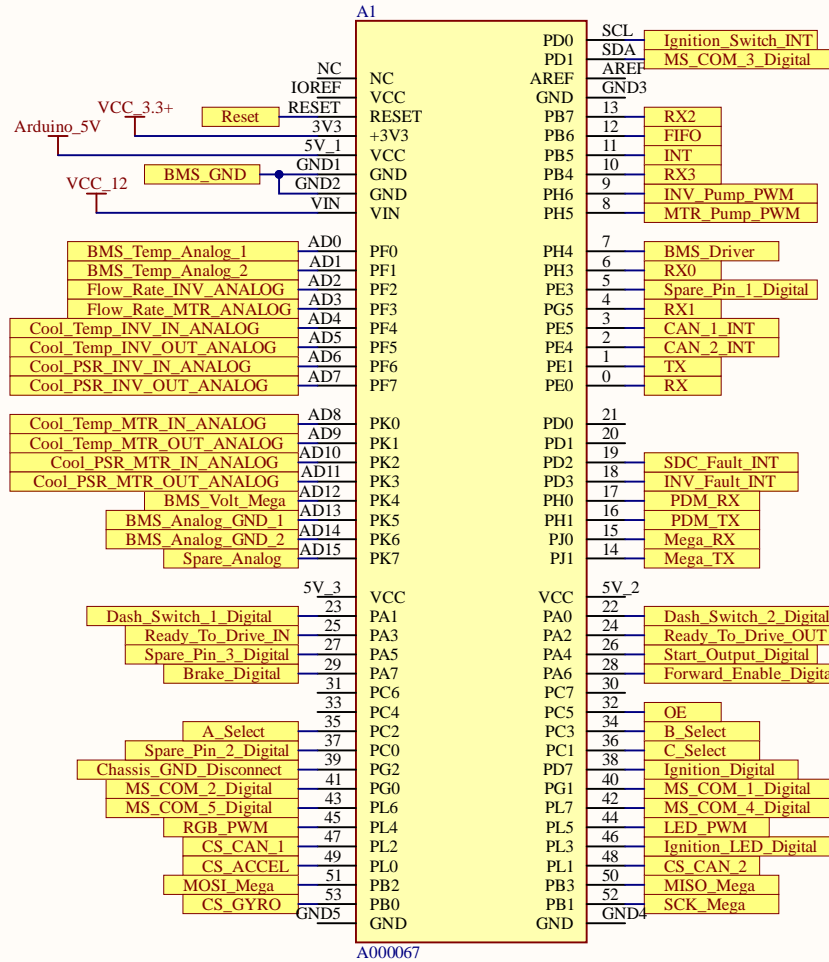
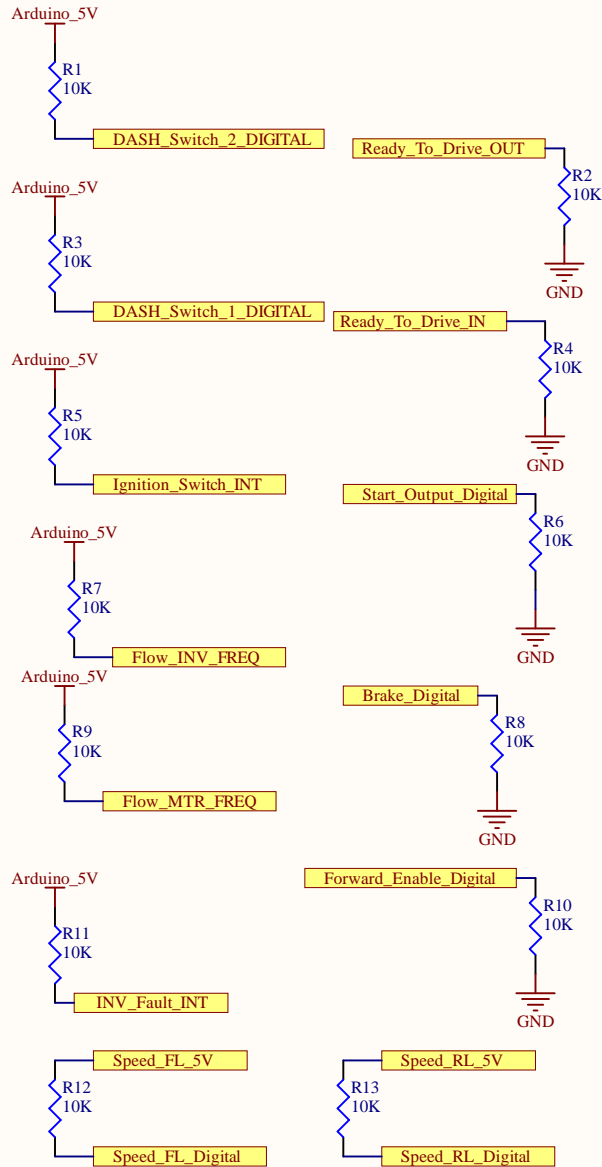
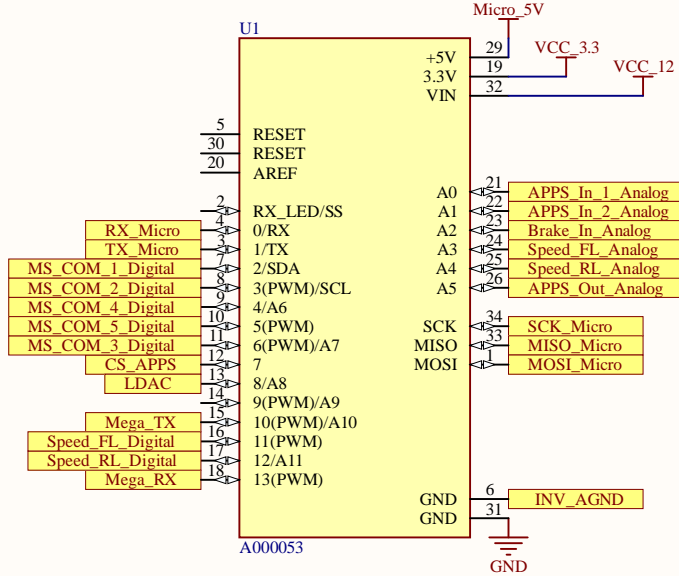


Pull Up and Pull Down Resistors and Divider



Arduino Micro Shield

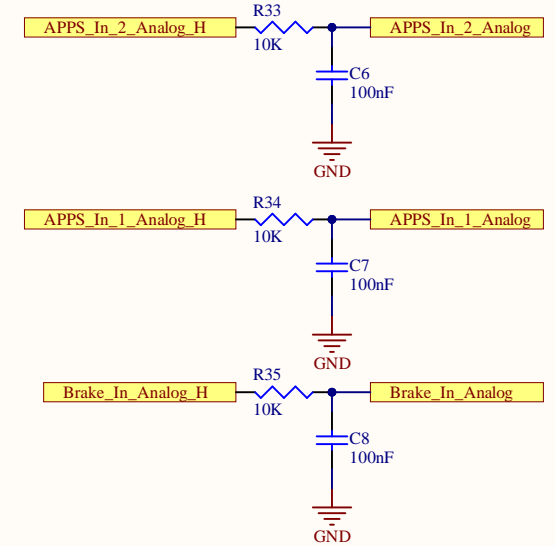


RC filter for drive critical analog inputs, resistor can be substituted with 00hm resistor if not needed

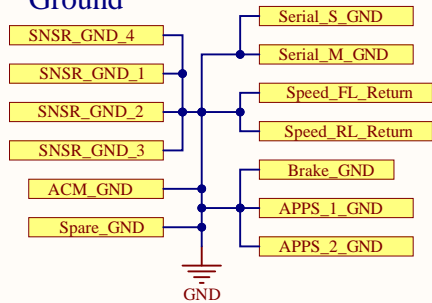
Interrupts: MS_COM_1_Digital, MS_COM_2_Digital

INV_AGND will be a trace coming from the powertrain connector to clean up the APPS OUT Signal. Other APPS GNDs might be worth putting on INV_AGND.

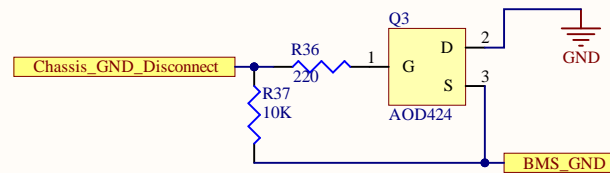
Signal Filters



Ground



Ground

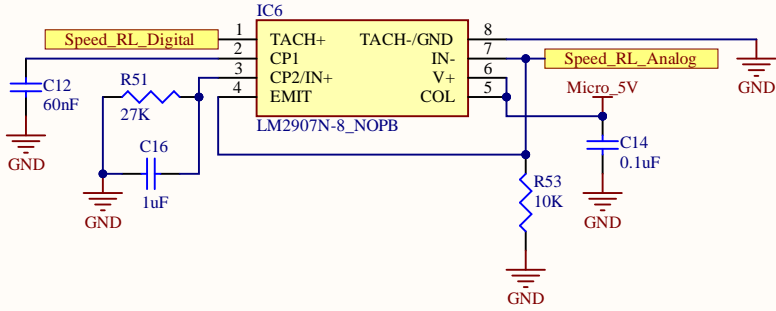


Max frequency is 452Hz with max speed of 130kph, 18" wheels and 18Hz per cycle. 600Hz with FOS which requires a 60nF capacitor.

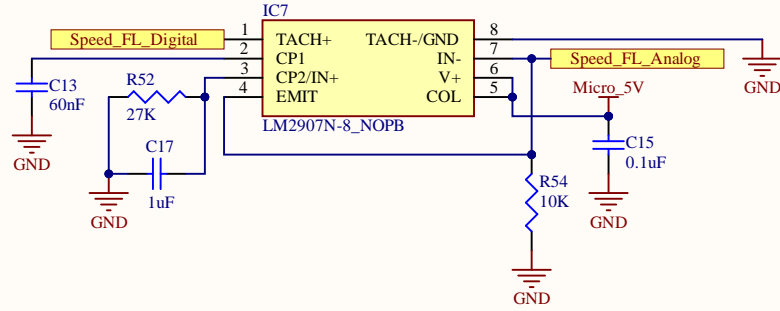
Ground plane (low impedance ground) is recommended. Trace INV_AGND is not recommended for Wheel Speed Tachometer.

Title Arduino Micro		
Size A4	Number 2	Revision v.2.2
Date: 2-06-2022	Sheet of 8	
File: D:\Benjamin\...\Arduino_Micro.SchDoc	Drawn By: Benjamin Liang	

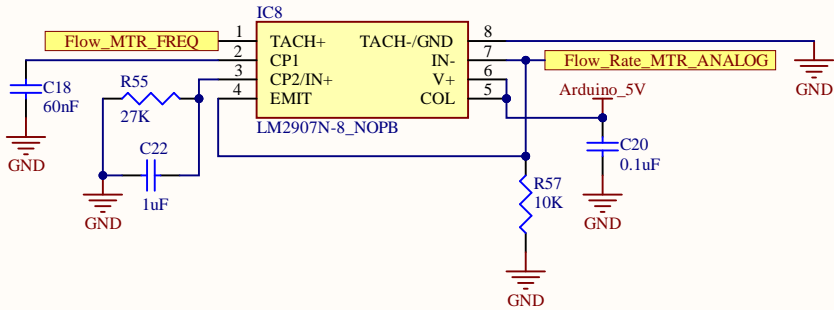
Wheel Speed RL



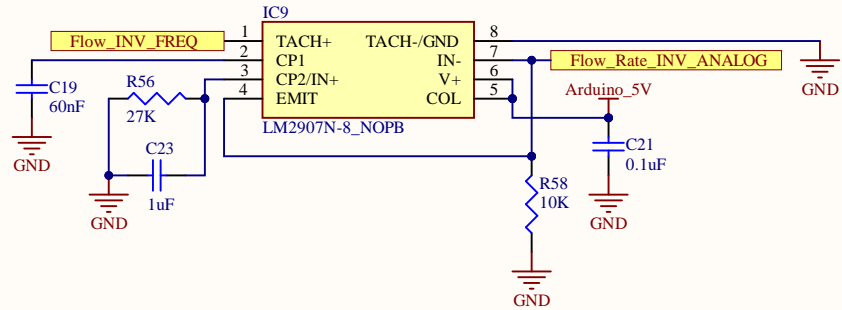
Wheel Speed FL



Flowrate MTR

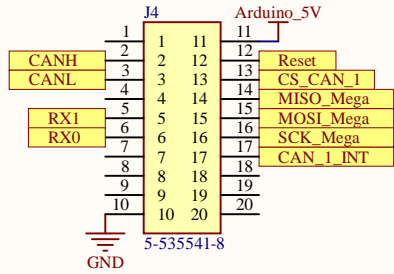


Flowrate INV

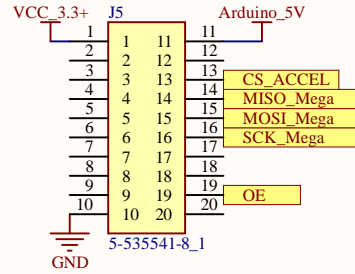


Title			Frequency to Analog
Size	Number	Revision	
A4	3	v.2.2	
Date:	2-06-2022	Sheet of	8
File:	D:\Benjamin\...\Frequency_Analog.SchDoc Drawn By: Benjamin Liang		

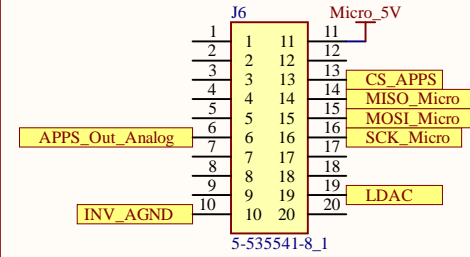
CAN Module 1



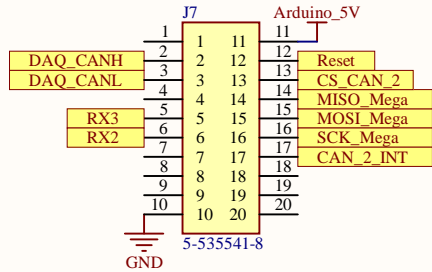
Accelerometer



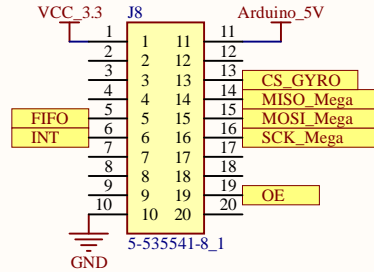
APPS OUT



CAN Module 2



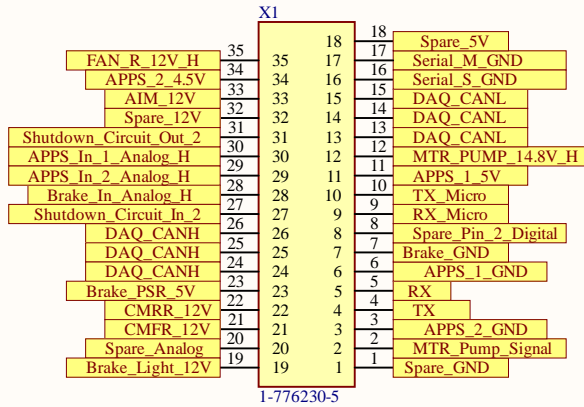
Gyroscope



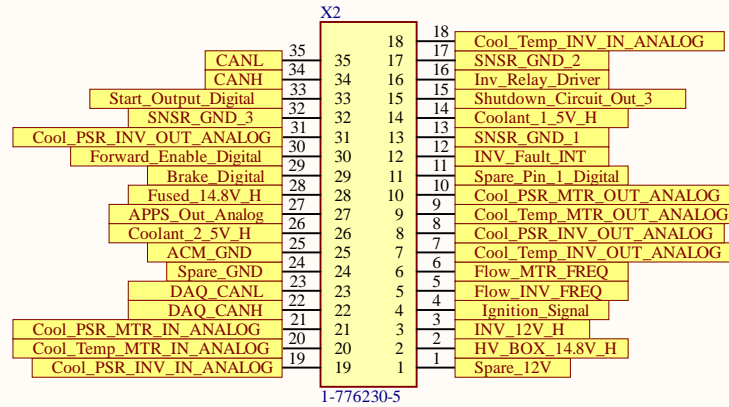
CANL and CANH traces should be similar length

Title SPI Breakout and CANBUS		
Size A4	Number 4	Revision v.2.2
Date:	2-06-2022	Sheet of 8
File:	D:\Benjamin\.\SPI_Breakout.SchDoc	Drawn By: Benjamin Liang

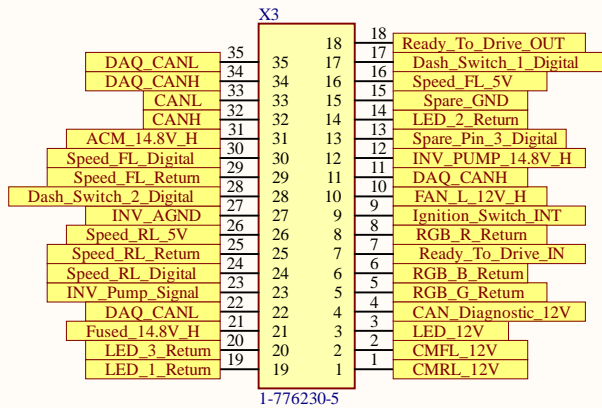
Right Body



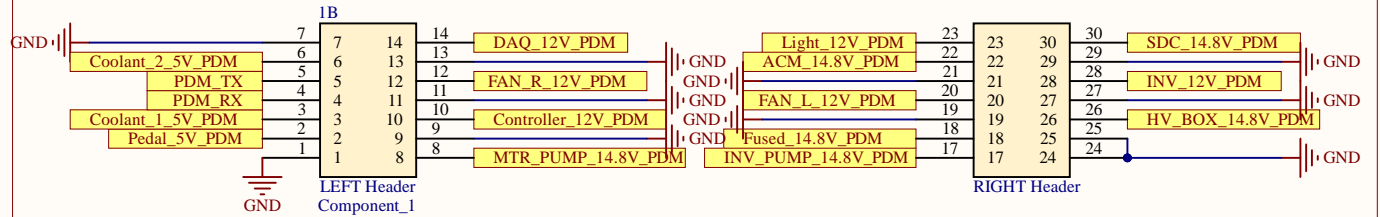
Powertrain



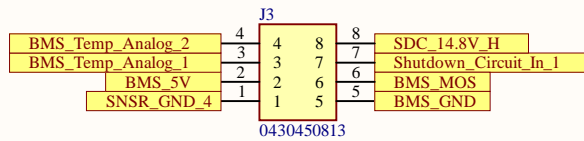
Left Body



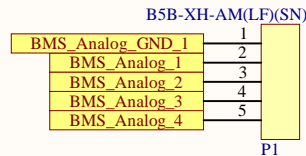
PDM Header



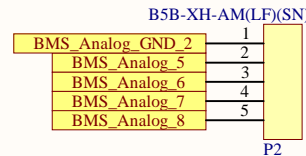
Internal Connector



Battery Connector 1

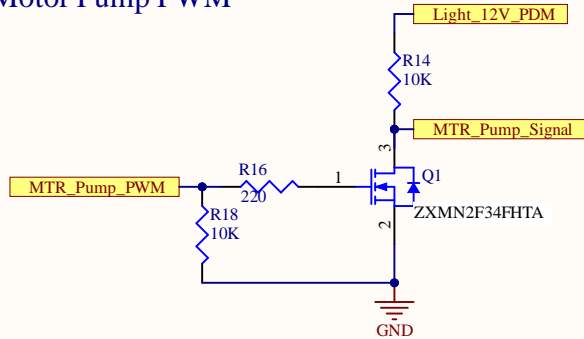


Battery Connector 2

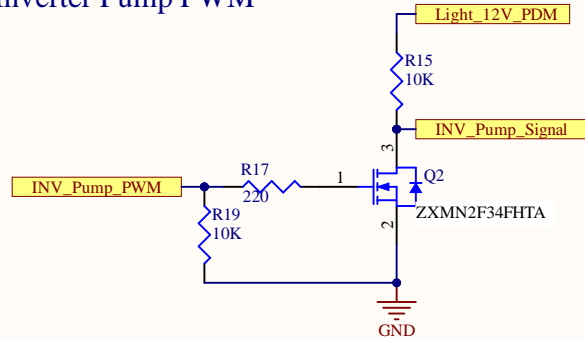


Title			Connector
Size	Number	Revision	
A4	5	v.2.2	
Date:	2-06-2022	Sheet of	8
File:	D:\Benjamin\...\Connector.SchDoc	Drawn By:	Benjamin Liang

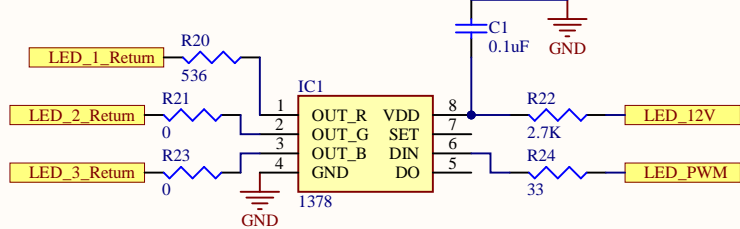
Motor Pump PWM



Inverter Pump PWM



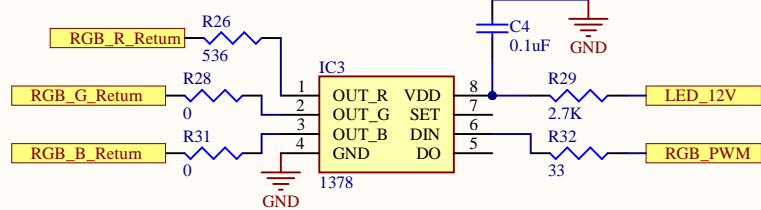
LED PWM Driver



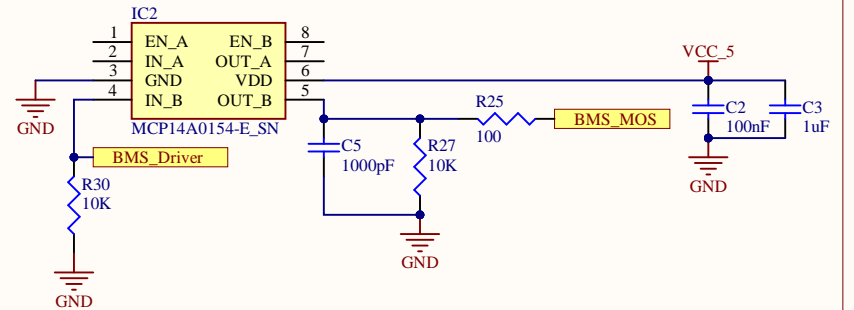
Request review for RGB PWM drivers, documentation is poor. Uncertainty with resistor placed in series with OUT_R.

The trace loop length and inductance should be minimized by the use of ground planes or traces under the MOSFET gate drive signal. Separate analog and power grounds, and local driver decoupling should also be used. Ground plane under device is recommended.

RGB PWM Driver



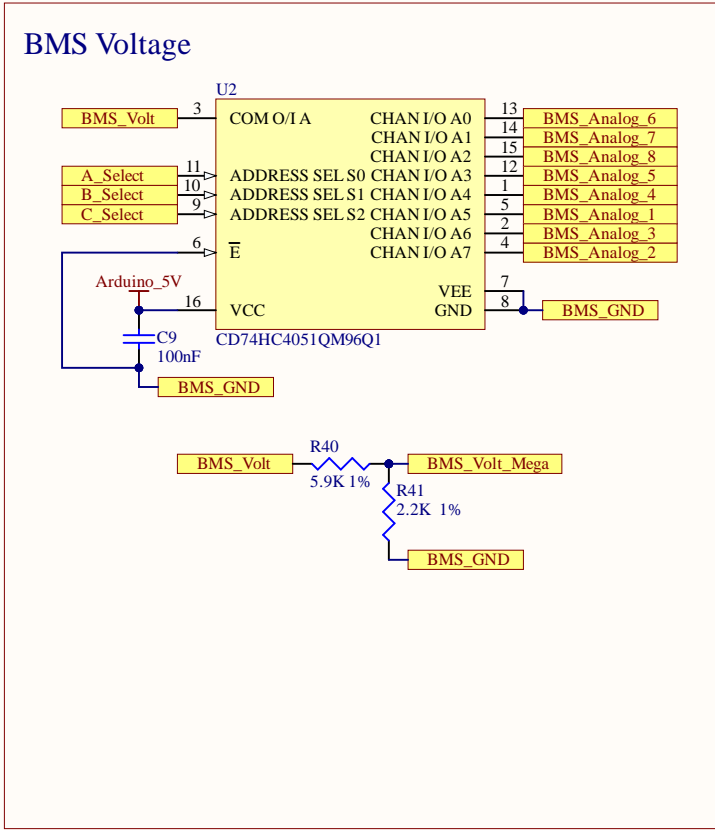
BMS Signal Gate Driver



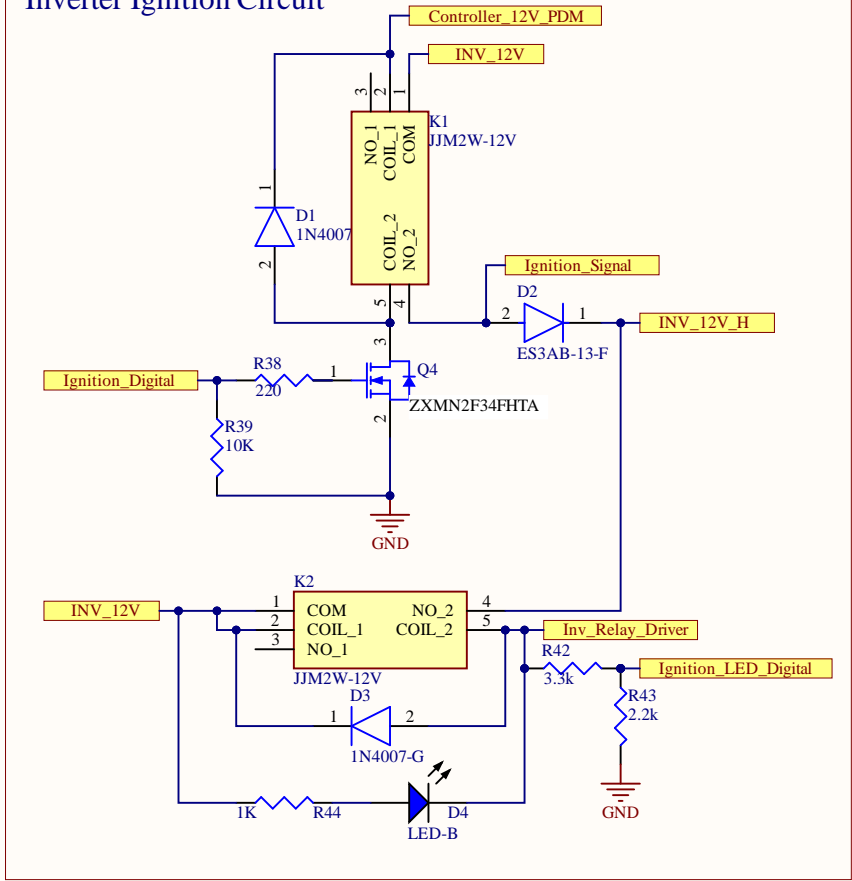
Title Mosfet and PWM			
Size A4	Number 6	Revision v.2.2	
Date: 2-06-2022	Sheet of 8		
File: D:\Benjamin\...\PWM_Mosfet.SchDoc	Drawn By: Benjamin Liang		

Place Flyback Diode near coil

BMS voltage gets divided to a maximum of 4.563V when the battery voltage is 16.8V

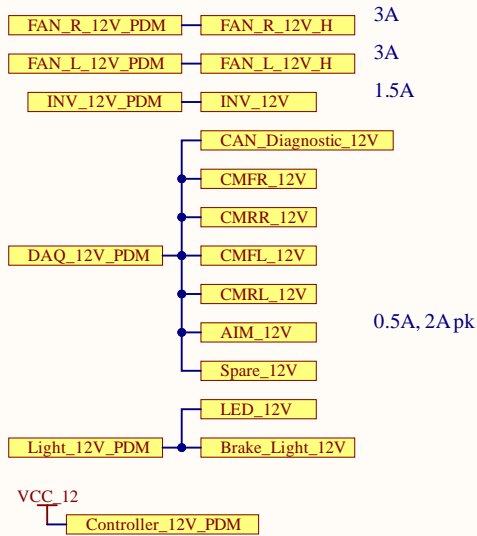


Inverter Ignition Circuit

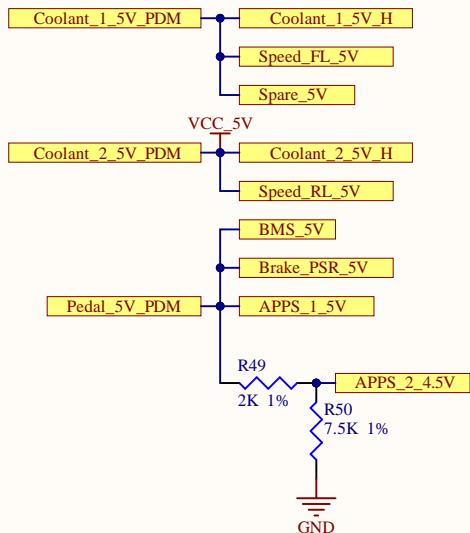


Title			
Ignition and Multiplexer			
Size	Number	Revision	
A4	7	v.2.2	
Date:	2-06-2022	Sheet of	8
File:	D:\Benjamin\...\Ignition_Mux.SchDoc	Drawn By:	Benjamin Liang

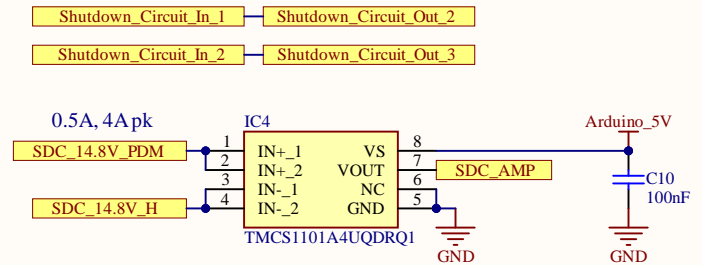
12V PDM Pass-Throughs



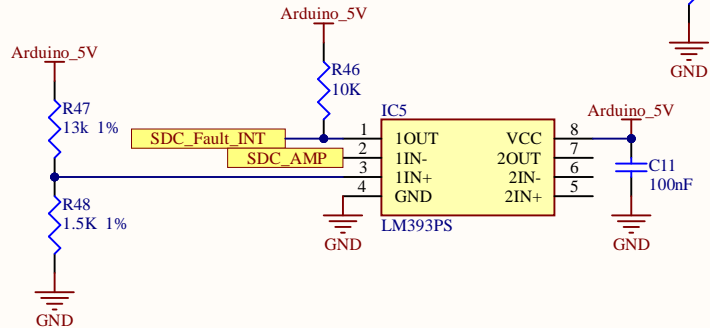
5V PDM Pass-Throughs



14.8V SDC Pass-Through and Current Sensor



Shutdown Circuit Current Comparator



Current Sensor: Minimize adjacent high-current traces in close proximity to the device. The input current trace can contribute additional magnetic field to the sensor if the input current traces are routed parallel to the vertical axis of the package. Merge input traces for both IN+ and IN- inputs. Make sure to consider the PCB design required creepage and clearance for system-level isolation requirements.

For better sensor thermal performance: Use large copper planes for both input current path and isolated power planes and signals. Use heavier copper PCB construction. Place thermal via farms around the isolated current input.

Comparator: Zero current is 0.5V, with 400mV/A sensitivity. Typical current of SDC is approx. 200mA so short circuit cut off is set at 43.1mA.

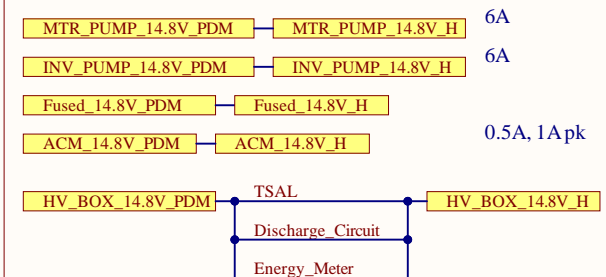
Comparator: Minimize coupling between outputs and inverting inputs to prevent output oscillations. Do not run output and inverting input traces in parallel unless there is a VCC or GND trace between output and inverting input traces to reduce coupling. Why series resistors?

High current traces are labeled

INV_RS_232_GND to be grounded to GND on inverter or chassis GND

Location of current sensor IC3 can be adjusted to accommodate layout. Other possible locations include SDC pass-throughs 1 and 2.

14.8V PDM Pass-Throughs



Title			
Passthrough			
Size	Number	Revision	
A4	8	v.2.2	
Date:	2-06-2022	Sheet of	8
File:	D:\Benjamin\...\Passthrough_Net.SchDoc	Drawn By:	Benjamin Liang