

A

A

B

B

C

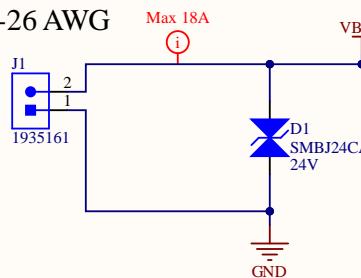
C

D

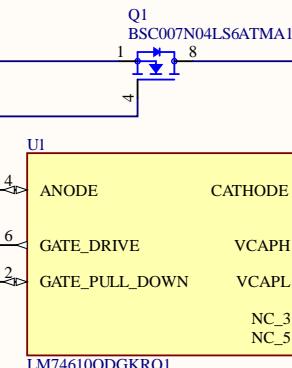
D

Battery Input (6s1p)

12-26 AWG

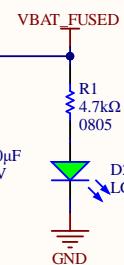


Ideal Diode Controller



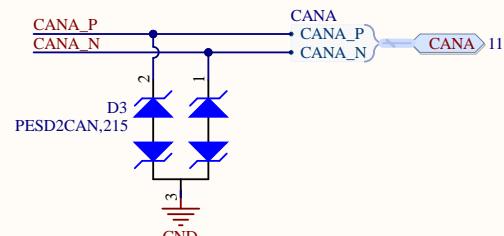
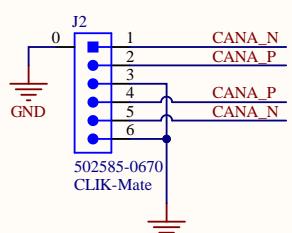
LED forward drop = 2.0V
Max VBAT = 24V
Min VBAT = 18V

Max LED current = $(24-2)/4700 = 4.7\text{mA}$
Min LED current = $(18-2)/4700 = 3.4\text{mA}$

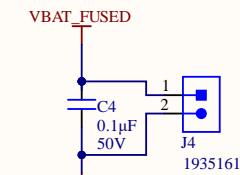
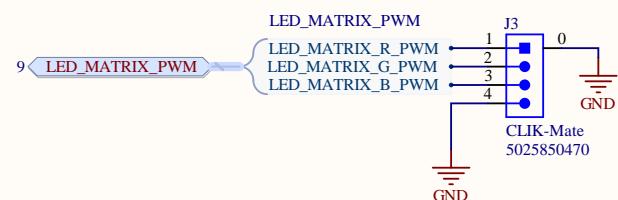


Title: Power Distribution Board Rev2 - Power	Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086	
Size: Letter	Drawn By: Cindy Li	
Date: 2020-11-03	Sheet 1 of 12	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH1 - POWER.SchDoc		UW ROBOTICS TEAM

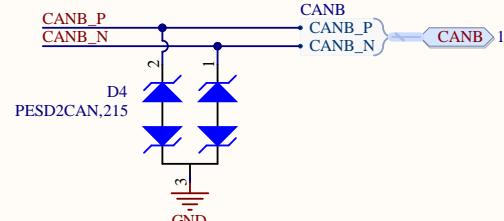
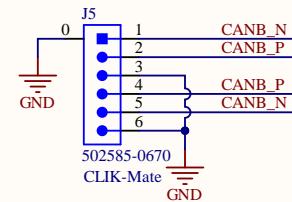
CAN BUS A



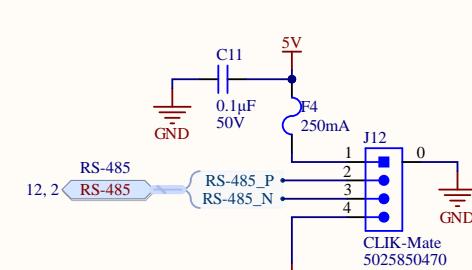
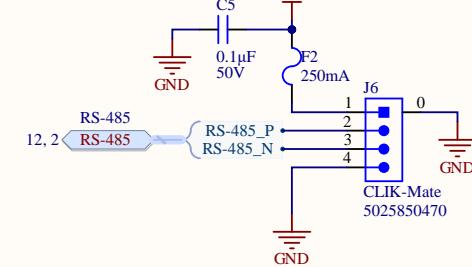
LED Matrix



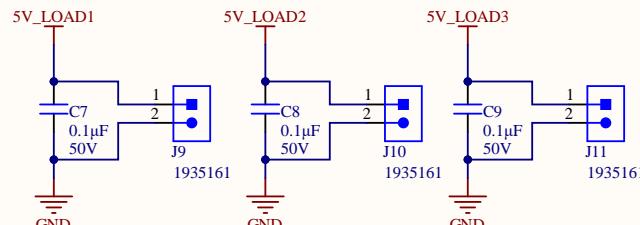
CAN BUS B



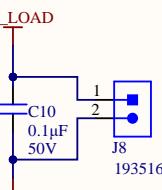
URM04 Ultrasonic Sensors



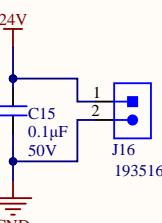
5V Output



17V Output



24V Output



Can use 12-26AWG

Title Power Distribution Board Rev2 - Connectors

Size: Letter Drawn By: Cindy Li

Date: 2020-11-03 Sheet 1 of 12

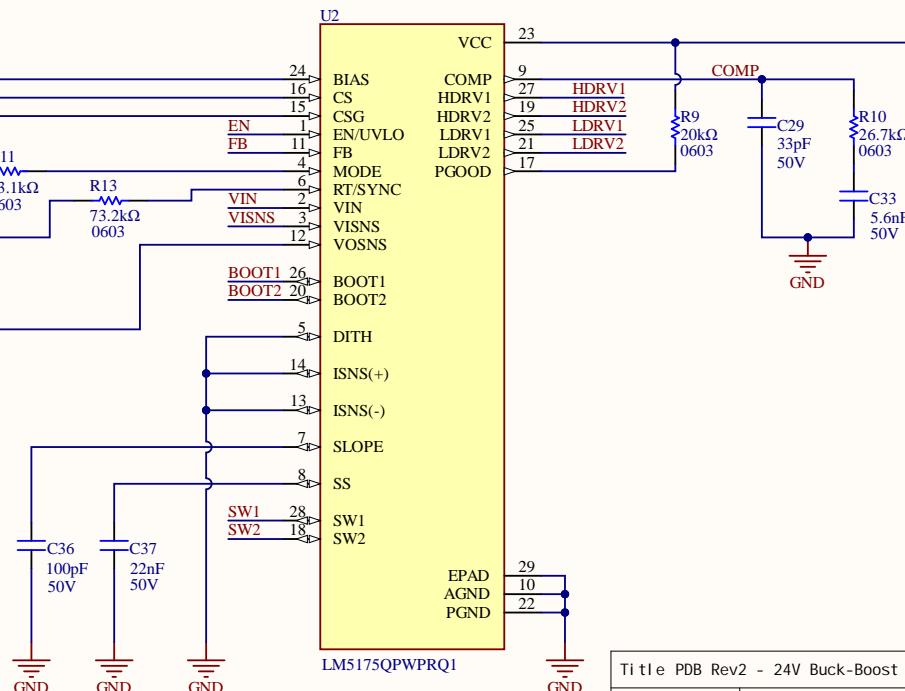
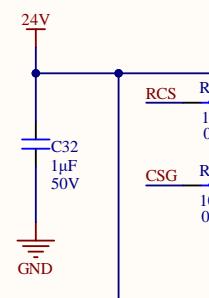
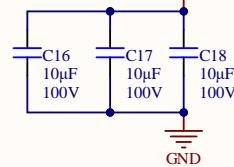
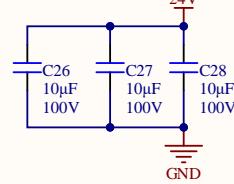
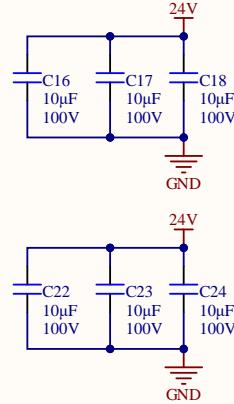
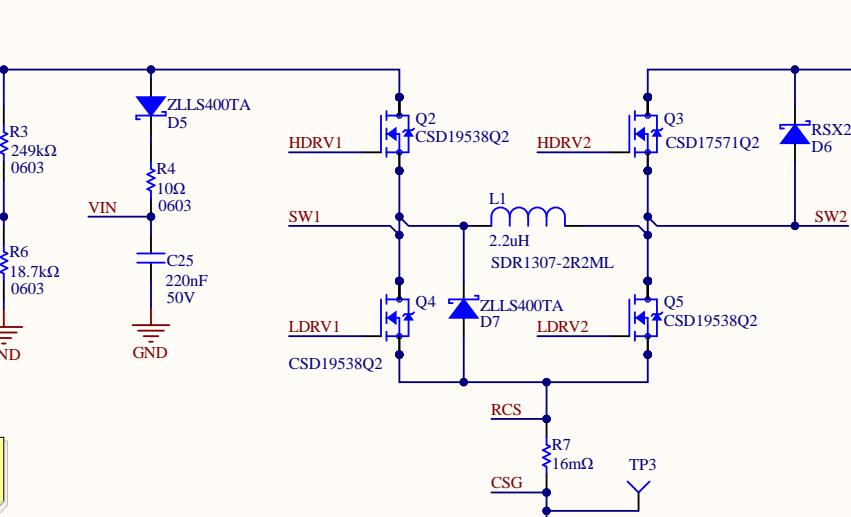
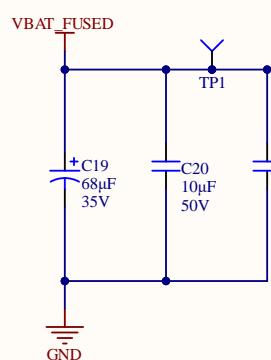
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH2 - CONNECTORS.SchDoc

Altium Limited
L3, 12a Rodborough Rd
Frenchs Forest
NSW Australia 2086



Input voltage range: 18-25.8V

24V Buck-Boost Converter @ 3A Max



Title PDB Rev2 - 24V Buck-Boost Converter

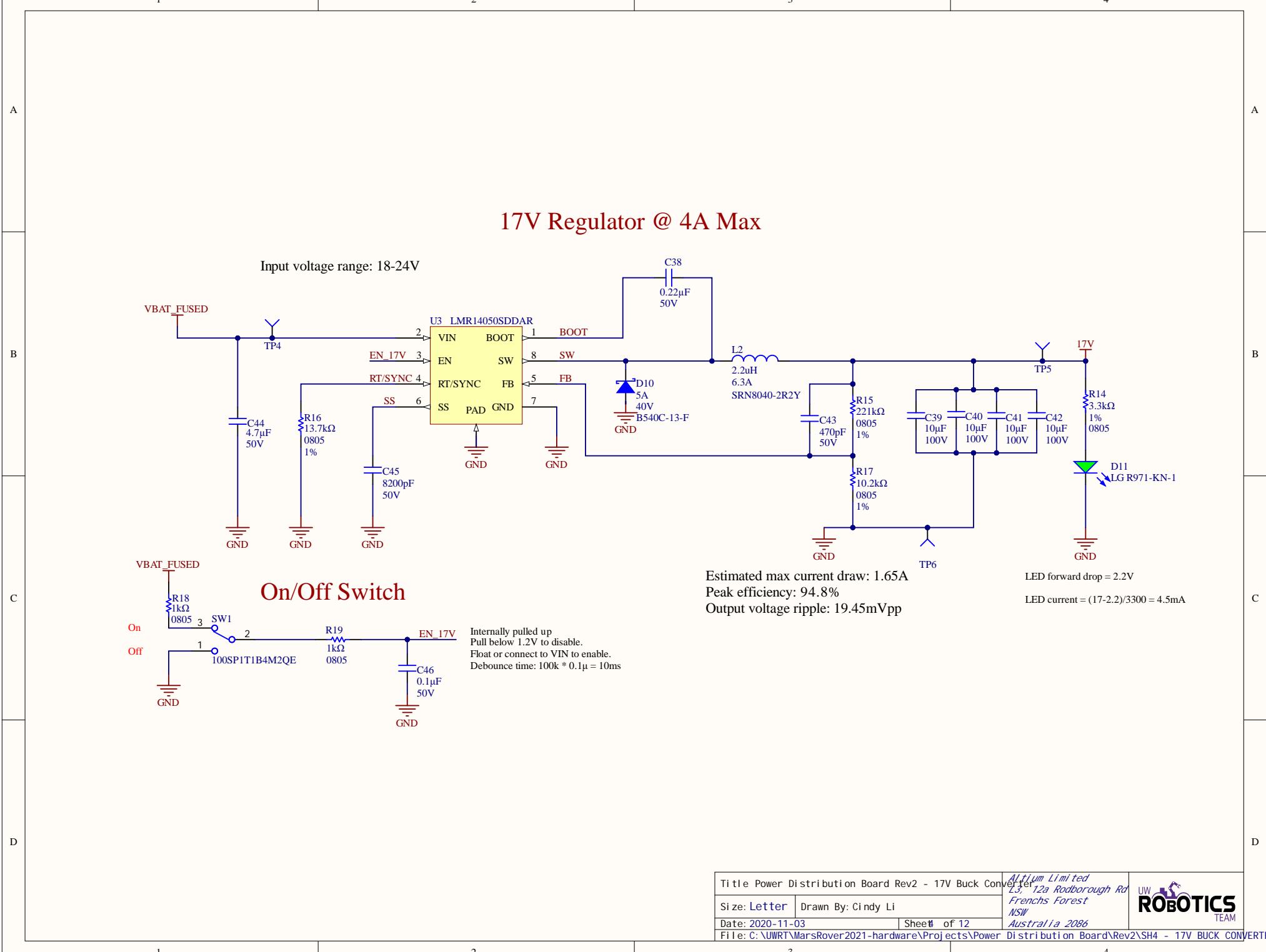
Size: Letter | Drawn By: Cindy Li

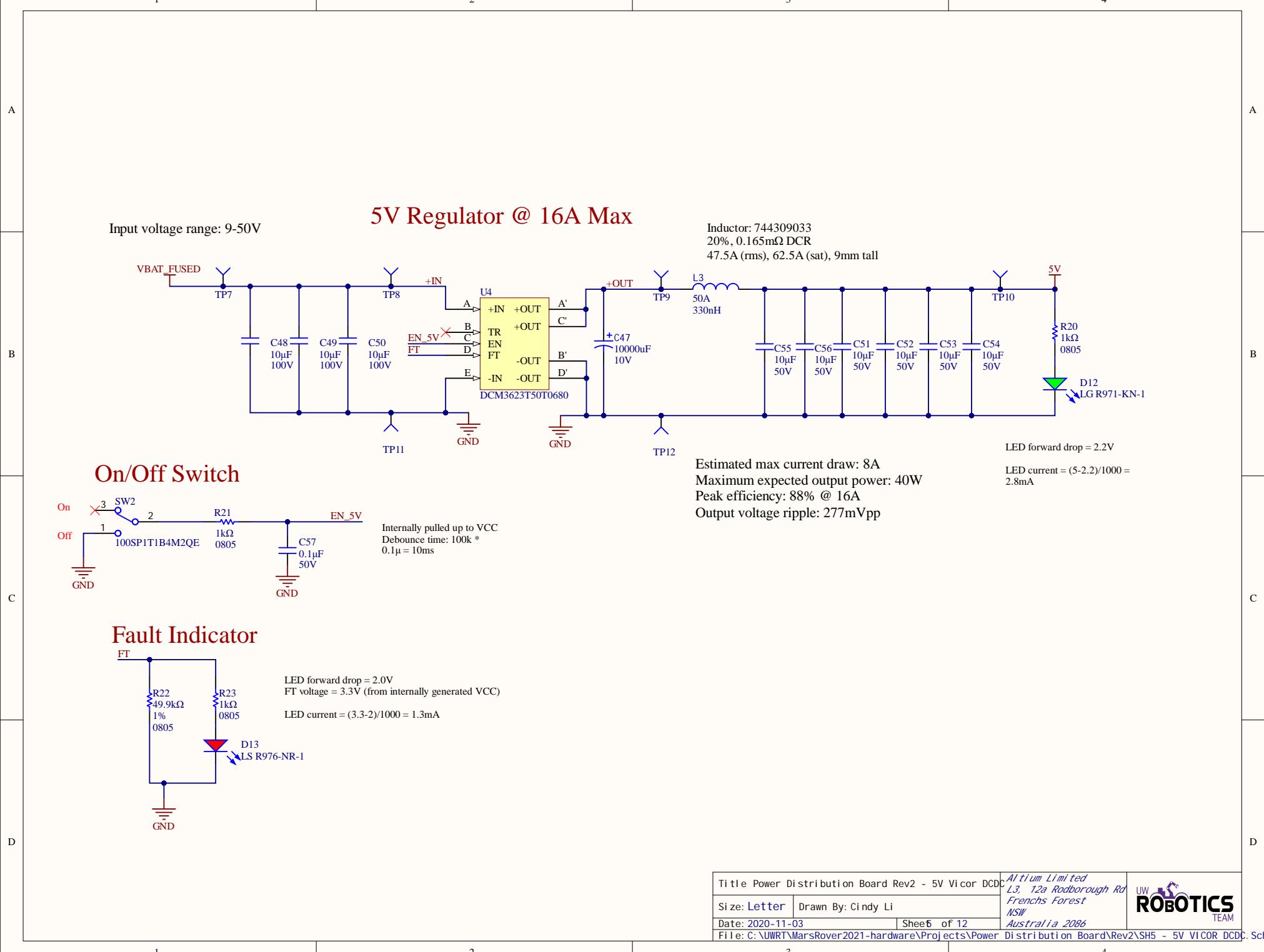
Date: 2020-11-03 | Sheet 8 of 12

File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH3 - 24V BUCK-BOOST CONVERTER.SchD

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Frenchs Forest
NSW Australia 2086

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A

A

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B

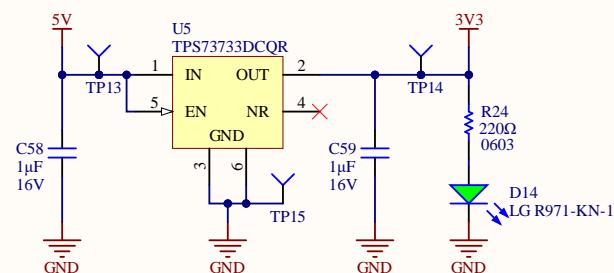
C

C

D

D

5V to 3.3V LDO



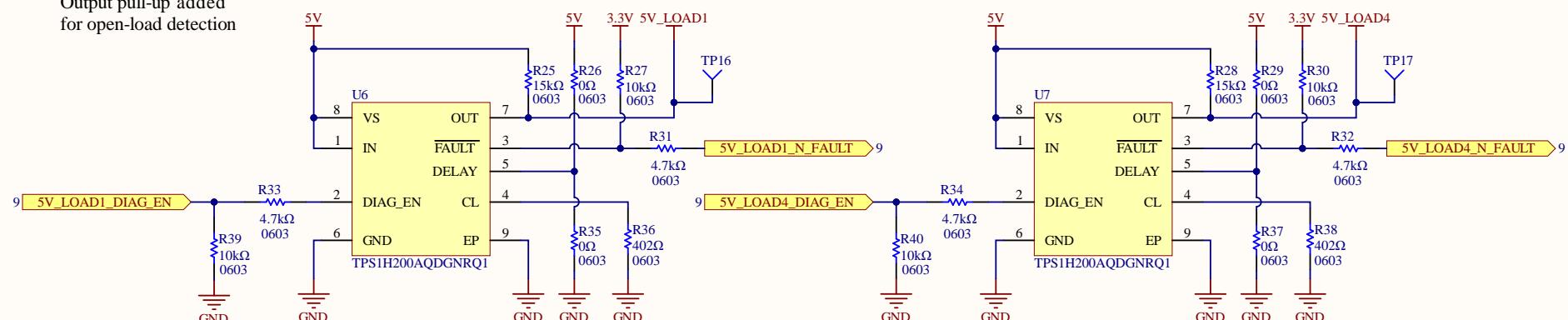
Current Calculations

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

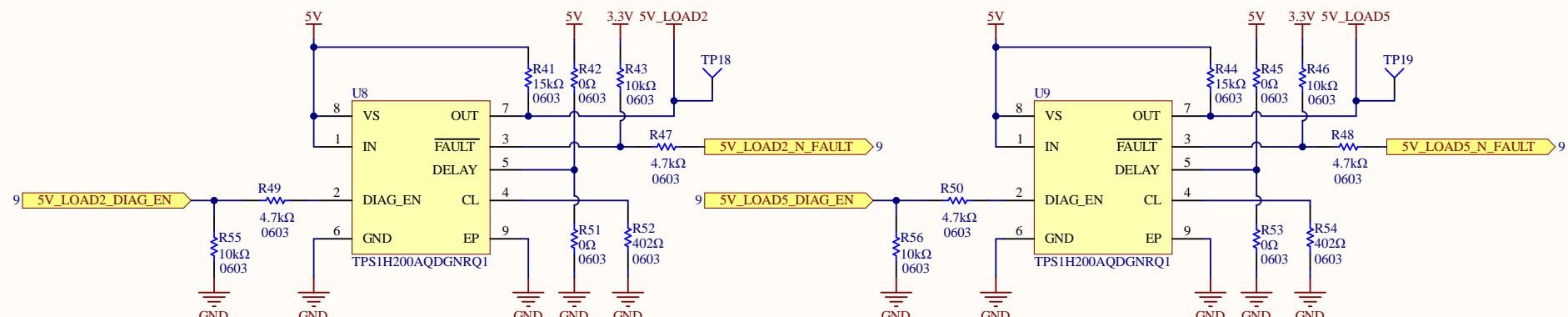
Title Power Distribution Board Rev2 - 3.3V Linear		<i>Altium Limited</i> 23/728 Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li	
Date: 2020-11-03	Sheet 6 of 12	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH6 - 3.3V LINEAR REGULATOR.SchDoc		UW ROBOTICS TEAM

5V Loads Smart Switches

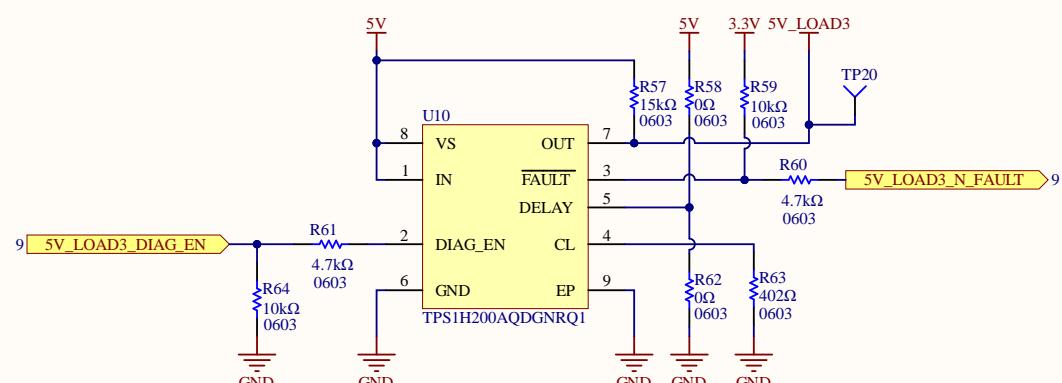
A
Output pull-up added for open-load detection



B



C



D

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 $R_{CL} = 402\Omega$

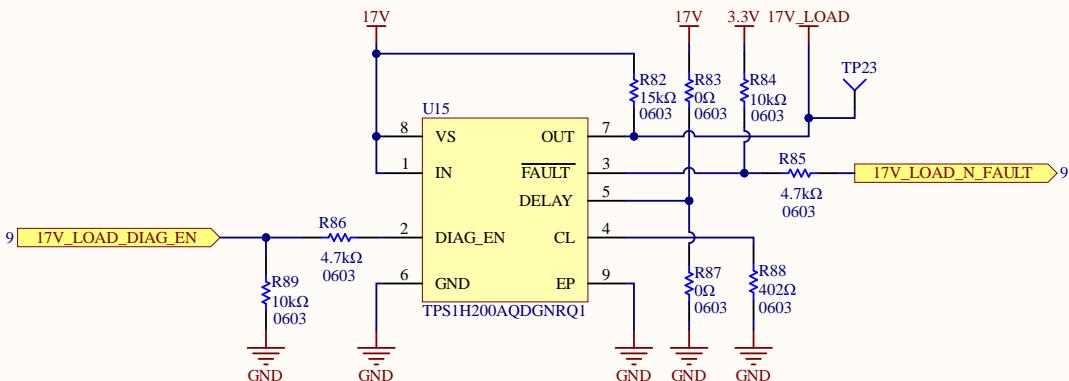
Current Limit Configurations - Refer to DELAY Pin

- 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

A

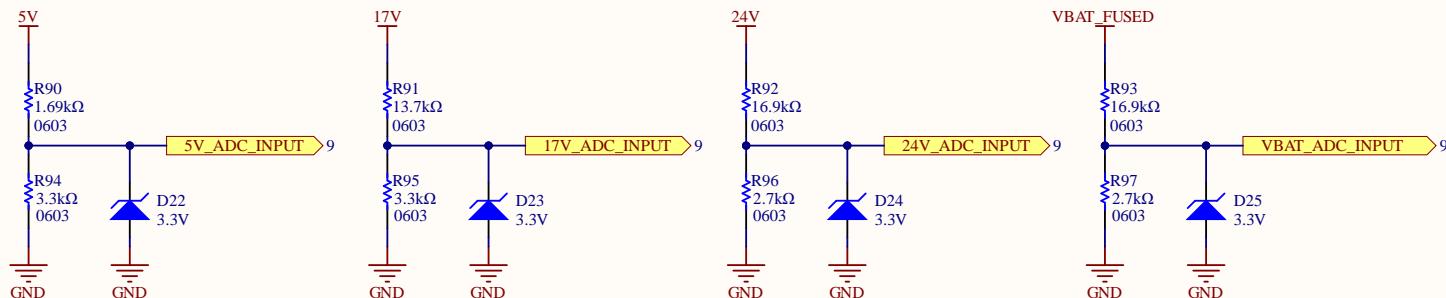
17V Load Smart Switch



B

B

Power Rail Voltage Monitoring



Divides 5V to 3.3V

Divides 17V to 3.3V

Divides 24V to 3.3V

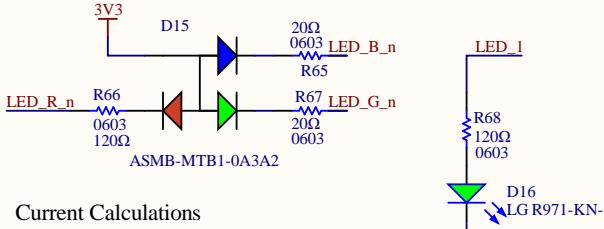
Divides 24V to 3.3V

D

D

Title Power Distribution Board Rev2 - Load Monitor		Altium Limited 102-128 Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li	Sheet 8 of 12
Date: 2020-11-03		File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH8 - LOAD MONITOR.SchDoc

Status/Debug LEDs



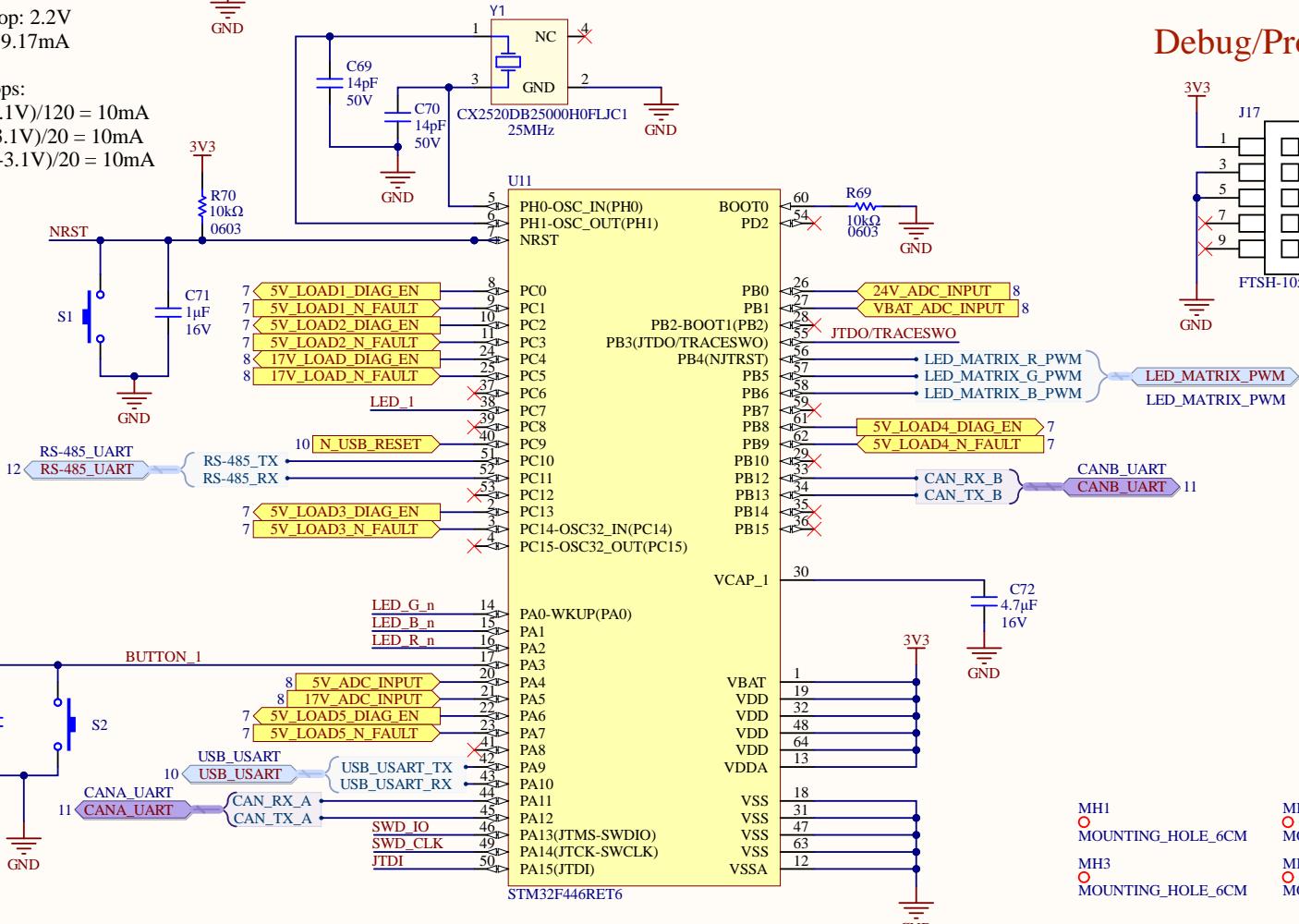
Current Calculations

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

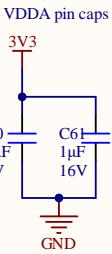
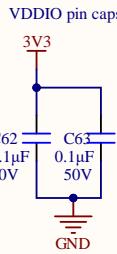
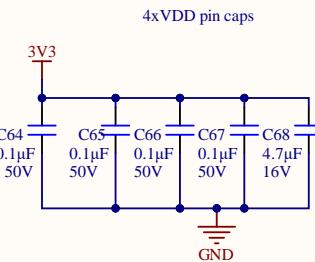
RGB LED voltage drops:

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

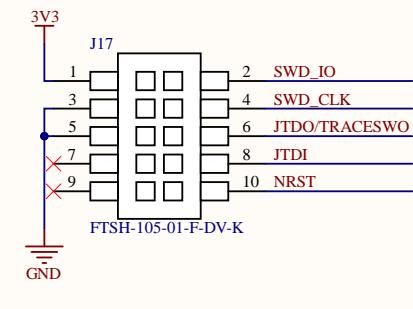
STM32F446RET6

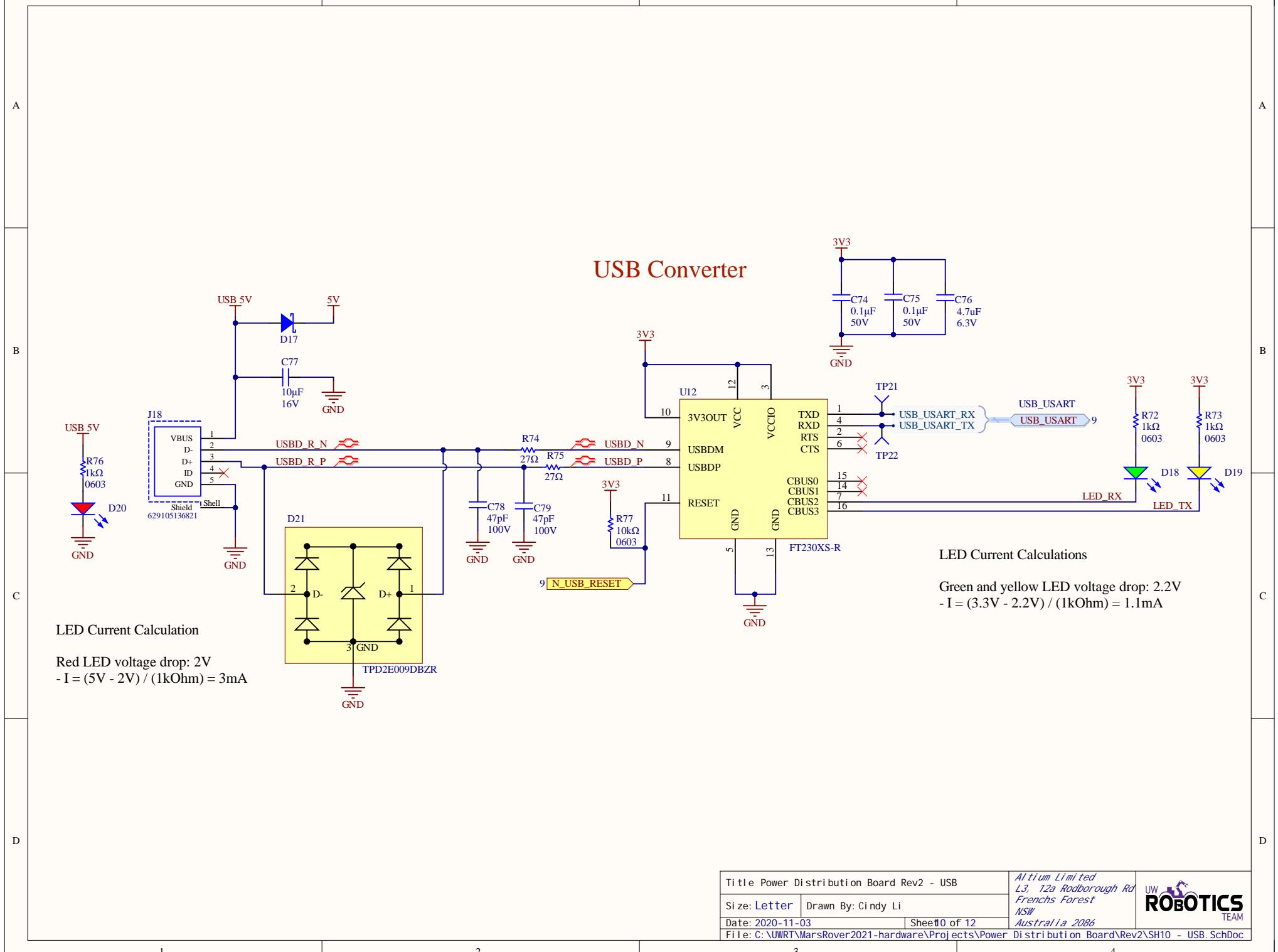


Decoupling Caps



Debug/Programming

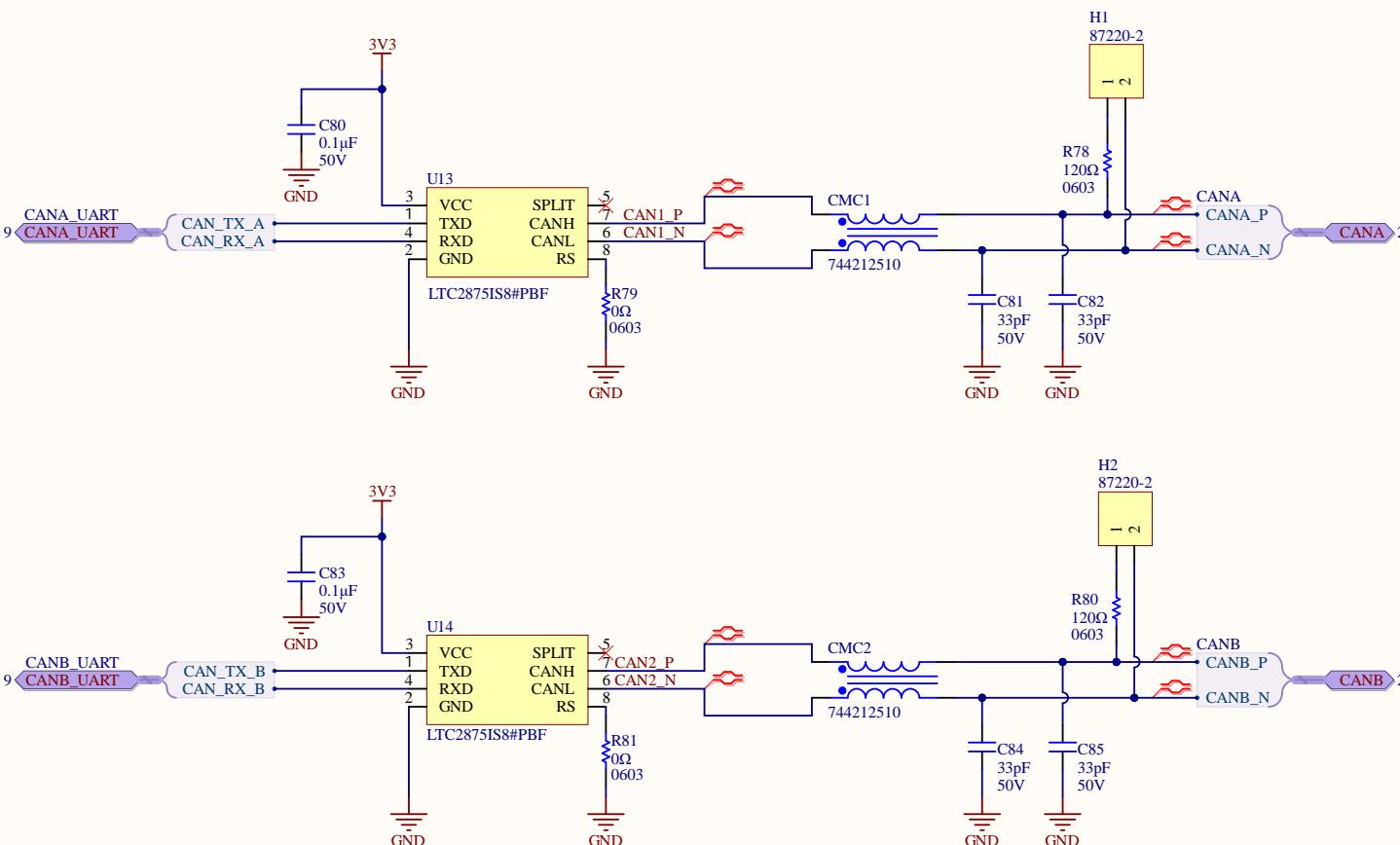




A

A

CAN Transceivers



Title: Power Distribution Board Rev2 - CAN Transceivers		Altium Limited 13/12a Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li	
Date: 2020-11-03	Sheet 1 of 12	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH11 - CAN.SchDoc		UW ROBOTICS TEAM

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B

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C

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D

D

RS-485 Transceiver

