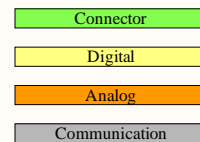


MCP33151-10 Eval Board

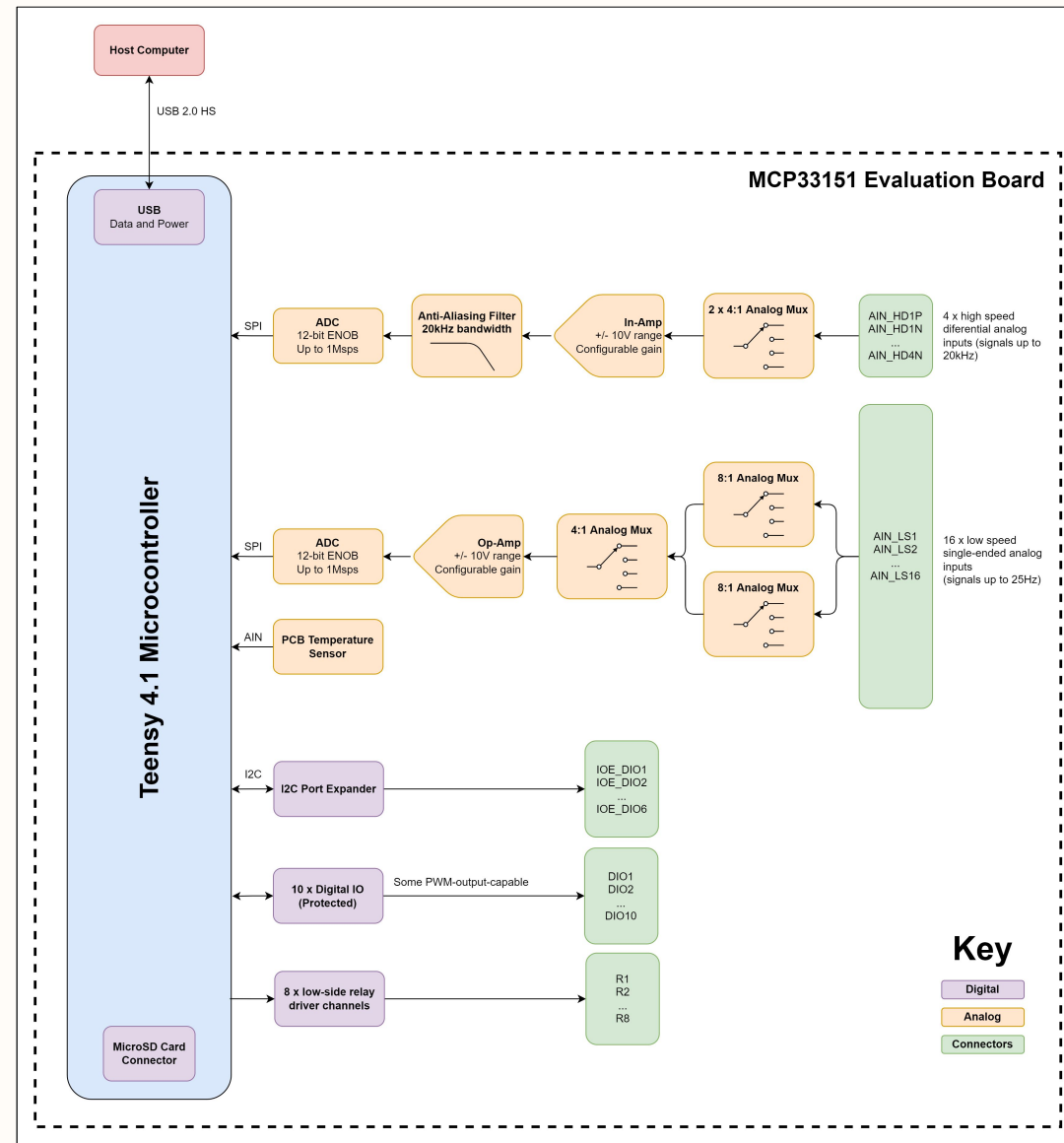
Table of Contents

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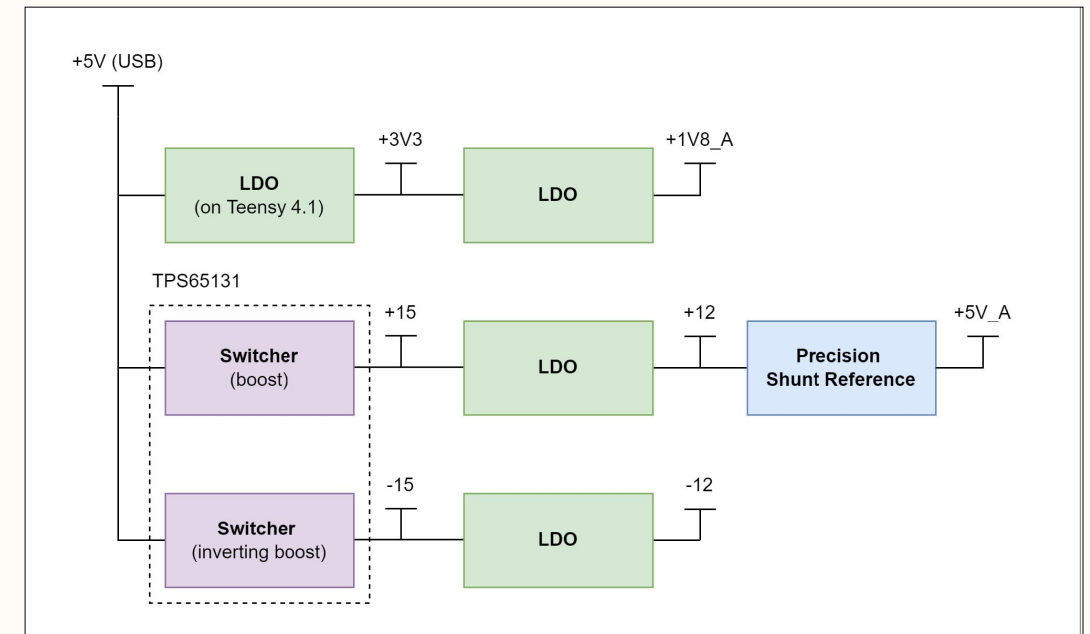
Port Colors




Main Block Diagram



Power Architecture



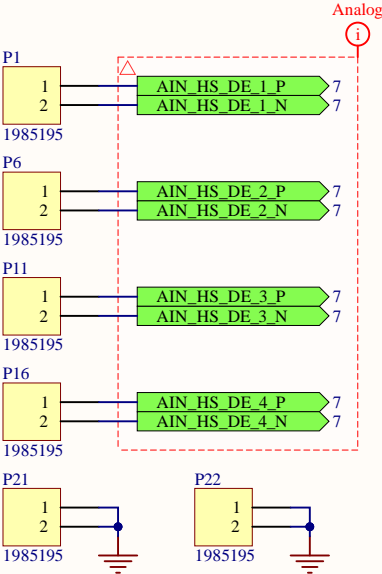
Title				<i>MCP33151-10 Eval Board</i>				<i>Avionics</i> <i>McGill Rocket Team</i> <i>McGill University</i> <i>Montreal, Quebec</i>							
Size: B		Revision: *		Drawn By: Jasper Yun											
Date: 2022-11-08		Time: 4:20:42 PM		Sheet 1 of 11											
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\MCP33151 Eval Board\Cover.SchDoc															

Connectors

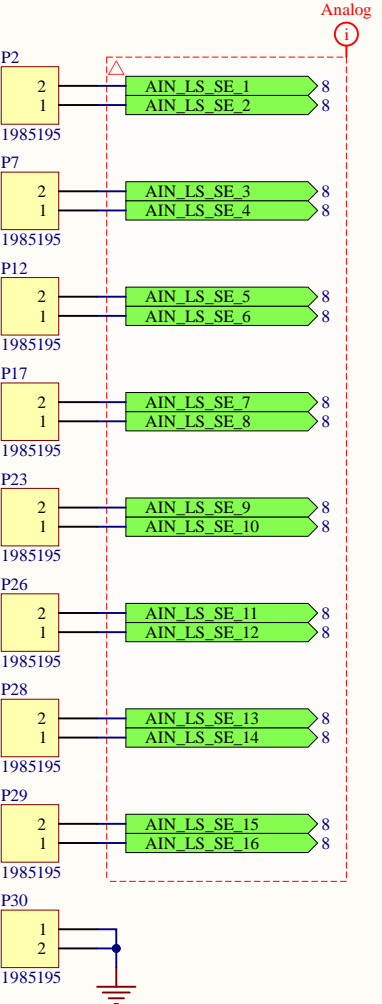
DE = differential-ended
SE = single-ended

All terminal blocks for ease of prototyping.

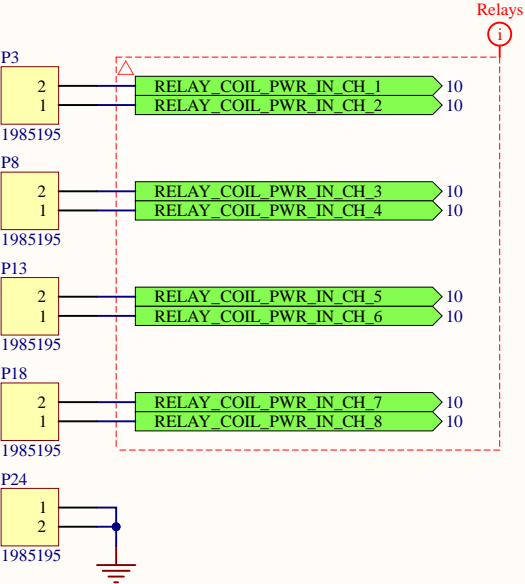
High Speed DE Analog



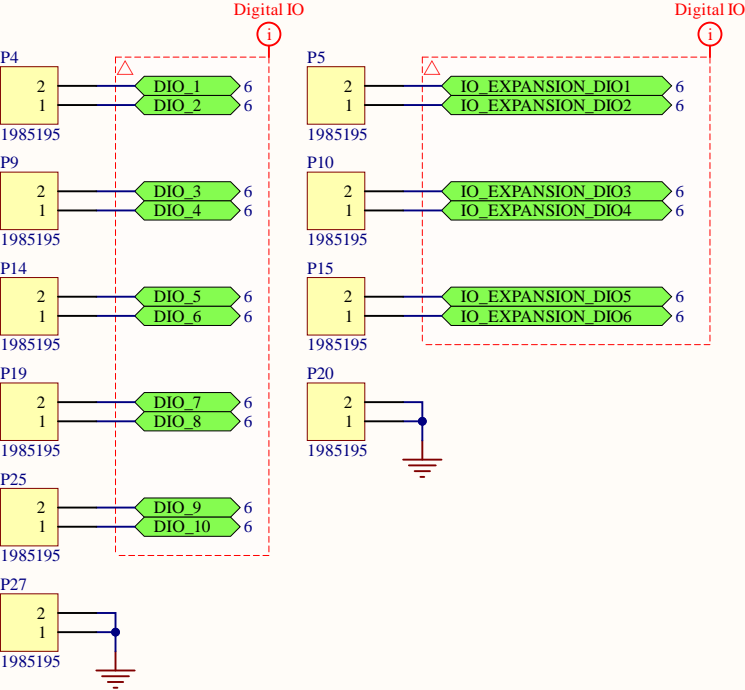
Low Speed SE Analog



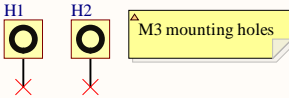
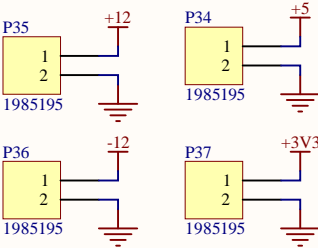
Relay Coils (Low Side)



Digital IO Pins



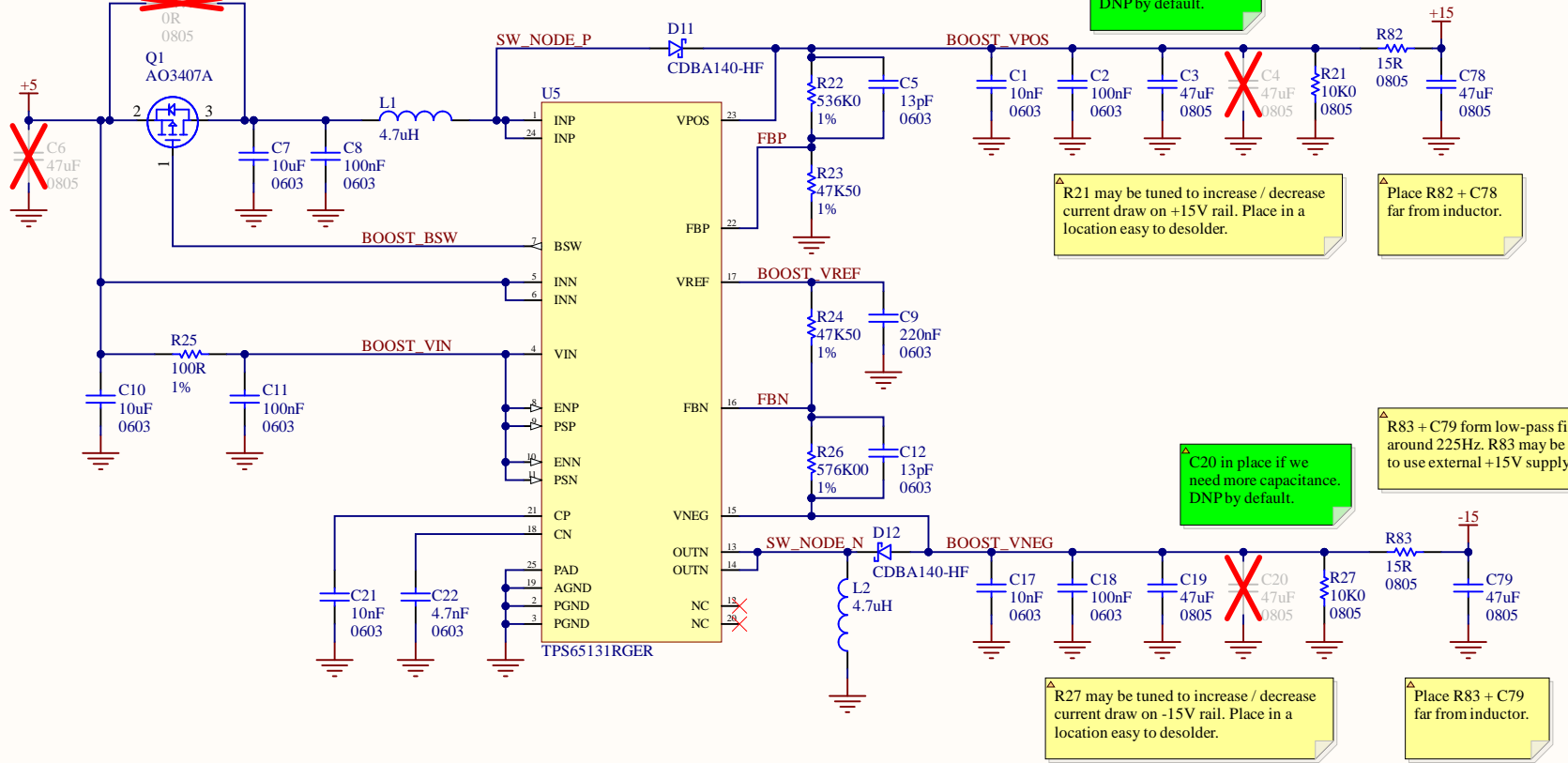
Power



Power

R84 is a jumper to bypass Q1. DNP by default.
C6 in place in case we need more capacitance. DNP by default.

+/- 15V



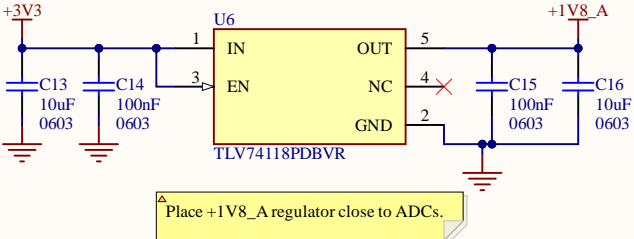
+5V (from USB port on Teensy :))

Nothing to be done.

+3V3 (from Teensy :))

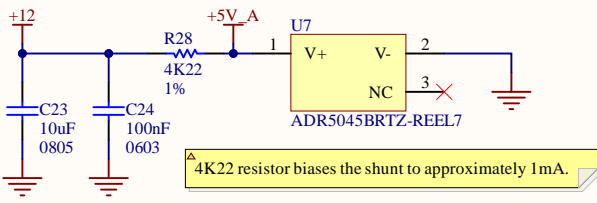
Nothing to be done.

+1V8_A (ADC)

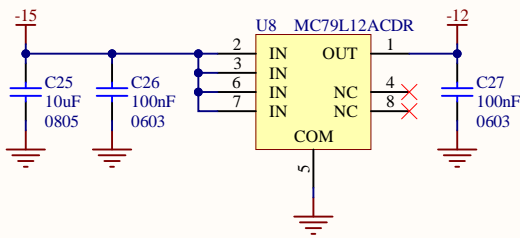


+5V_A (Analog Reference)

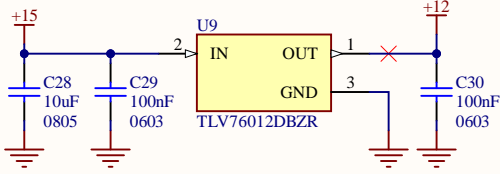
Voltage reference IC. Keep away from noisy sources and place close to ADCs.



-12V



+12V

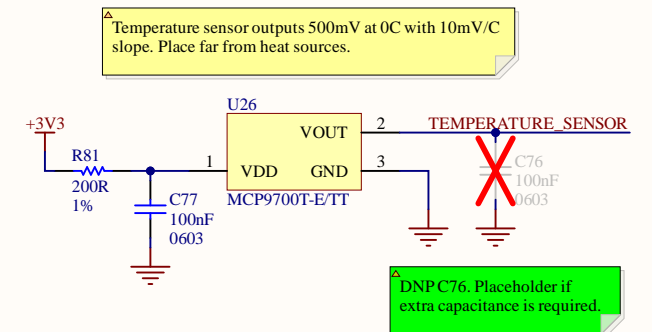
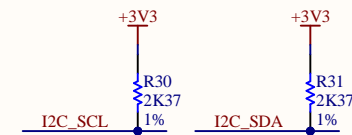
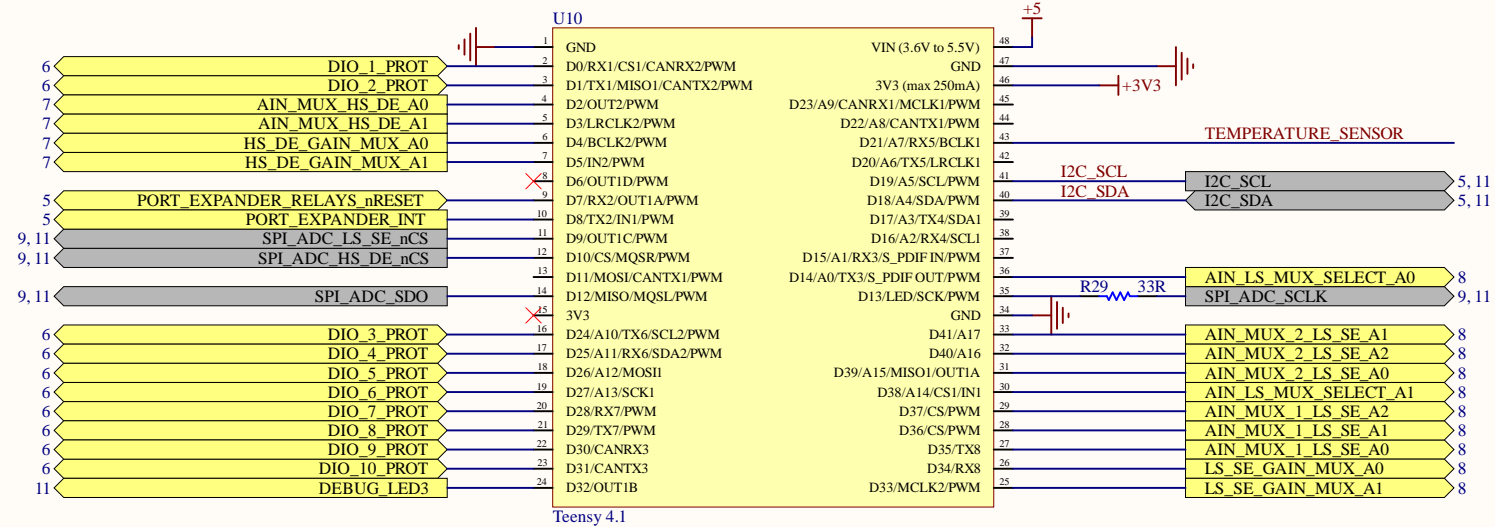


Microcontroller

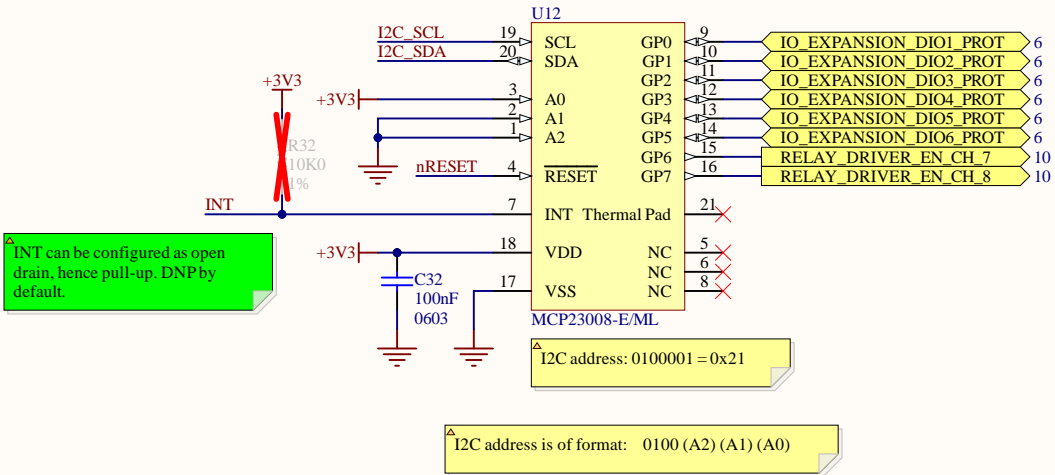
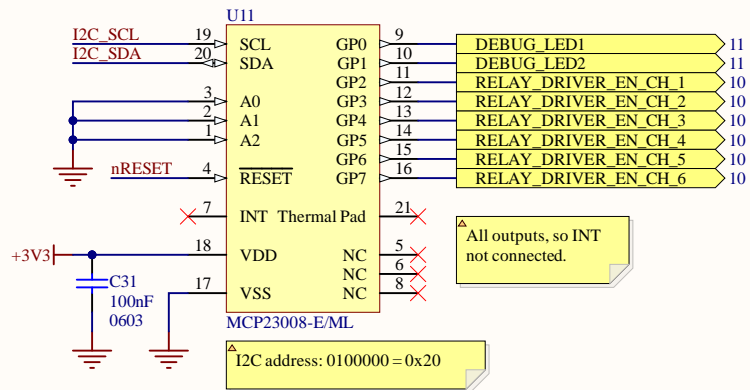
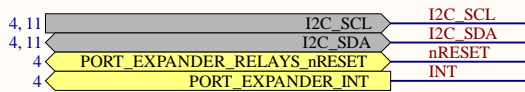
Teensy will be interfaced by USB thus powered by USB. Board is thus limited to 500mA from the +5V rail.

Use Teensy 4.1 Ethernet kit to add Ethernet capability to the board.

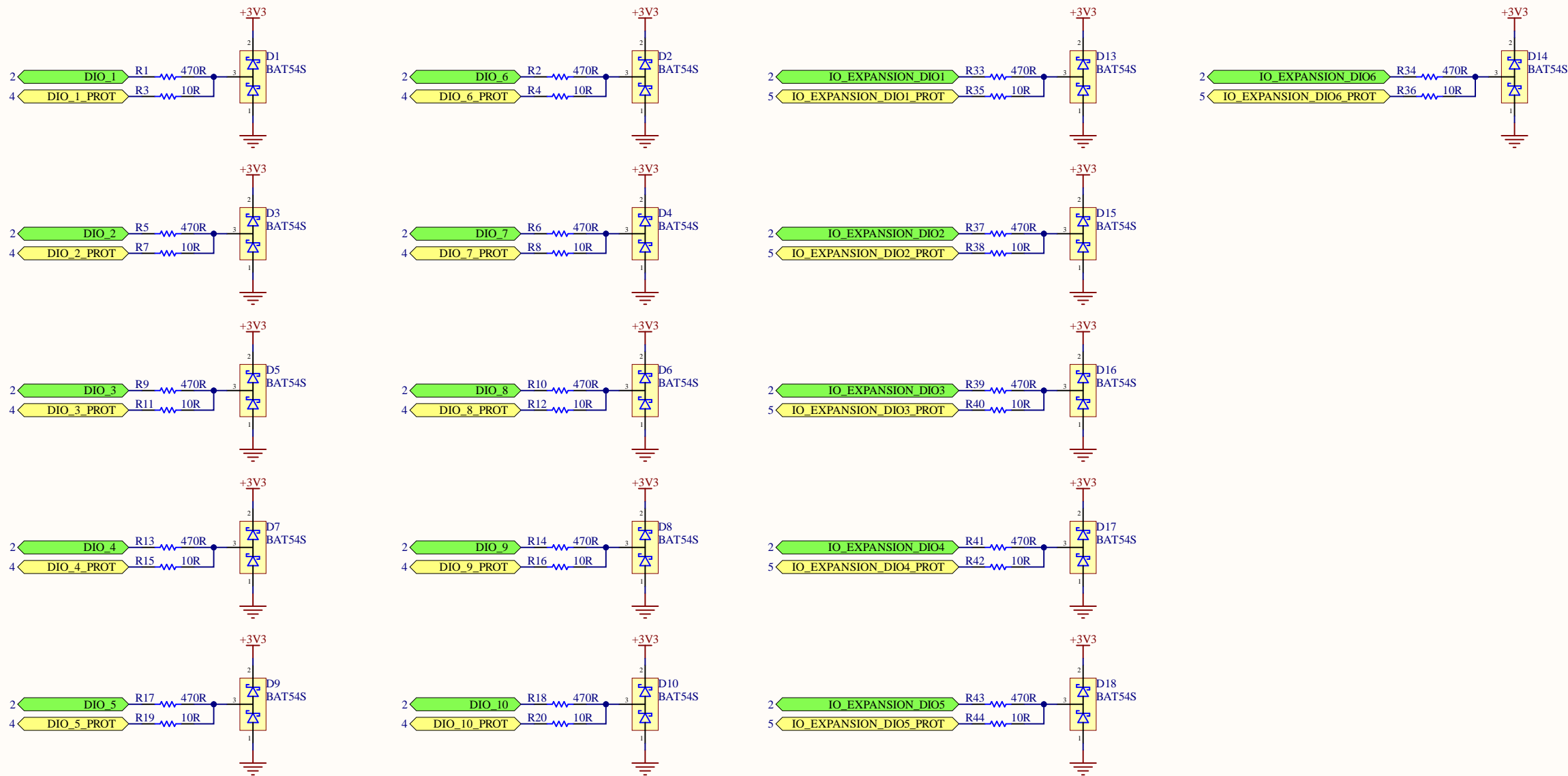
Teensy 4.1 has built-in SD card which interfaces using 4-bit SDIO. No need for SD card on this board.



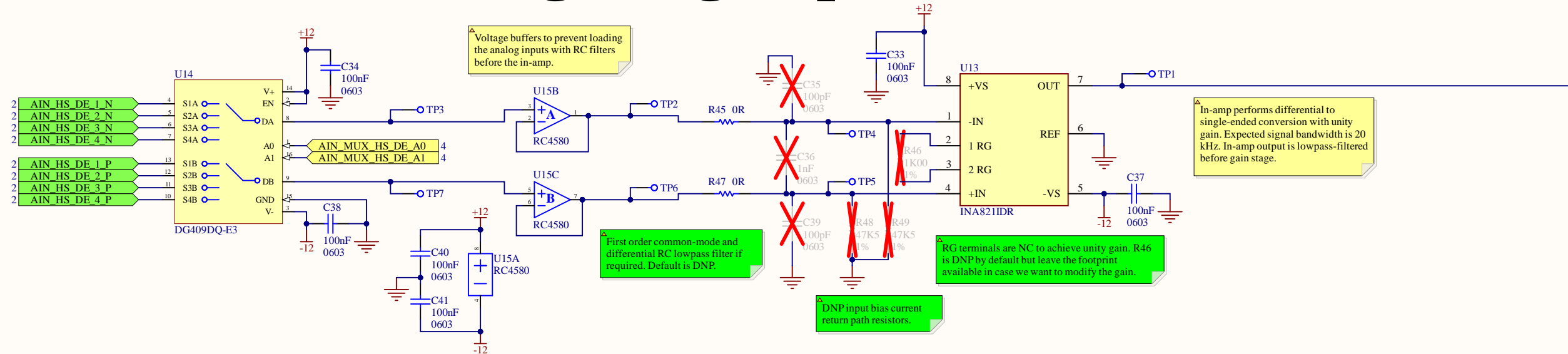
IO Expansion



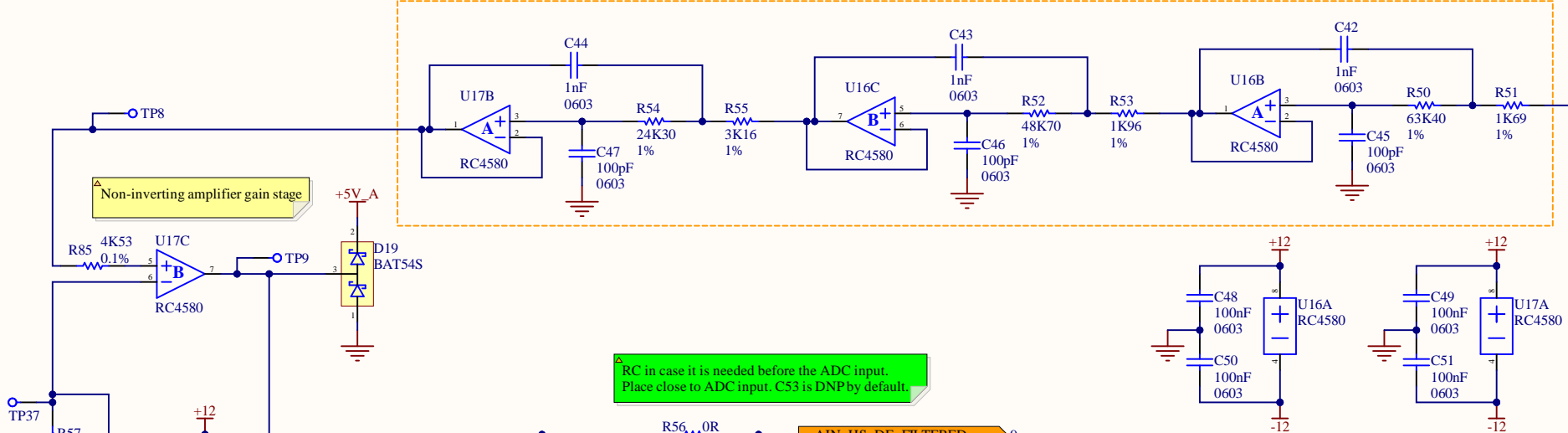
Digital IO Protection



Analog - High Speed Differential



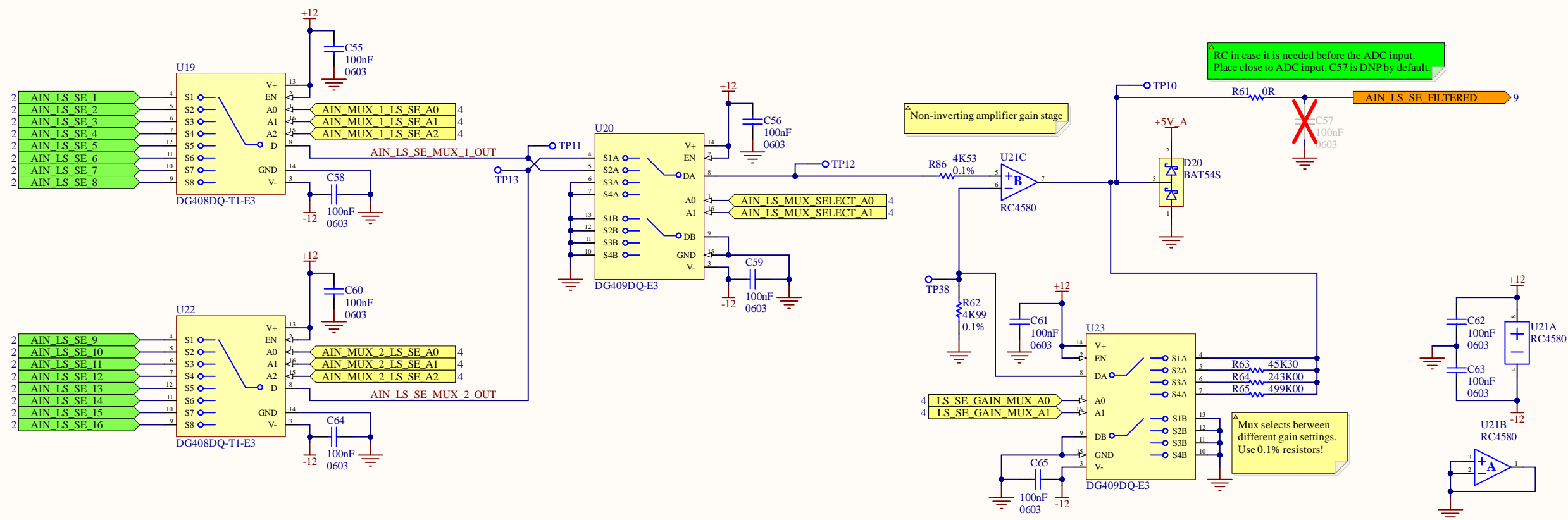
6th order Bessel Low Pass Filter (-3dB at 28kHz)



Non-Inverting Amplifier Gain Tolerances

		Tolerance	Min	Nom	Max	Units
G = 1 V/V	Non-inverting amplifier Rf	0.10%	0	0	0	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	1.008	1.020	1.025	V/V
G = 10 V/V	Non-inverting amplifier Rf	0.10%	45.255E+3	45.300E+3	45.345E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	10.068	10.098	10.121	V/V
G = 50 V/V	Non-inverting amplifier Rf	0.10%	242.757E+3	243.000E+3	243.243E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	49.705	49.717	49.820	V/V
G = 100 V/V	Non-inverting amplifier Rf	0.10%	498.501E+3	499.000E+3	499.499E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	100.808	101.020	101.225	V/V

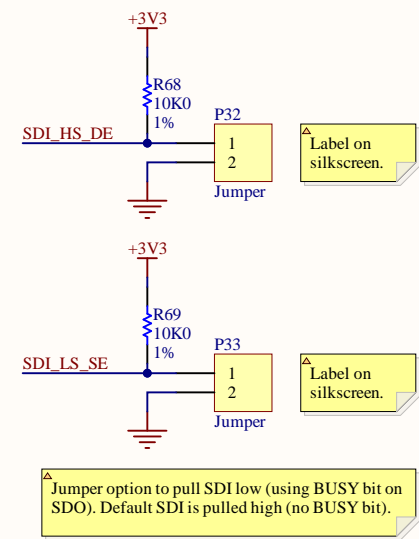
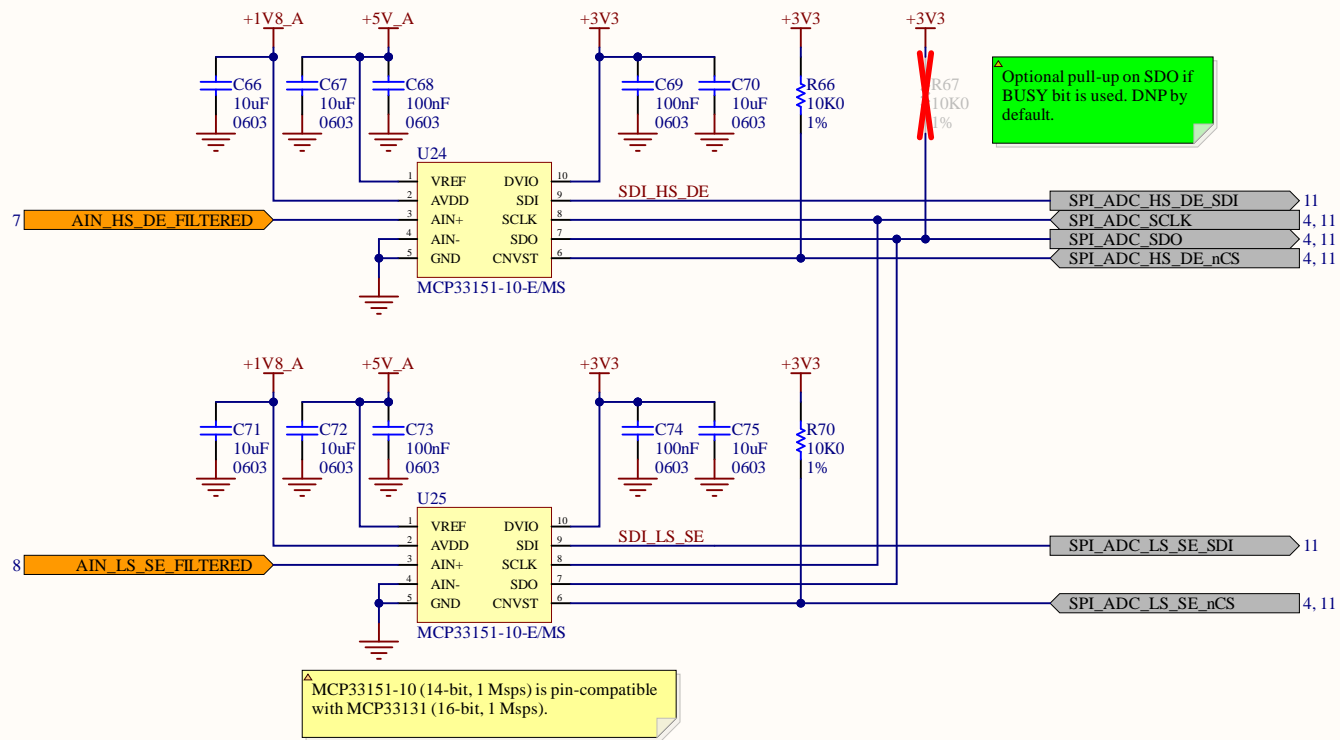
Analog - Low Speed Single-Ended



Non-Inverting Amplifier Gain Tolerances

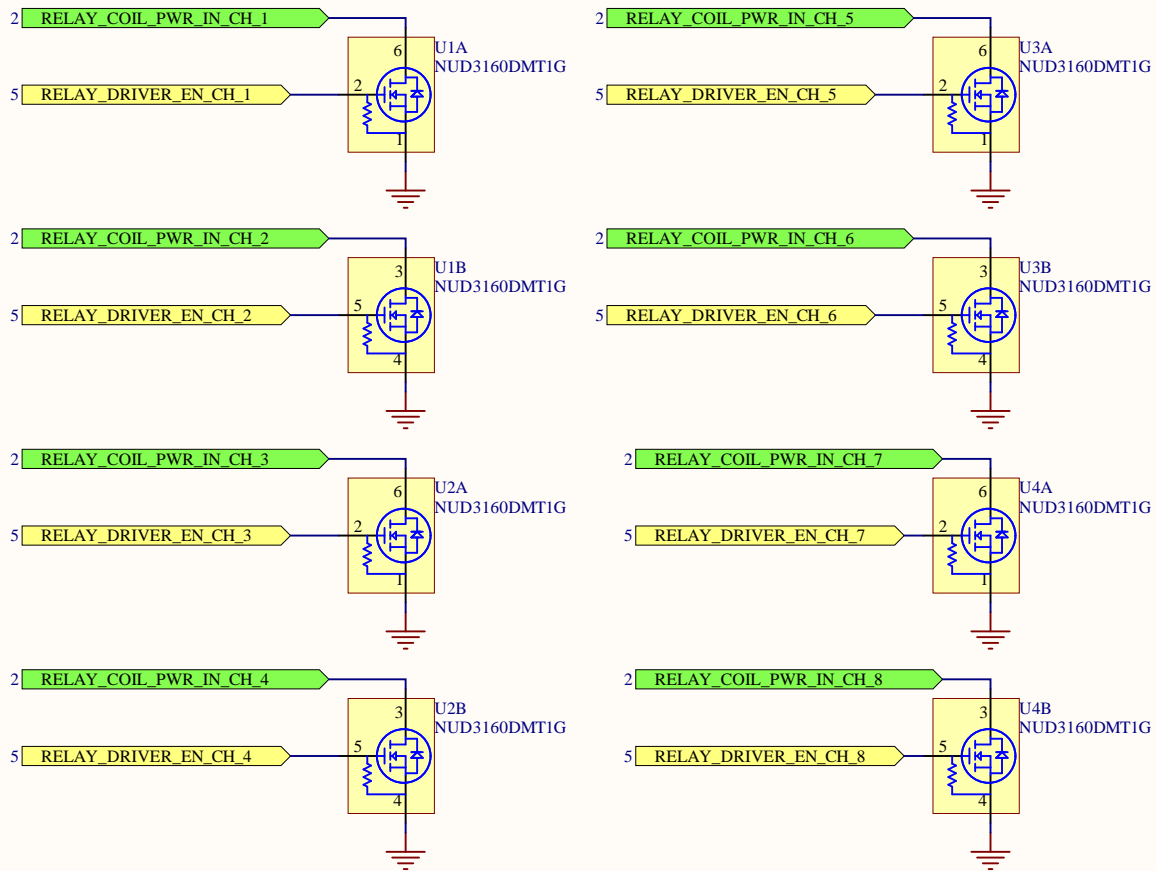
		Tolerance	Min	Nom	Max	Units
G = 1 V/V	Non-inverting amplifier Rf	0.10%	0	0	0	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	1.008	1.020	1.025	V/V
G = 10 V/V	Non-inverting amplifier Rf	0.10%	45.255E+3	45.300E+3	45.345E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	10.068	10.098	10.121	V/V
G = 50 V/V	Non-inverting amplifier Rf	0.10%	242.757E+3	243.000E+3	243.243E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	49.705	49.717	49.820	V/V
G = 100 V/V	Non-inverting amplifier Rf	0.10%	498.501E+3	499.000E+3	499.499E+3	Ohm
	Non-inverting amplifier Rg	0.10%	4.985E+3	4.990E+3	4.995E+3	Ohm
	Analog mux on-state resistance	-	40	100	125	Ohm
	Gain = 1 + Rf/Rg	-	100.808	101.020	101.225	V/V

Analog to Digital Conversion



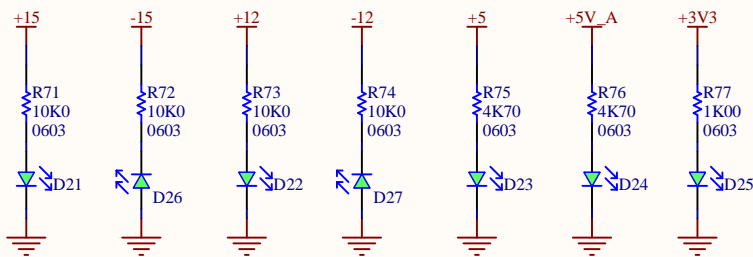
Relay Drivers

Relay drivers are low-side nFETs which are rated to 60V drain-source. Relay coil outputs are connected to RELAY_COIL_PWR_IN_CH_XY.

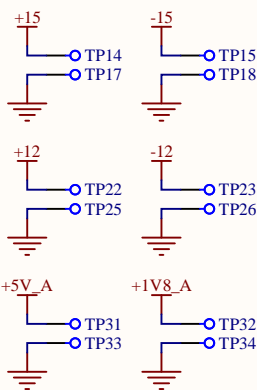


Debug

Power LEDs

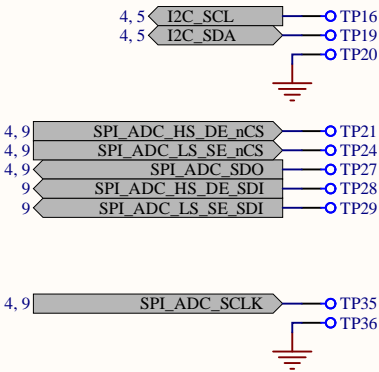


Power Rails Test Points



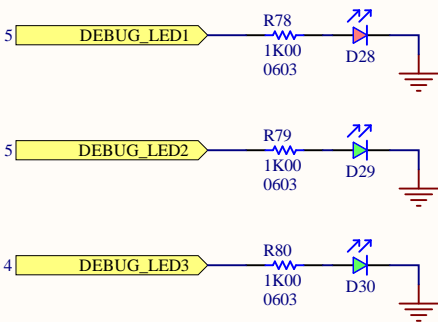
Place close to output of regulators, conducive for probing with oscilloscope + ground spring.

Place test power and ground points close together.



SMD test point pads. Label silkscreen with net names.

Program Debug LEDs



Analog Test Points

See analog sheets.