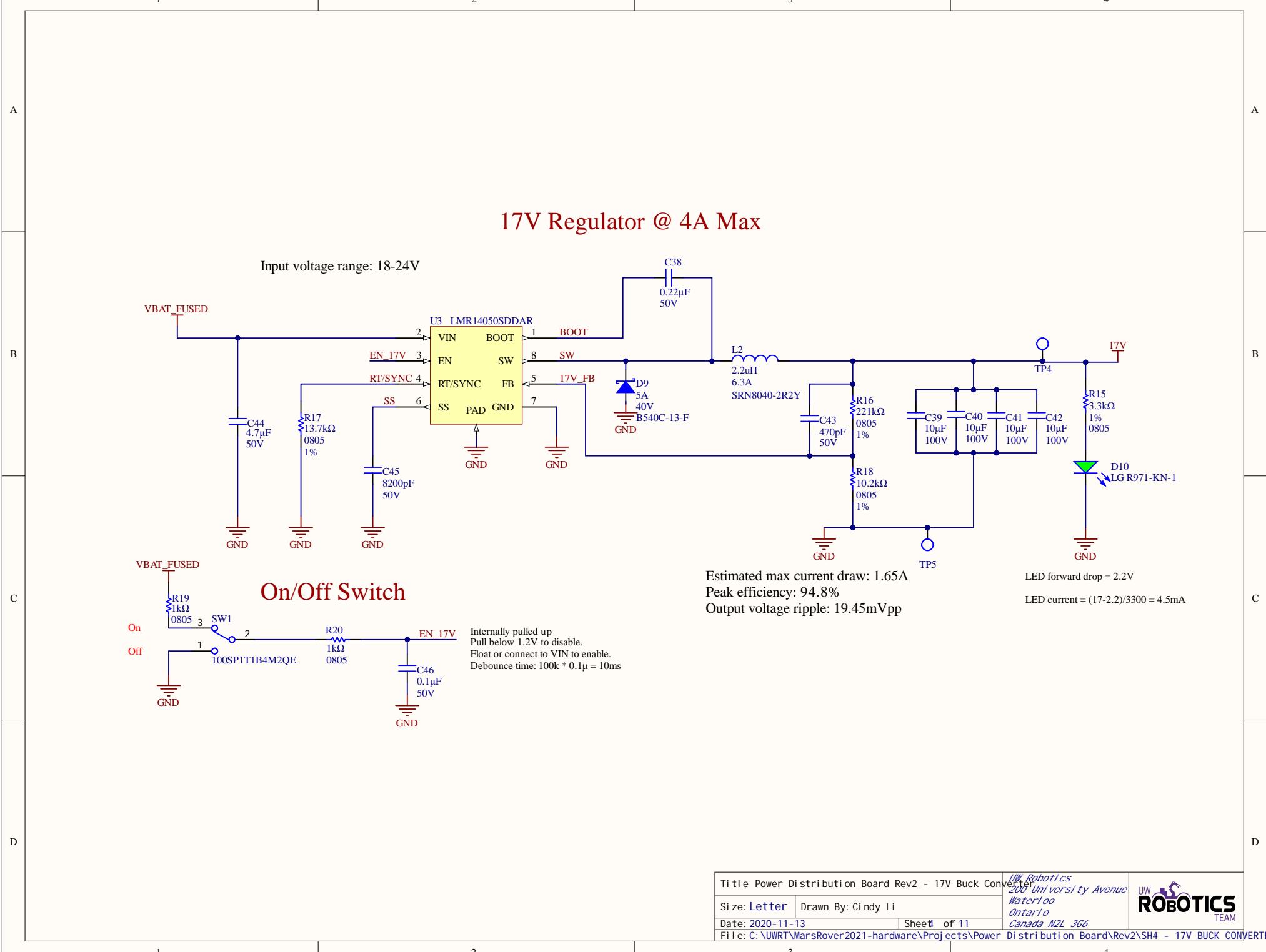
Size: Letter Drawn By: Cindy Li

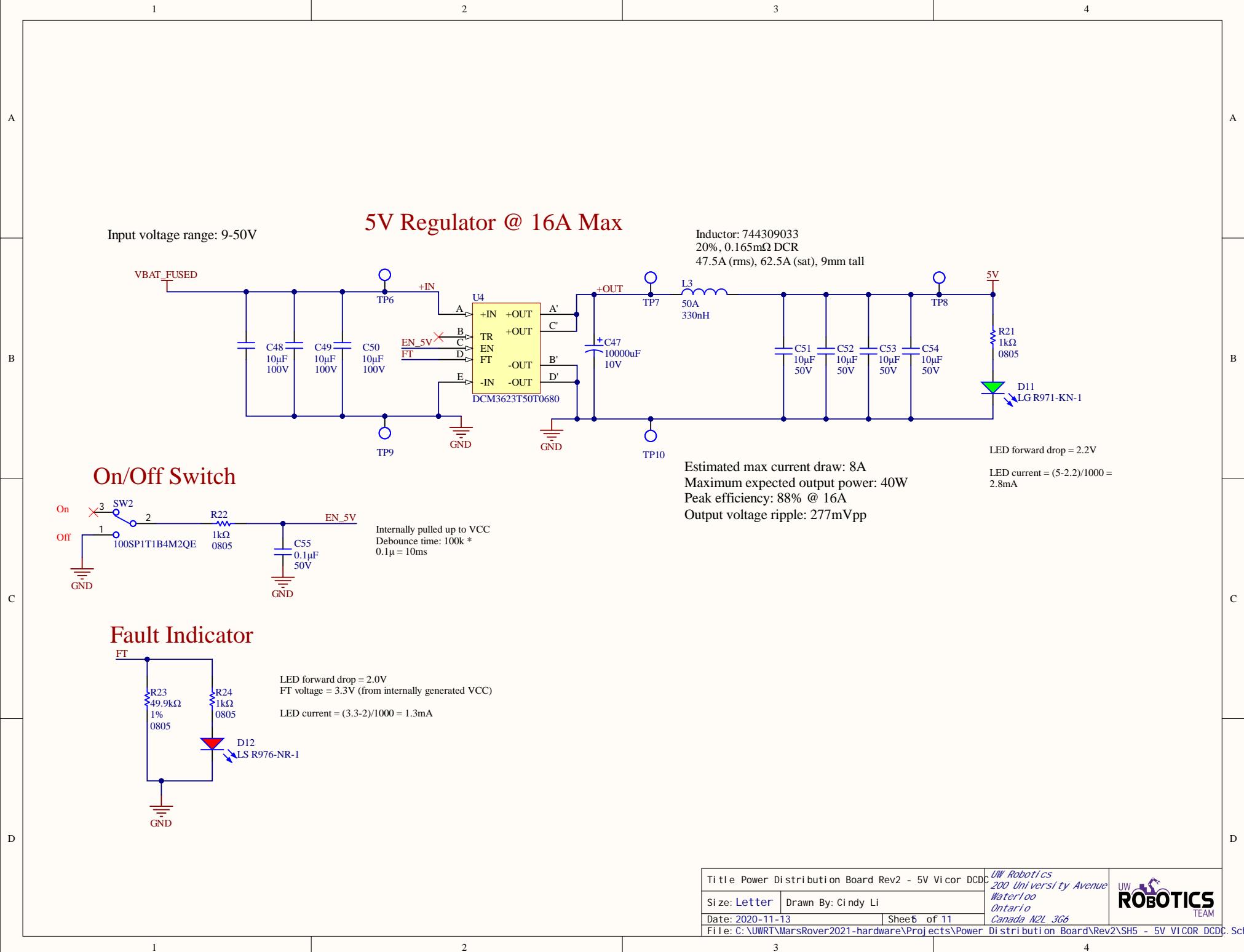
Date: 2020-11-13 Sheet 8 of 11

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

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A

A

B

B

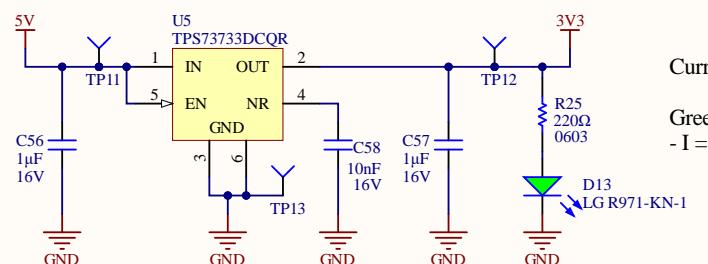
C

C

D

D

5V to 3.3V LDO @ 1A Max



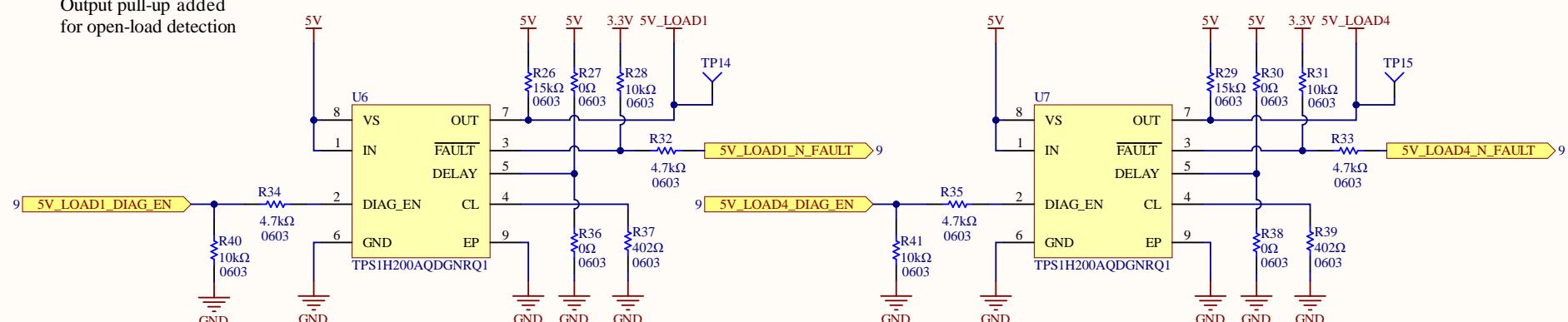
Current Calculations

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

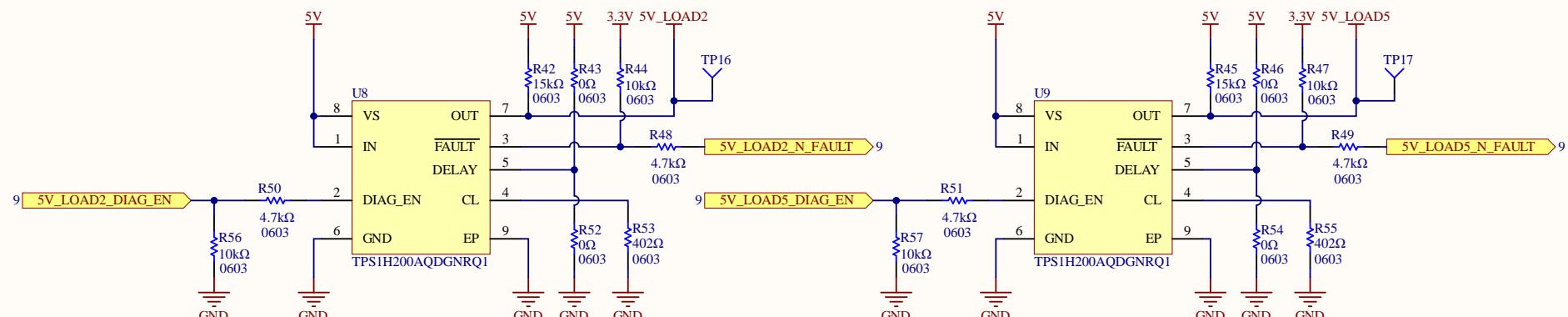
Title Power Distribution Board Rev2 - 3.3V Linear		<i>UW Robotics</i> 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter	Drawn By: Cindy Li	
Date: 2020-11-13	Sheet 6 of 11	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH6 - 3.3V LINEAR REGULATOR.SchDoc	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

5V Loads Smart Switches

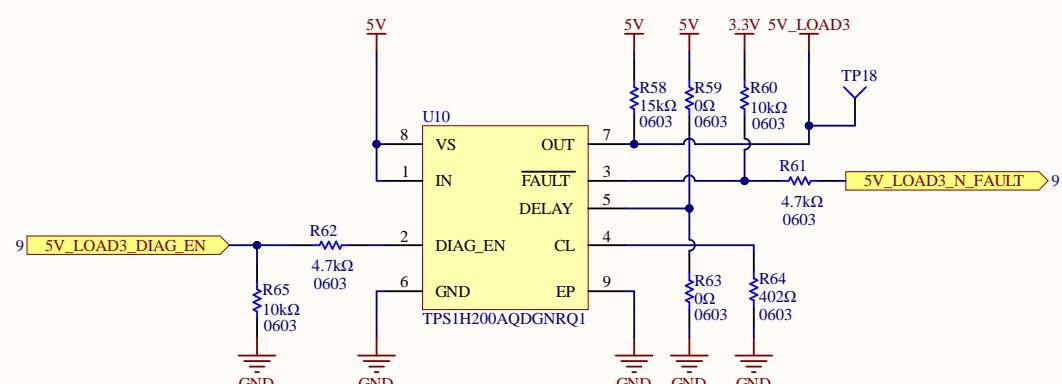
A
Output pull-up added for open-load detection



B



C



Smart Switch Current Limited to 5A

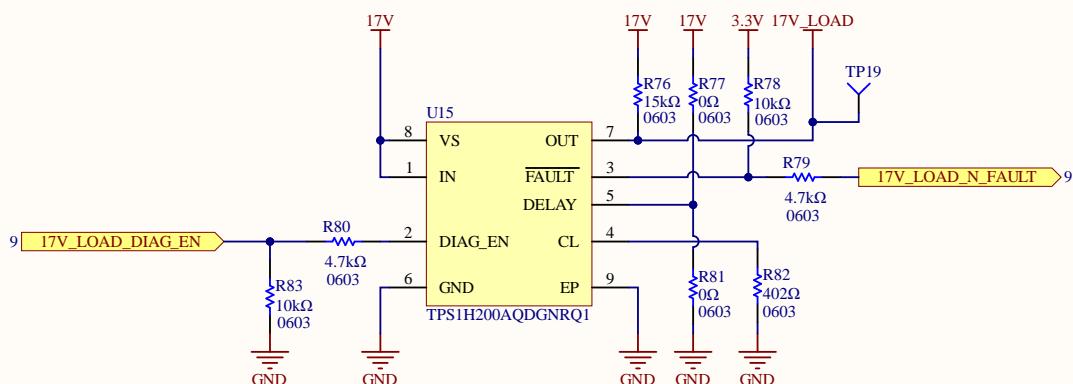
- $I_{out} = 5A$, $V_{CL(th)} = 0.8V$, $K_{CL} = 2500$ (values from datasheet)
- $R_{CL} = V_{CL(th)} * K_{CL} / I_{out} = 0.8 * 2500 / 5 = 400\Omega \rightarrow$ use $R_{CL} = 402\Omega$

Current Limit Configurations - Refer to DELAY Pin

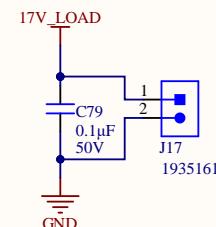
- Holding mode: depopulate pull-up and populate pull-down with a 0Ω resistor
- Latch-off mode: depopulate pull-up and populate pull-down with a capacitor or (calculated based on required delay time)
- Auto-retry mode: populate pull-up with a pull-up resistor and depopulate pull-down

A

17V Load Smart Switch

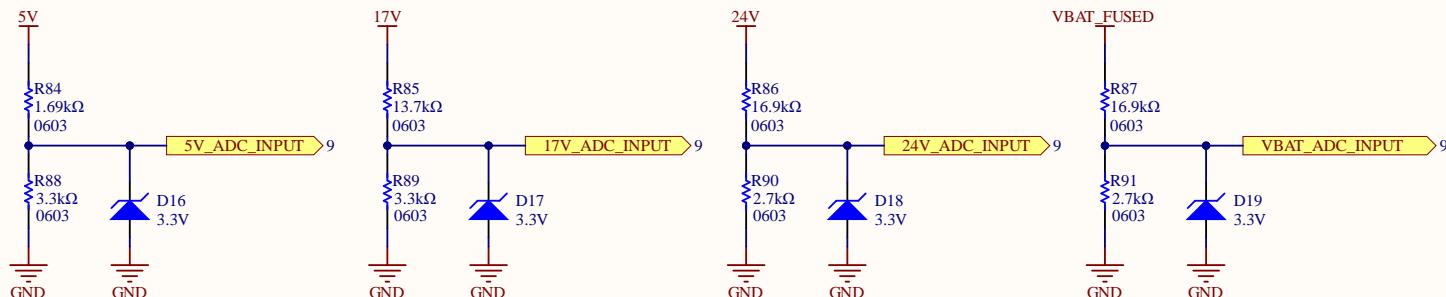


17V Output



B

Power Rail Voltage Monitoring



Divides 5V to 3.3V

Divides 17V to 3.3V

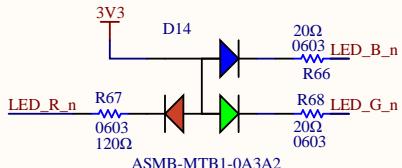
Divides 24V to 3.3V

Divides 24V to 3.3V

C

D

Status LED

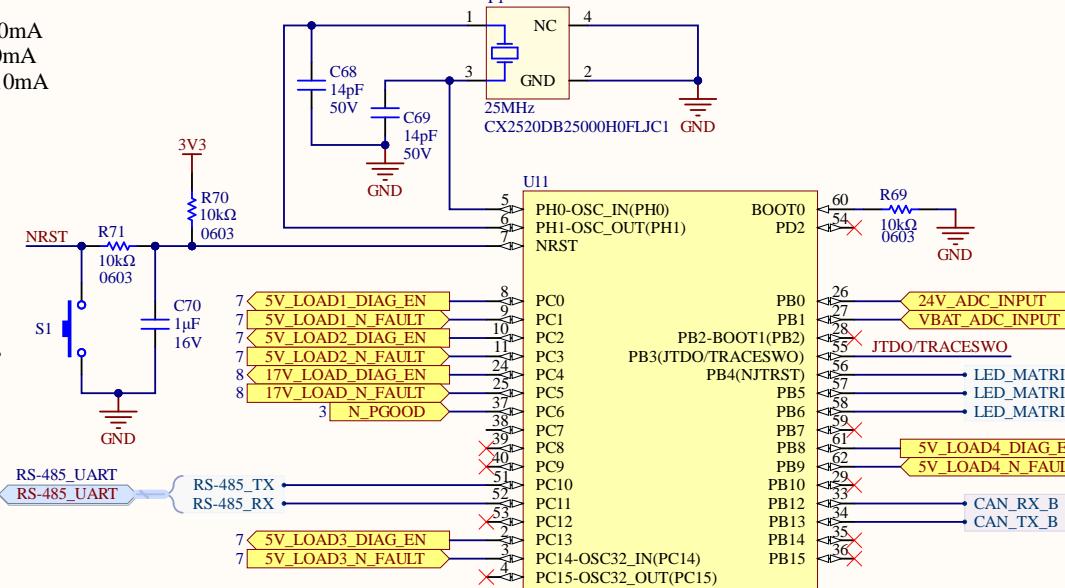


Current Calculations

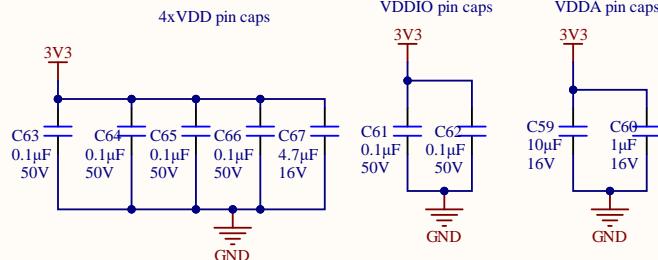
RGB LED voltage drops:

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

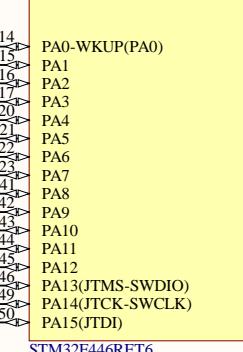
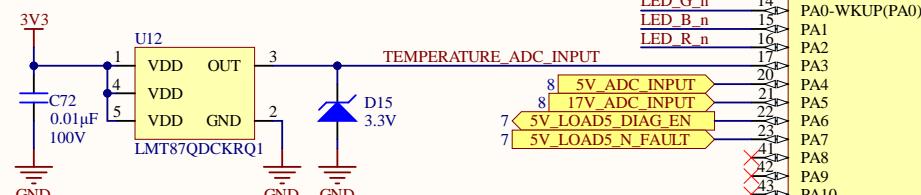
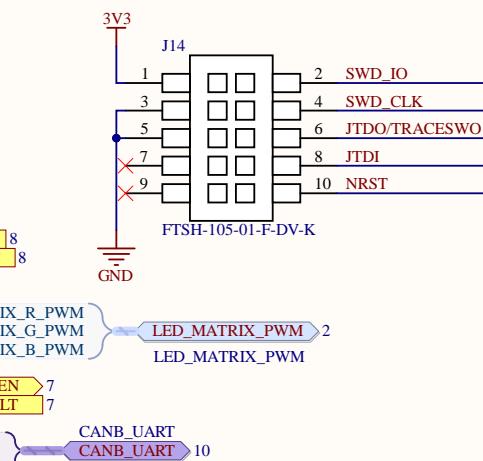
STM32F446RET6



Decoupling Caps



Debug/Programming



STM32F446RET6

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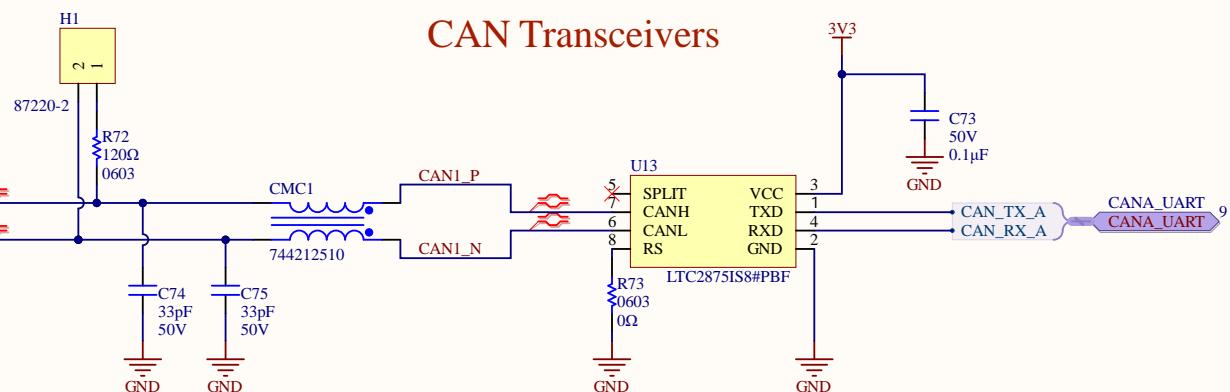
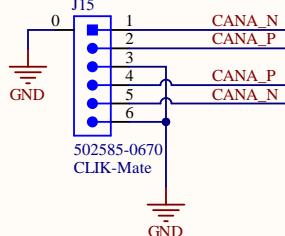
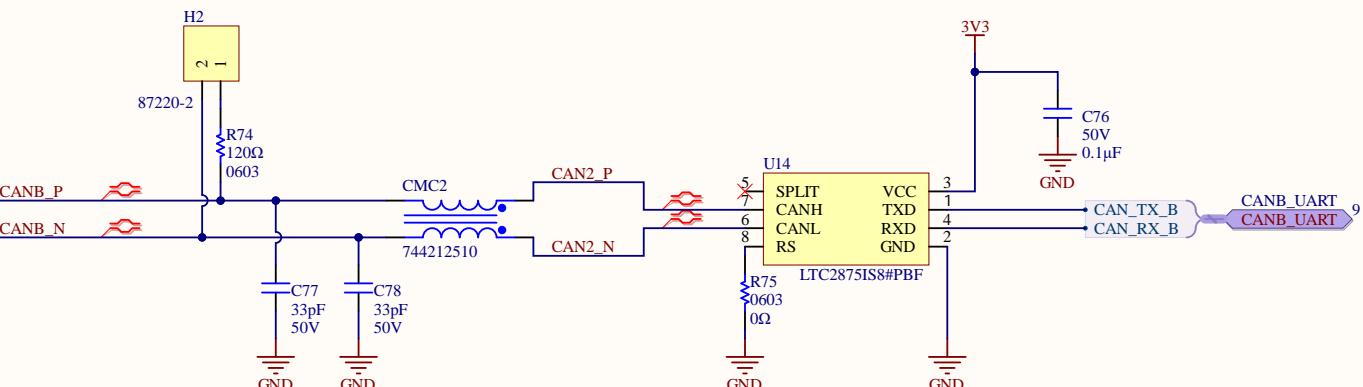
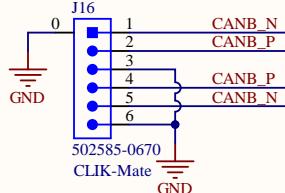
Date: 2020-11-13

Sheet 1 of 11

File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH9 - MICROCONTROLLER.schDoc

A

A

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

A

A

B

B

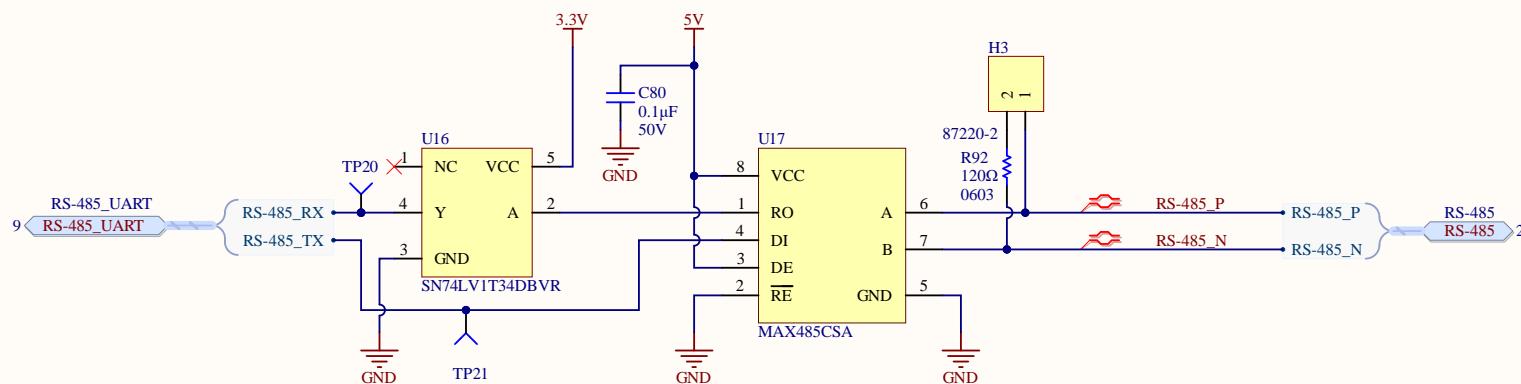
C

C

D

D

RS-485 Transceiver



Title Power Distribution Board Rev2 - RS-485		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6	UW ROBOTICS TEAM
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File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH11 - RS-485.SchDoc			

