

REPLACE LDO WITH BUCK CONVERTER

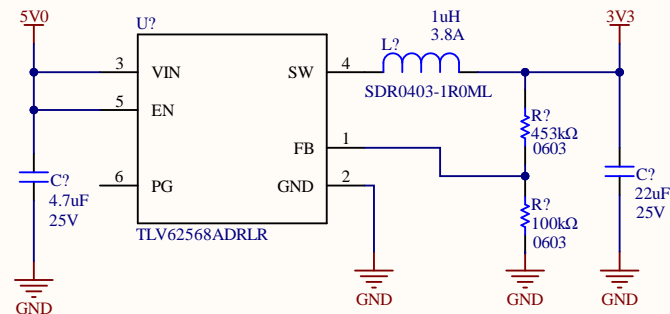
5V - 3.3V Buck Converter

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

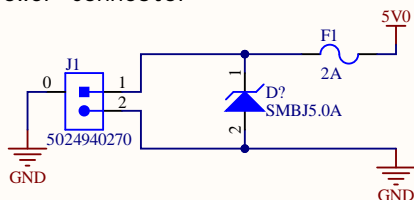


Maximum output power = 6.6W
Expected efficiency at 1A = 94.3%

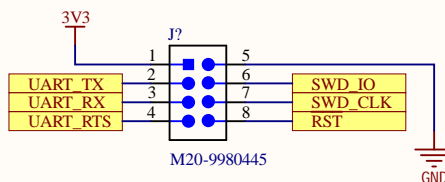
Current Calculations
Green LED voltage drop: 2.2V
- I = (3.3 - 2.2V) / 120 = 10.83mA

Title Power		UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6		
Size: Letter	Drawn By: Qinyang Bao, Nicole Rosario			
Date: 6/4/2020	Sheet of			
File: C:\Users\badpr\al\tium_projects\MarsRover2020-PCB\Projects\Safety\Rev2\SH1 - POWER.SchDoc				

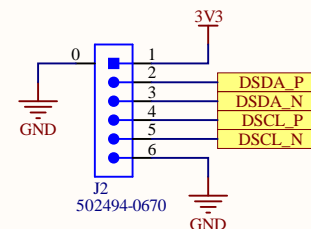
Power Connector



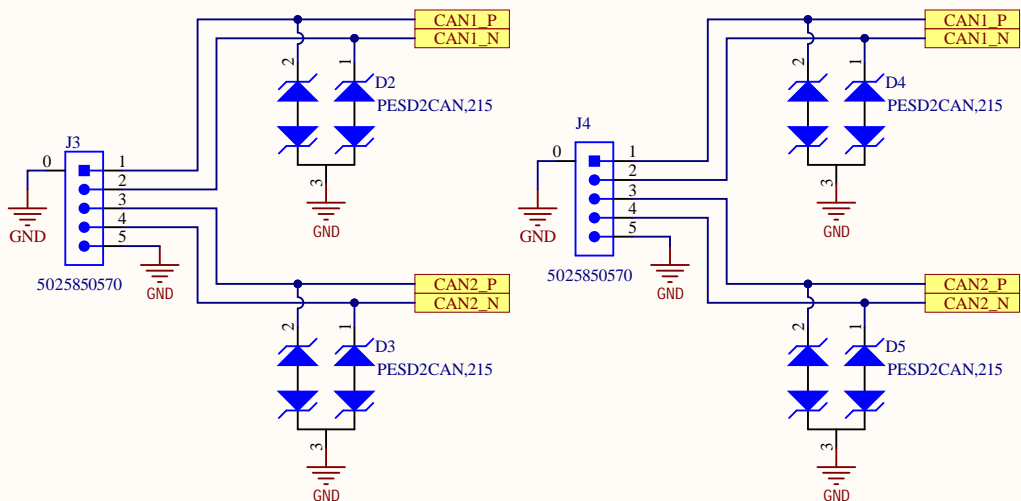
Programming Connector



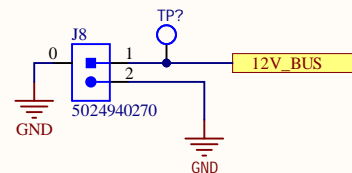
I2C Current Sensors



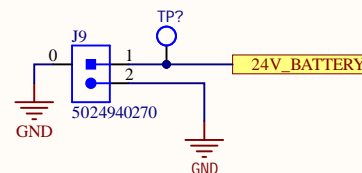
CAN Daisy Chain Connectors



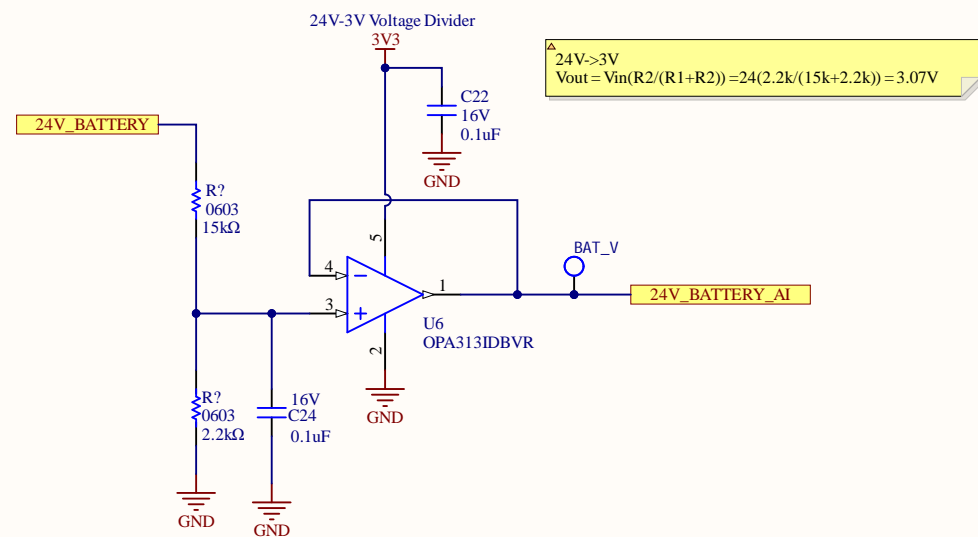
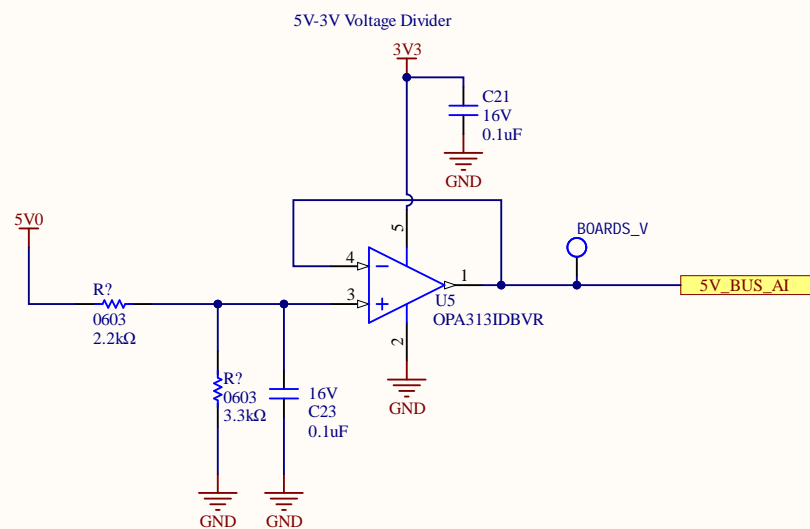
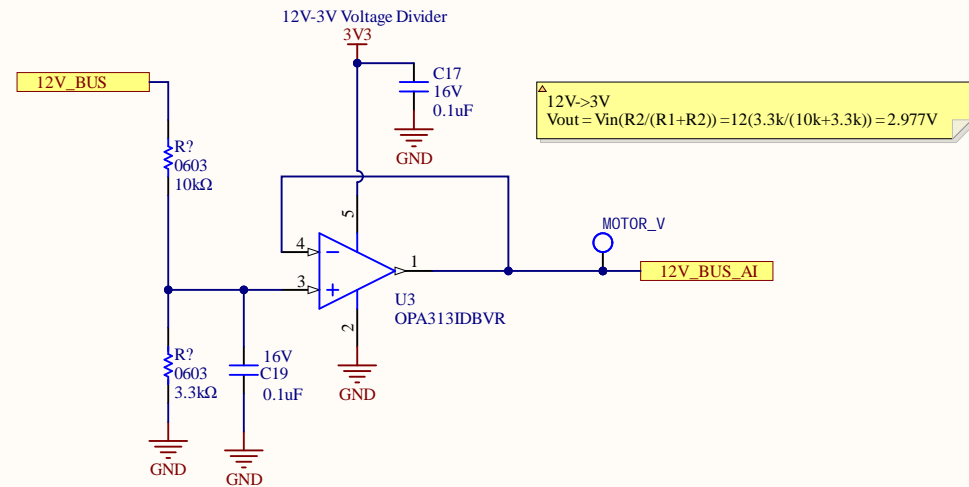
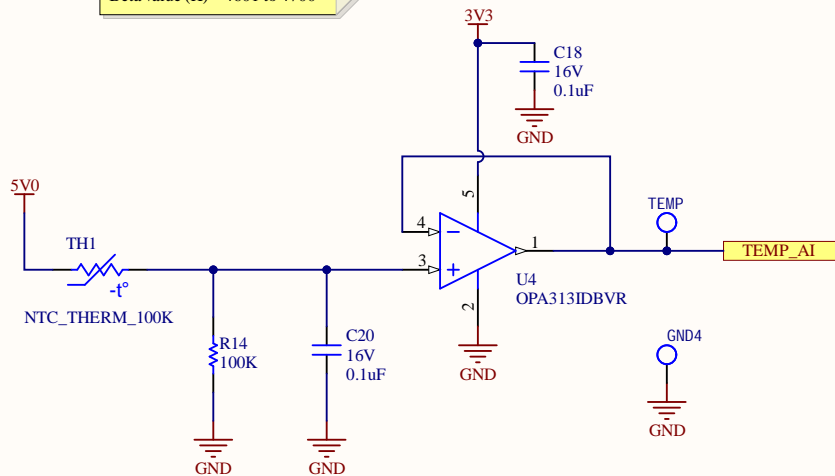
Motor Voltage



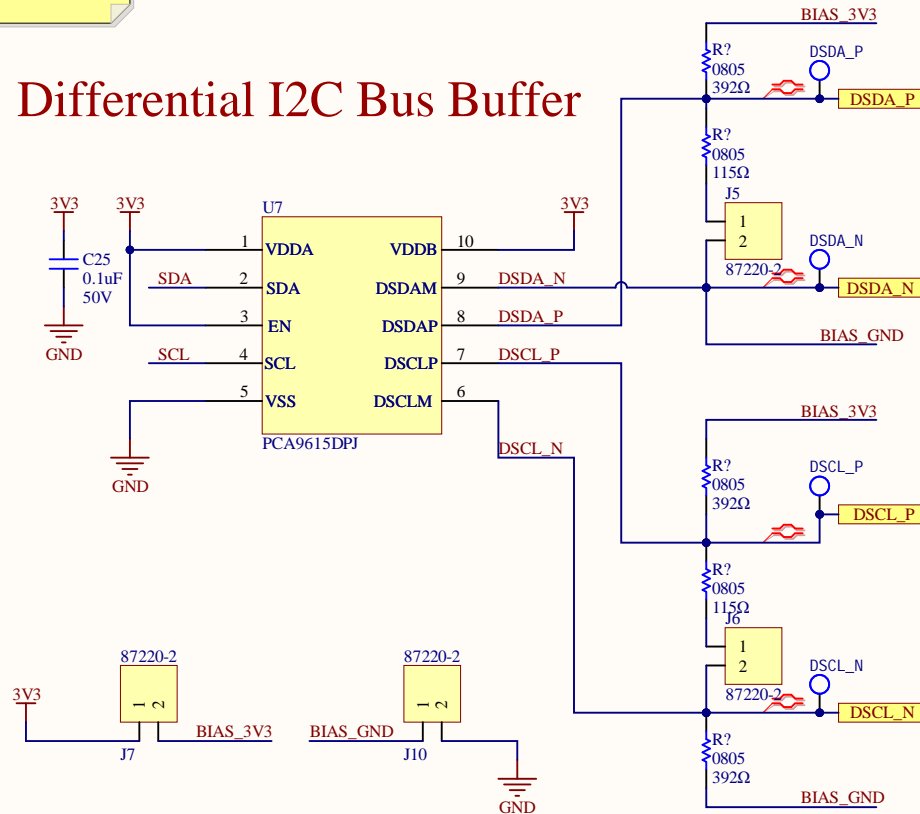
Battery Voltage



Thermistor Parameter:
Beta value (K) = 4601 to 4700



Differential I2C Bus Buffer



Termination resistor(s) should only be used on Safety board and last current sensor in the chain of current sensors (ie the first and last node).

Characteristic impedance of cable= $Z_o = 100 \text{ Ohms}$
 Cable: <https://www.digikey.ca/product-detail/en/general-cable-carol-brand/C0601A-41-10/C0601AG-50-ND/7313814>
 Calculations & Theory: <http://www.ti.com/lit/an/snla031/snla031.pdf> pg3
 Terminating resistance = $Z_o = 100 \text{ Ohm} = R_c = R_b$
 Bias resistors for FAILSAFE BIAS = $R_d = R_a$
 $V_{fsb} = V_{cc} (R_c / R_b / (R_c / R_b + R_d + R_a))$
 Parallel terminating resistance = $100 // 100 = 50 \text{ Ohms}$, $V_{cc} = 3.3 \text{ V}$, $V_{fsb} = 0.2 \text{ V}$ (for FAILSAFE bias)
 Therefore, $R_a = R_d = (50 * 3.3 / 0.2 - 50) / 2 = 387.5 \text{ Ohms}$
 Recalculating total terminating resistance: $100 // (387.5 * 2) = 88.6 \text{ Ohms}$
 88.6 is more than 10% diff from Z_o , therefore recalculate R_c using $Z_o = R_c // (R_a + R_d) = 100$
 $R_c = Z_o * (R_a + R_d) / (R_a + R_d - Z_o) = 114.8 \text{ Ohms}$
 Using 1% tolerance: $R_c = 115 \text{ Ohms}$ $R_a = R_d = 392 \text{ Ohms}$
 Check:
 $R_c // (R_a + R_d) = 100.3 = Z_o$
 $F_{sb} = V_{cc} (R_c / R_b / (R_c / R_b + R_d + R_a)) = 3.3 (115 // 100 / (115 // 100 + 2 * 392)) = 0.21 \text{ V}$

Title Safety - Differential I2C

Size: Letter Drawn By: Ayesha Ebrahim

Date: 6/4/2020

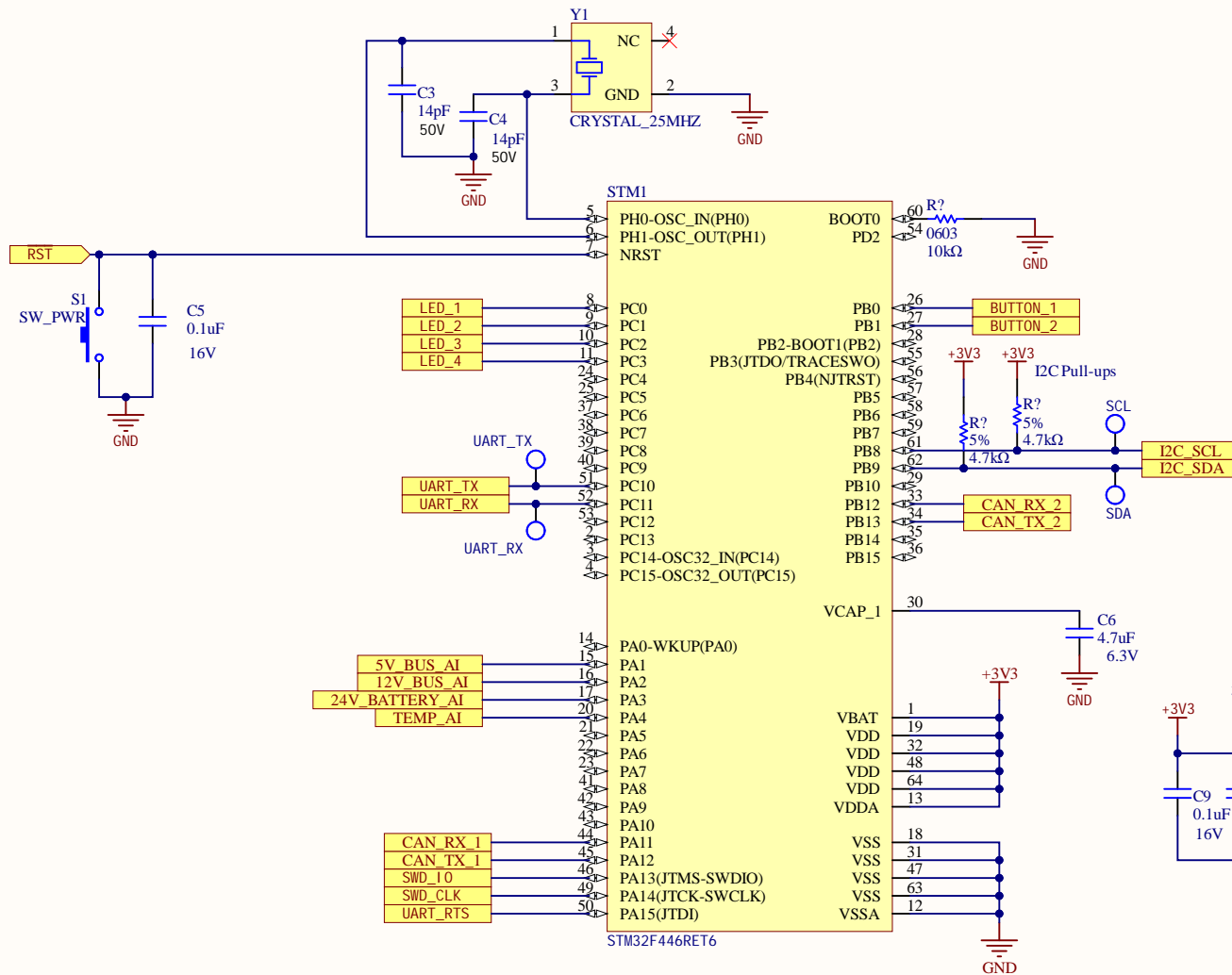
Sheet of

File: C:\Users\badpr\al tium_projects\MarsRover2020-PCB\Projects\Safety\Rev2\SH4 - DIFFERENTIAL I2C.Sch

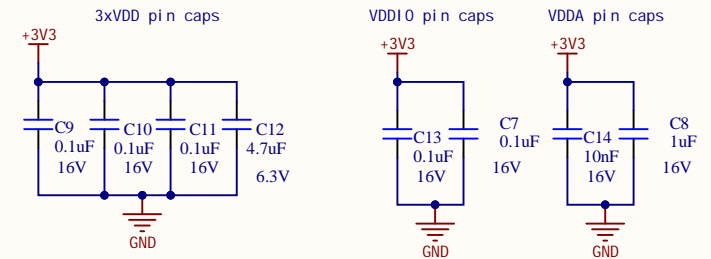
UW Robotics
 200 University Avenue
 Waterloo
 Ontario
 Canada N2L 3G6



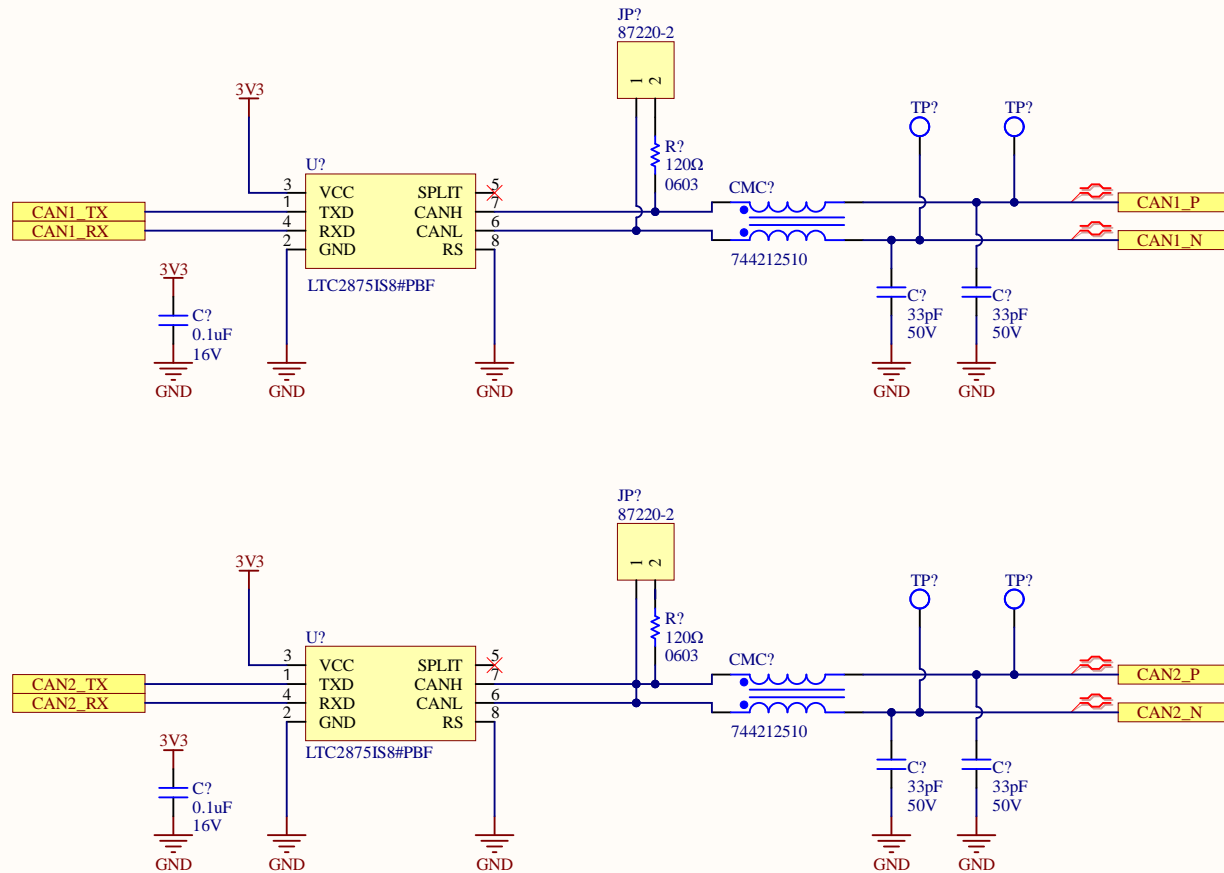
STM32F446RET6



Bypass Capacitors



CAN Transceivers



Board Stack Report