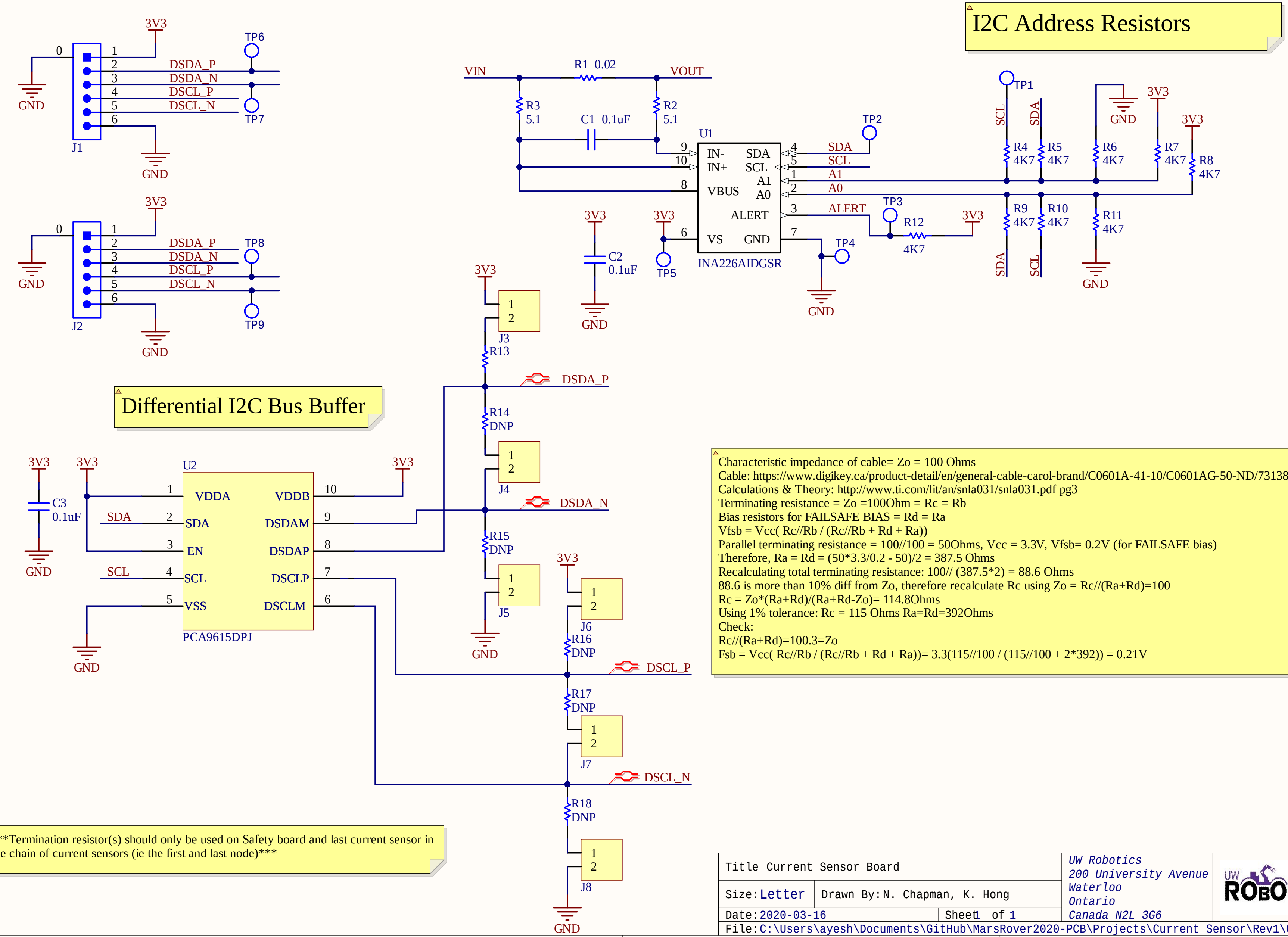


Turntable: I = 60.95 A, R = 0.75 mΩ, P = 2.786 W, Shunt V = 39.75 mV
Bicep: I = 5.75 A, R = 15 mΩ, P = 0.496 W, Shunt V = 75 mV
Elbow: I = 28.75 A, R = 3 mΩ, P = 2.48 W, Shunt V = 75 mV
Wrist: I = 8.05 A, R = 10 mΩ, P = 0.648 W, Shunt V = 70 mV
Claw: I = 6.325 A, R = 12 mΩ, P = 0.48 W, Shunt V = 66 mV
Allen Key: I = 3.45 A, R = 22 mΩ, P = 0.262 W, Shunt V = 75.9 mV

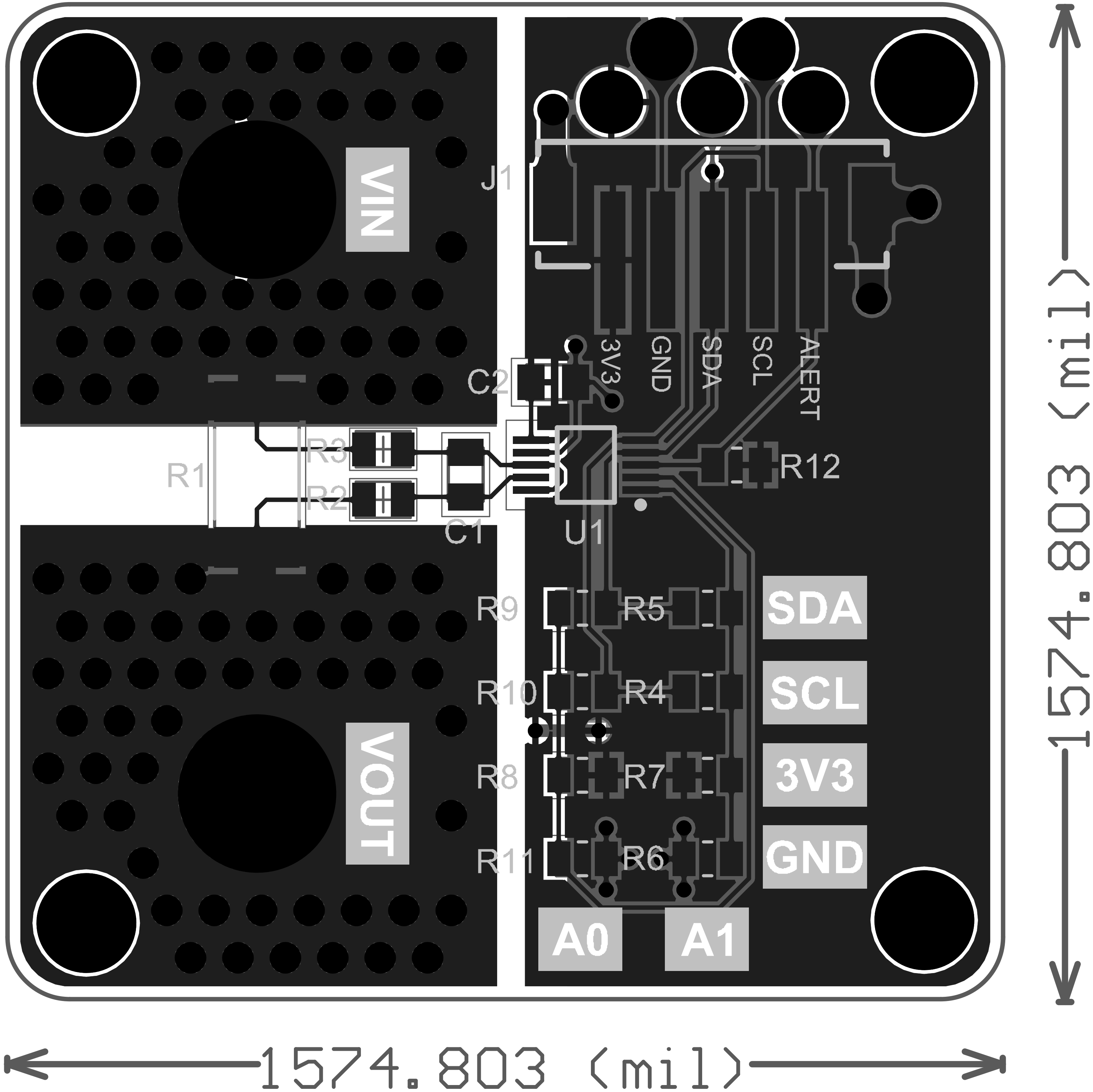
I2C Address Resistors

Differential I2C Bus Buffer

Characteristic impedance of cable= Zo = 100 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 = Zo =100Ohm = Rc = Rb
Bias resistors for FAILSAFE BIAS = Rd = Ra
Vfsb = Vcc(Rc//Rb / (Rc//Rb + Rd + Ra))
Parallel terminating resistance = 100//100 = 50Ohms, Vcc = 3.3V, Vfsb= 0.2V (for FAILSAFE bias)
Therefore, Ra = Rd = (50*3.3/0.2 - 50)/2 = 387.5 Ohms
Recalculating total terminating resistance: 100// (387.5*2) = 88.6 Ohms
88.6 is more than 10% diff from Zo, therefore recalculate Rc using Zo = Rc//(Ra+Rd)=100
Rc = Zo*(Ra+Rd)/(Ra+Rd-Zo)= 114.8Ohms
Using 1% tolerance: Rc = 115 Ohms Ra=Rd=392Ohms
Check:
Rc//(Ra+Rd)=100.3=Zo
Fsb = Vcc(Rc//Rb / (Rc//Rb + Rd + Ra))= 3.3(115//100 / (115//100 + 2*392)) = 0.21V

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)

Title Current Sensor Board	UW Robotics 200 University Avenue Waterloo Ontario Canada N2L 3G6
Size: Letter — Drawn By: N. Chapman, K. Hong	
Date: 2020-03-16 — Sheet 1 of 1	
File: C:\Users\ayesh\Documents\GitHub\MarsRover2020-PCB\Projects\Current Sensor\Rev1\Current Sensor.SchDoc	


VIN
VOUT
J1
3V3
GND
SDA
SCL
ALERT
C2
C1
R1
R2
R3
U1
R12
R9
R5
R10
R4
R8
R7
R11
R6
SDA
SCL
3V3
GND
A0
A1
1574.803 (mil)
1574.803 (mil)