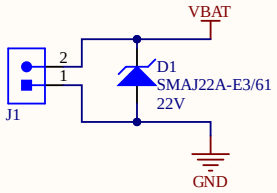
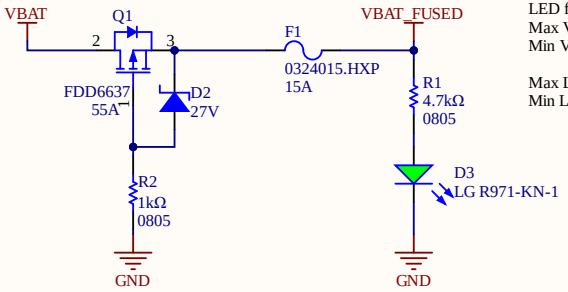
24V Input



Rated Current = 16A

Reverse Polarity Protection



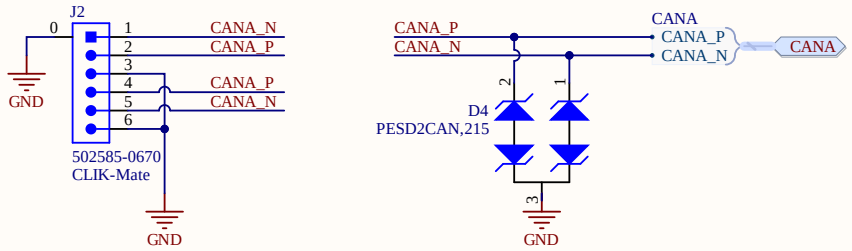
LED forward drop = 2.0V
Max VBAT = 24V
Min VBAT = 18V

Max LED current = (24-2)/4700 = 4.7mA
Min LED current = (18-2)/4700 = 3.4mA

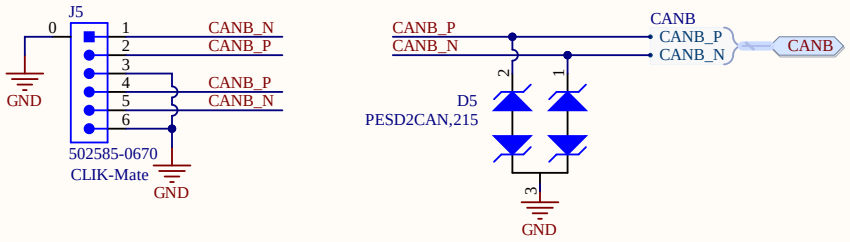
TODO: replace curremt RPP with ideal diode

Title Power Distribution Board Rev2 - Power		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086	UW ROBOTICS TEAM
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 1 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH1 - POWER.SchDoc			

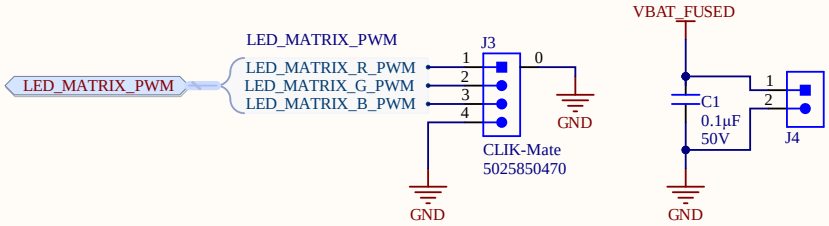
CAN BUS A



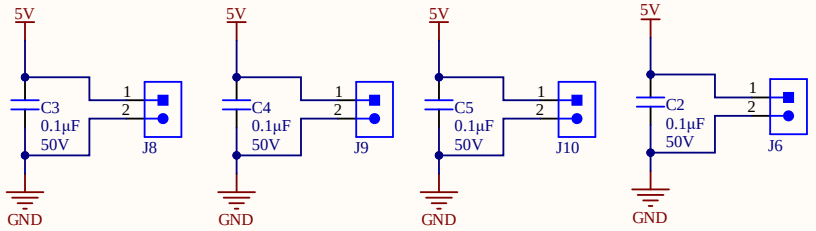
CAN BUS B

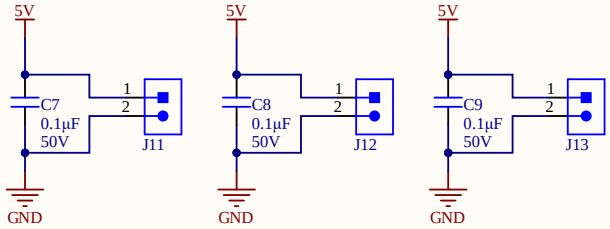


LED Matrix

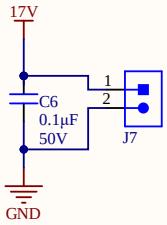


5V Output





17V Output



TODO:
- add connectors for ultrasonic sensor signals
- check if using correct connectors

MH1
MOUNTING_HOLE_6CM

MH2
MOUNTING_HOLE_6CM

MH3
MOUNTING_HOLE_6CM

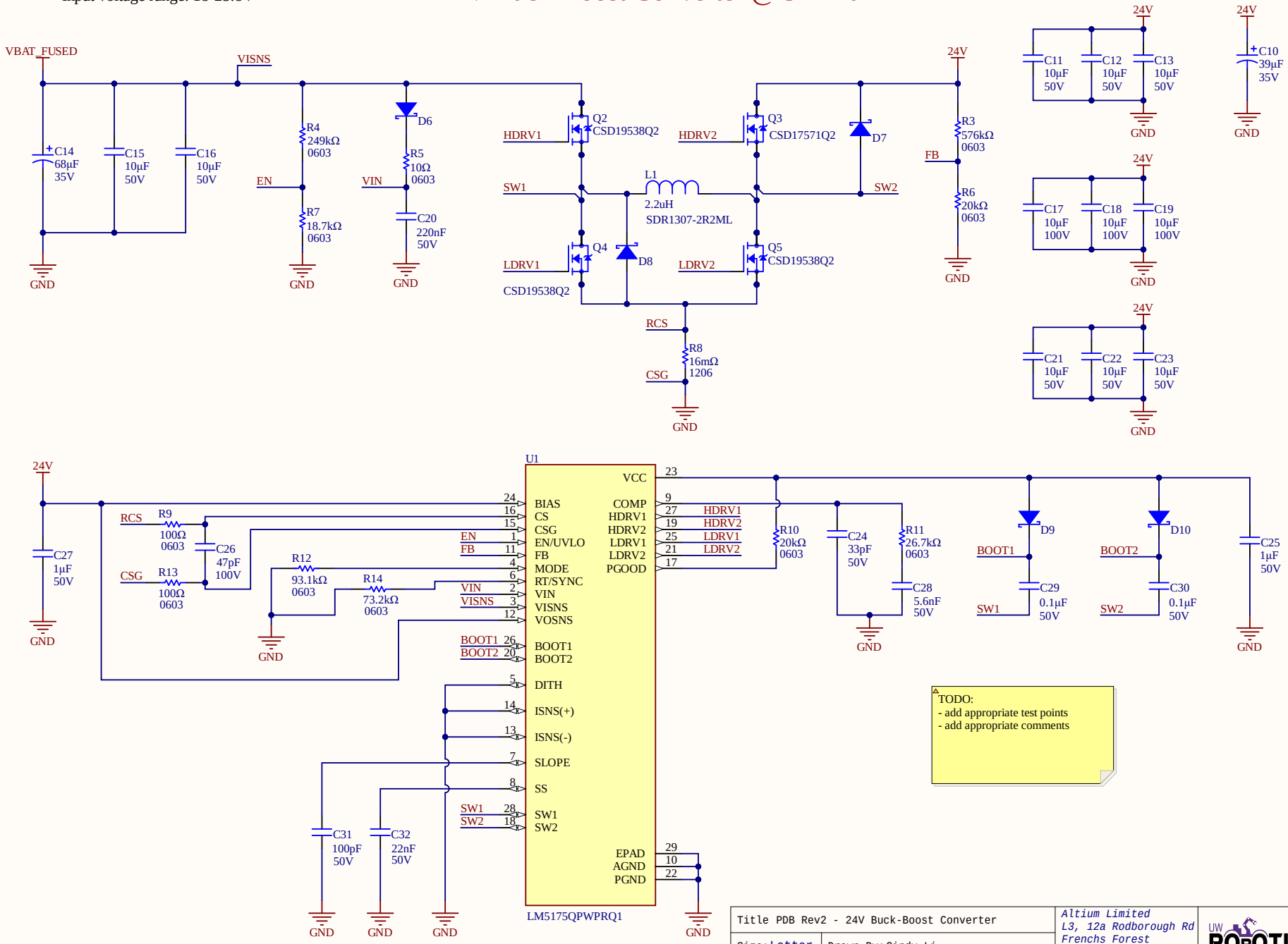
MH4
MOUNTING_HOLE_6CM

Can use 12-26AWG

Title Power Distribution Board Rev2 - Connectors		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li	
Date: 2020-10-27	Sheet 2 of 10	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH2 - CONNECTORS.SchDoc		

Input voltage range: 18-25.8V

24V Buck-Boost Converter @ 3A Max

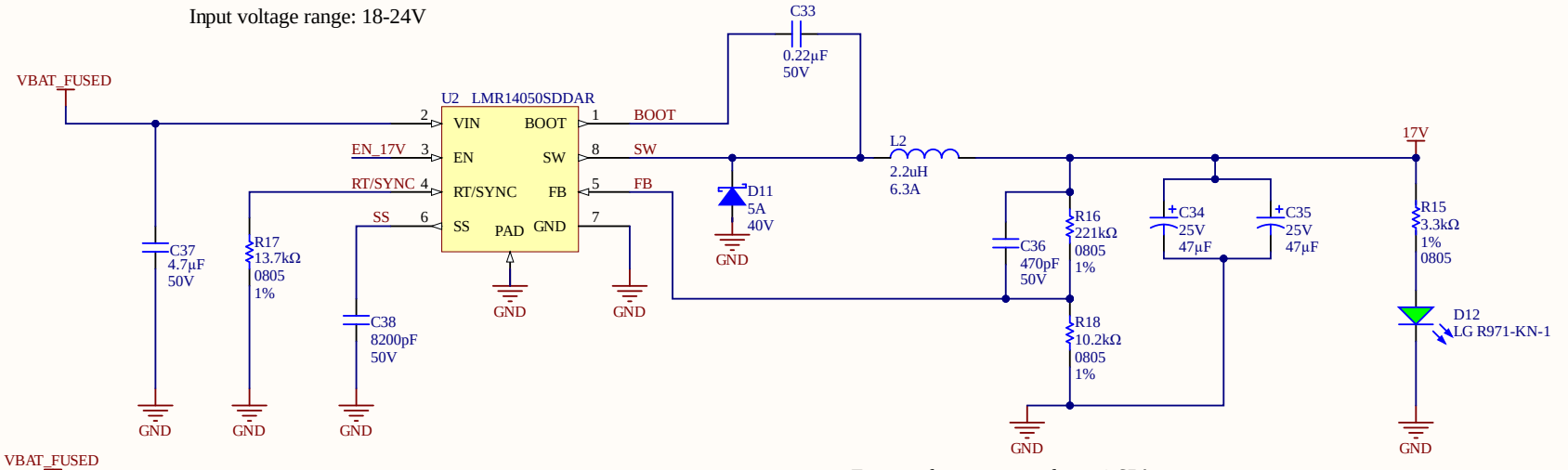


TODO:
- add appropriate test points
- add appropriate comments

Title PDB Rev2 - 24V Buck-Boost Converter		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li	UW ROBOTICS TEAM
Date: 2020-10-27	Sheet 8 of 10	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH3 - 24V BUCK-BOOST CONVERTER.SchD		

17V Regulator @ 4A Max

Input voltage range: 18-24V

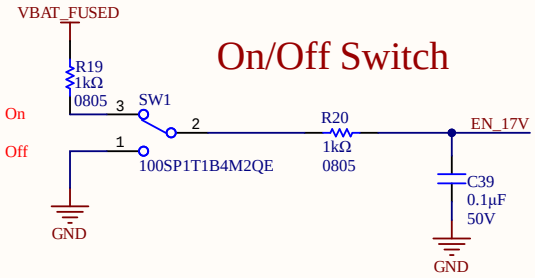


Estimated max current draw: 1.65A
Peak efficiency: 94.8%
Output voltage ripple: 19.45mVpp

LED forward drop = 2.2V

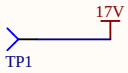
LED current = (17-2.2)/3300 = 4.5mA

On/Off Switch



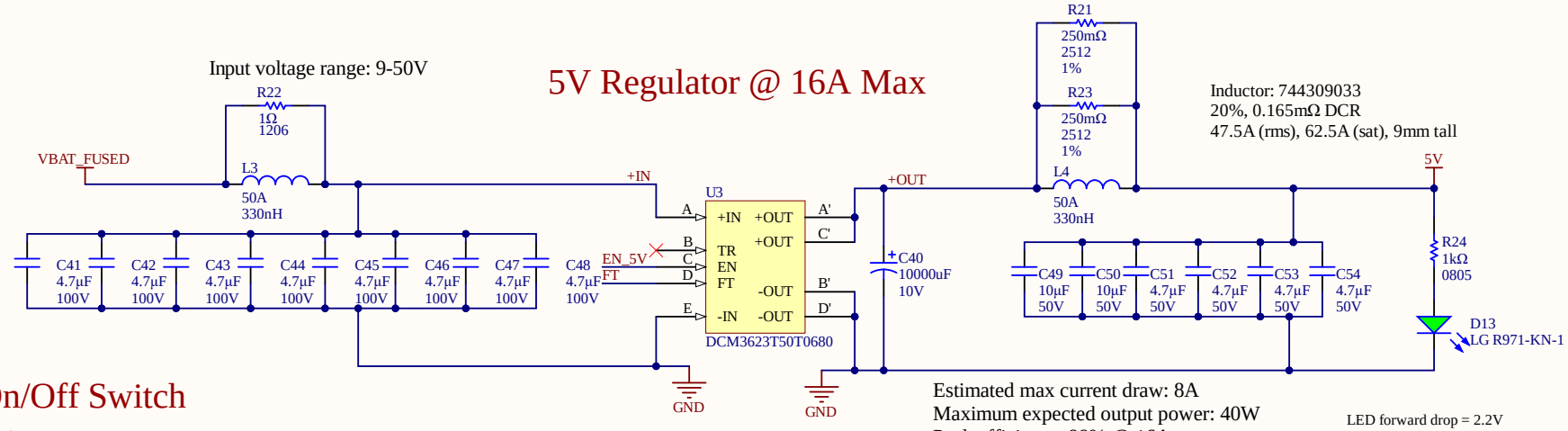
Internally pulled up
Pull below 1.2V to disable.
Float or connect to VIN to enable.
Debounce time: 100k * 0.1µ = 10ms

Test Point

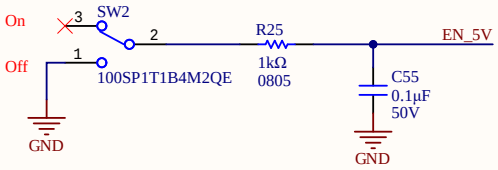


Title Power Distribution Board Rev2 - 17V Buck Converter			Altium Limited 13, 12a Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 4 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH4 - 17V BUCK CONVERTER.SchDoc			

5V Regulator @ 16A Max

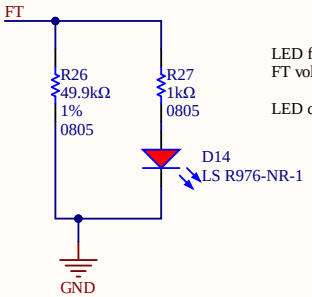


On/Off Switch



Internally pulled up to VCC
Debounce time: 100k * 0.1µ = 10ms

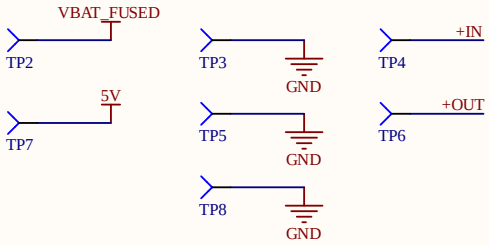
Fault Indicator



LED forward drop = 2.0V
FT voltage = 3.3V (from internally generated VCC)

LED current = (3.3-2)/1000 = 1.3mA

Test Points



Title Power Distribution Board Rev2 - 5V Vicor DCDC		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086	UW ROBOTICS TEAM
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 5 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH5 - 5V VICOR DCDC.SchDoc			

3.3V Buck Converter

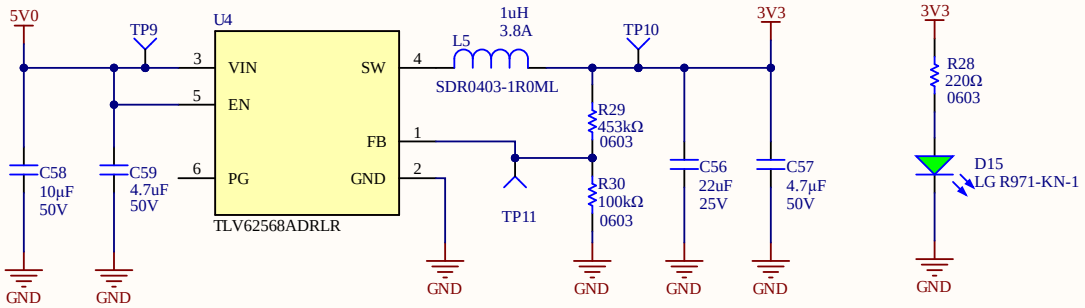
Designed for 3.3V - 5V input

Route for 1A in

Inductor: SDR0403-1R0ML
1uH, 20%, 33mOhm DCR (max)
3.8A (rms), 5.5A (sat), 3.2mm tall

Route for 3A out

Maximum output current = 2A
Maximum output power = 6.6W
Expected efficiency at 1A = 94.3%



Current Calculations

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

Title: Power Distribution Board Rev2 - 3.3V Buck Converter			Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 6 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH6 - 3.3V BUCK CONVERTER.SchDoc			

TODO: Add voltage sensing to each power rail -> inputs to external ADC, add smart switches to 5V and 17V

Title Power Distribution Board Rev2 - Voltage Sensing		
Size: Letter	Drawn By: Cindy Li	
Date: 2020-10-27	Sheet 7 of 10	
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH7 - RAIL MONITORING.SchDoc		

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NSW
Australia 2086

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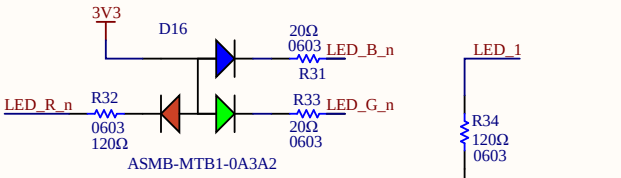
Status/Debug LEDs

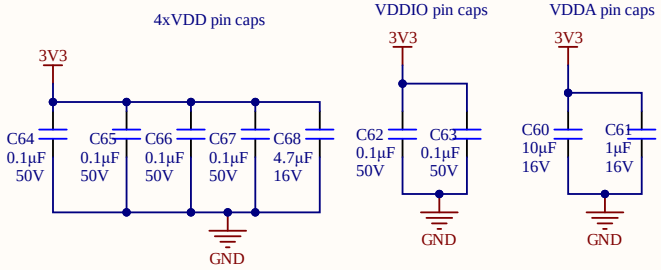


Current Calculations

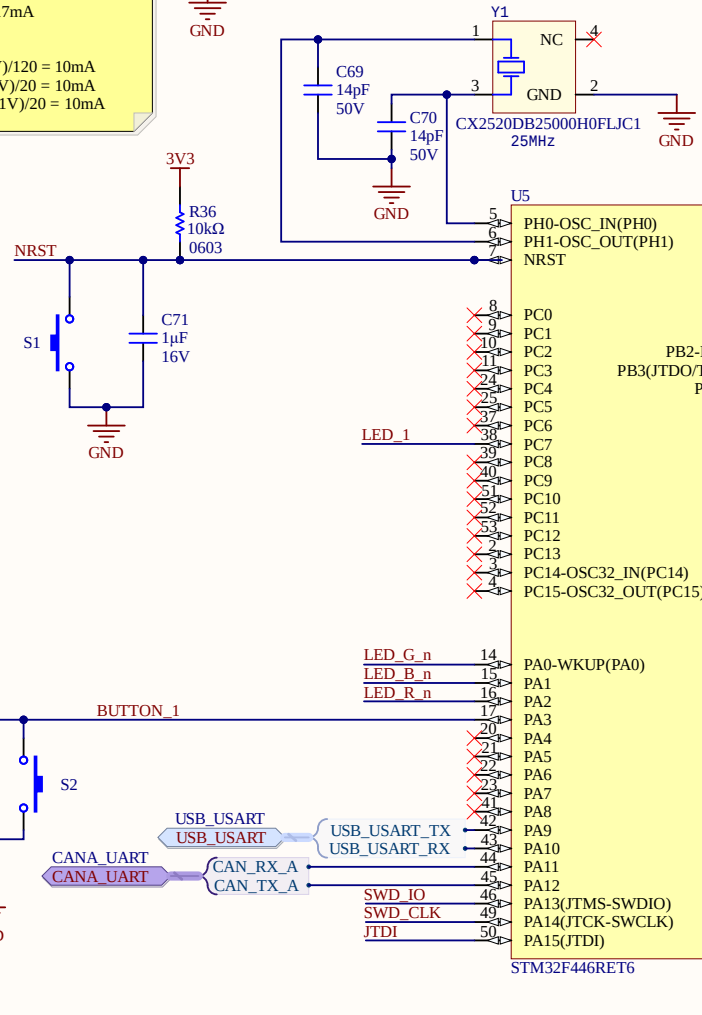
Green LED voltage drop: 2.2V
- I = (3.3-2.2V)/120 = 9.17mA

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

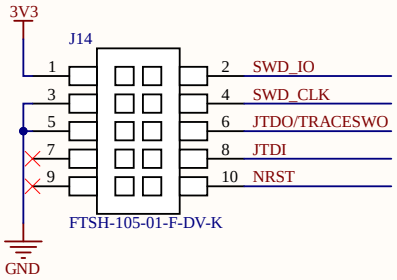
Decoupling Caps



STM32F446RET6

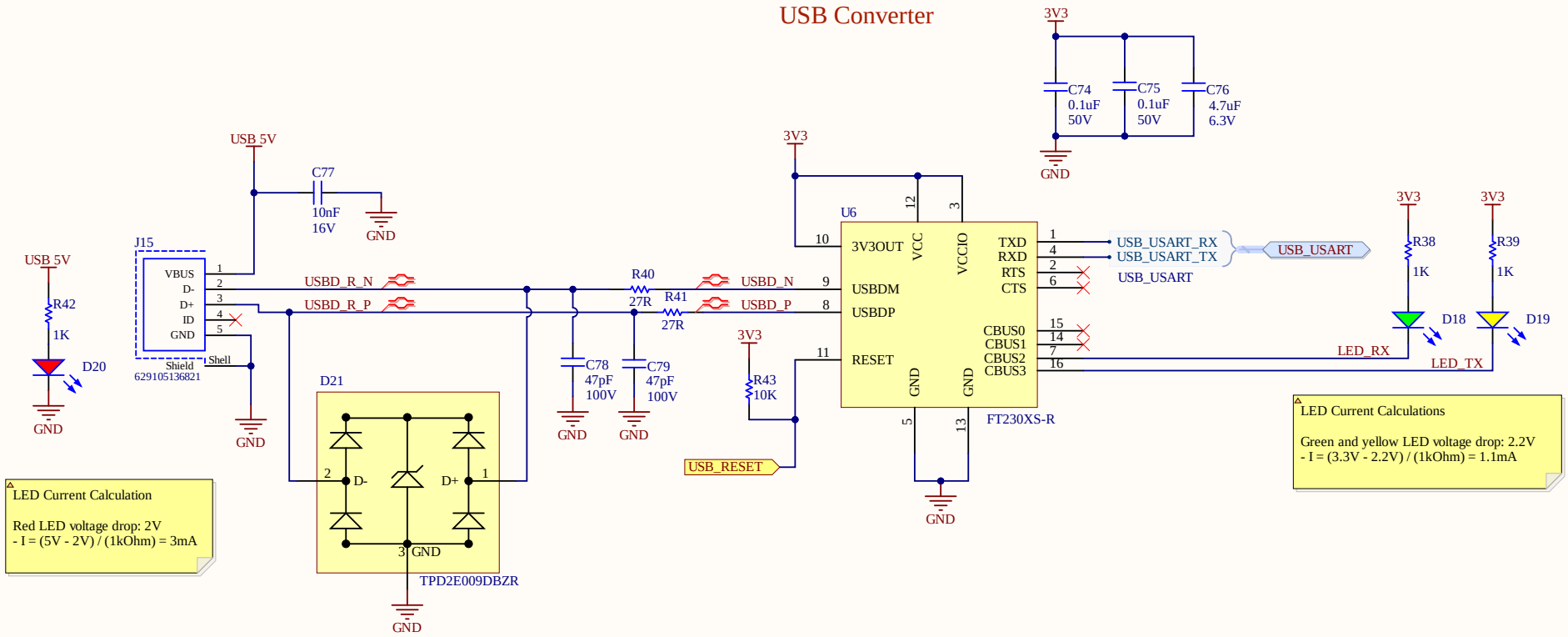


Debug/Programming



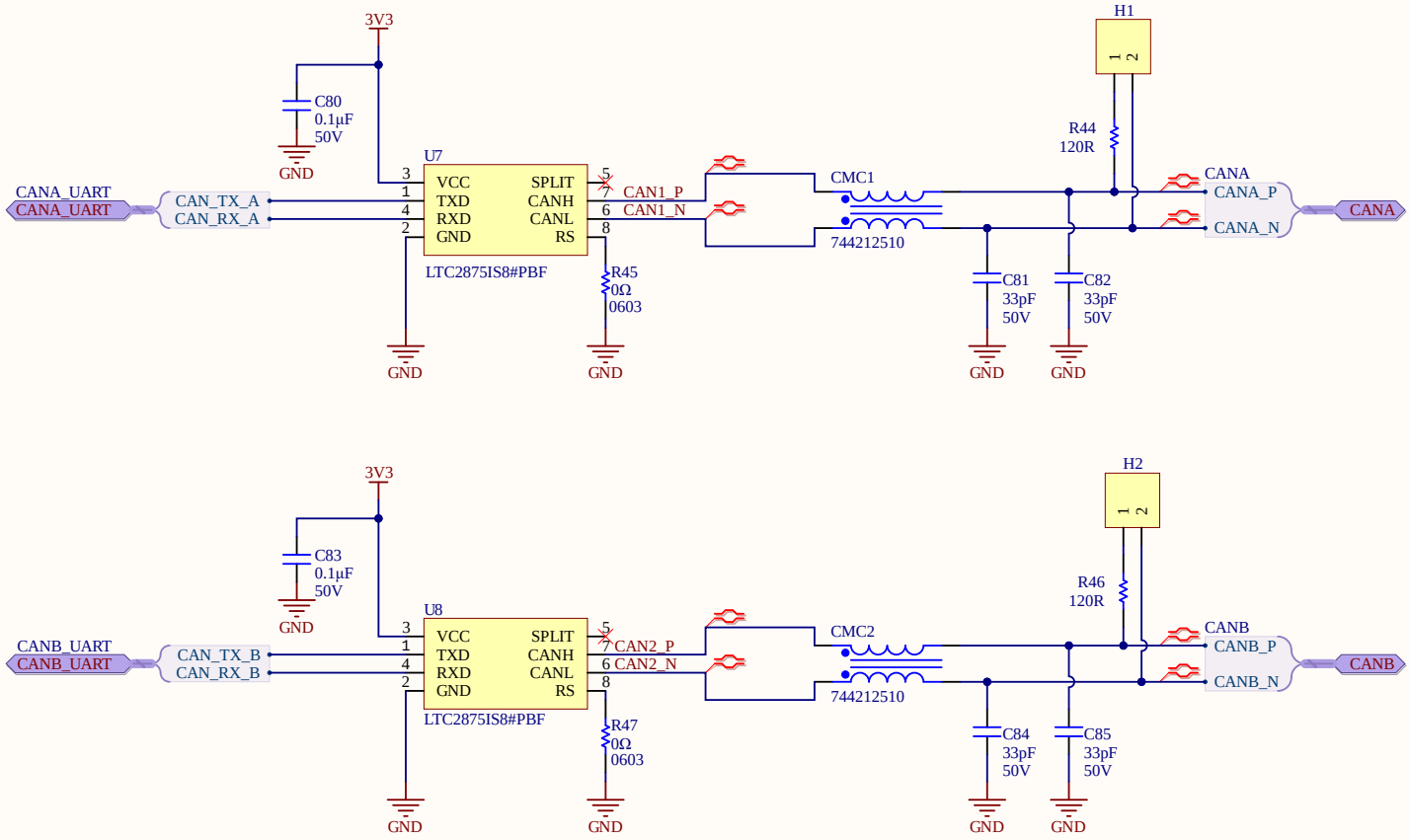
TODO:
- USB Reset (digital out)

Title Power Distribution Board Rev2 - MCU		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086	UW ROBOTICS TEAM
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 3 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH8 - MICROCONTROLLER.SchDoc			



Title Power Distribution Board Rev2 - USB		Altium Limited L3, 12a Rodborough Rd Frenchs Forest NSW Australia 2086	UW ROBOTICS TEAM
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 9 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH9 - USB.SchDoc			

CAN Transceivers



Title Power Distribution Board Rev2 - CAN Transceivers			
Size: Letter	Drawn By: Cindy Li		
Date: 2020-10-27	Sheet 10 of 10		
File: C:\UWRT\MarsRover2021-hardware\Projects\Power Distribution Board\Rev2\SH10 - CAN.SchDoc			

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