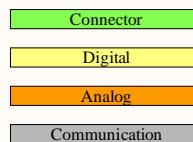


# ECSE478 - DAQ Device

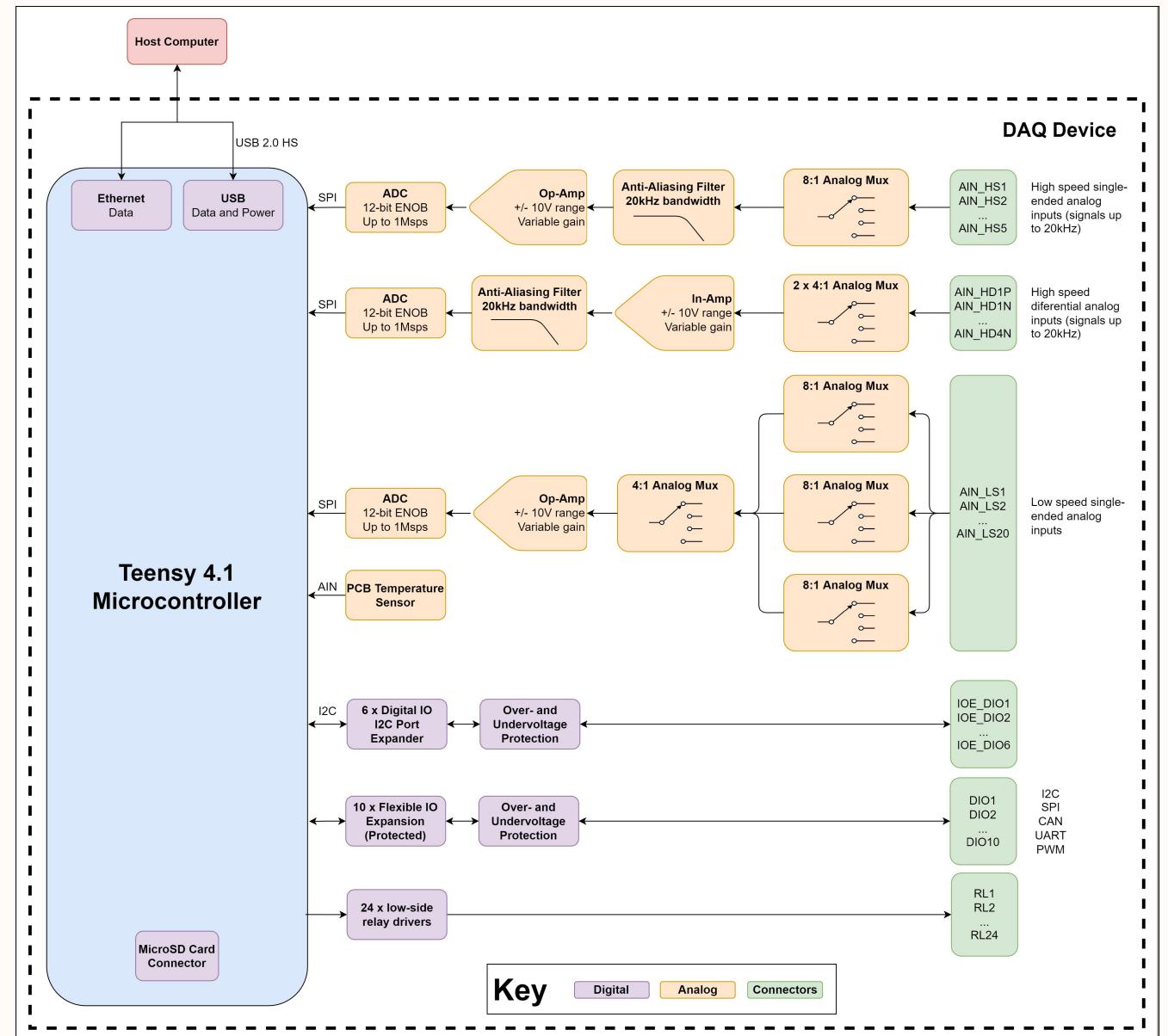
## Table of Contents

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- 7 Digital IO Protection
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- 12 ADC
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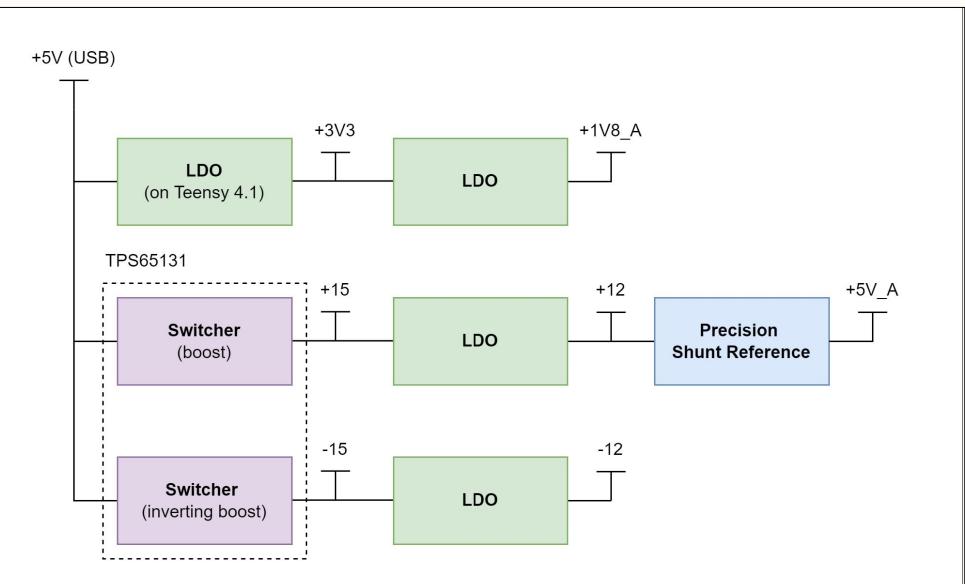
## Port Colors



## Main Block Diagram

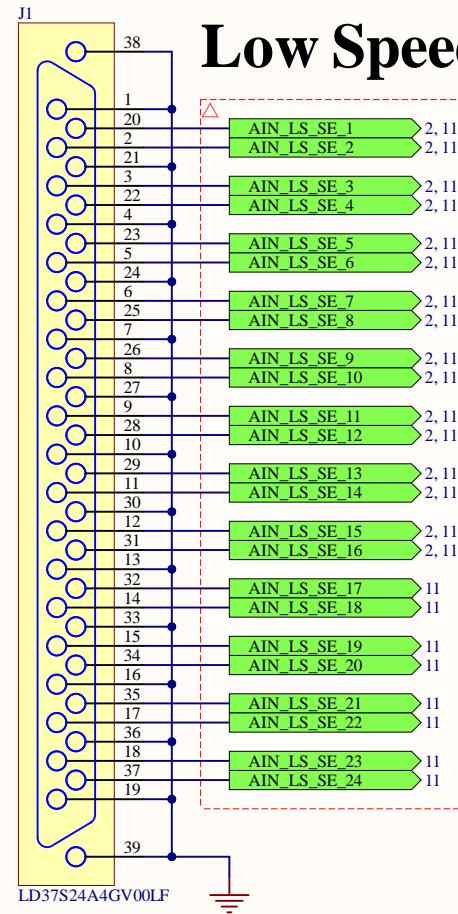


## Power Architecture

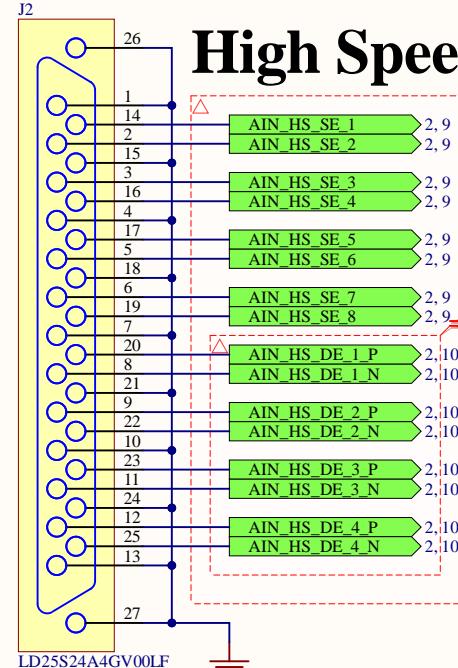


DE = differential-ended  
SE = single-ended

## Low Speed Analog

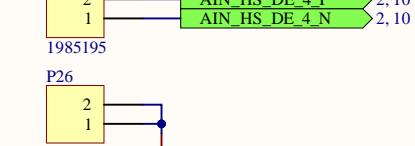
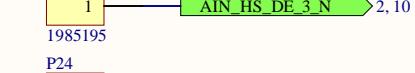
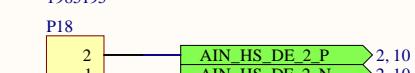
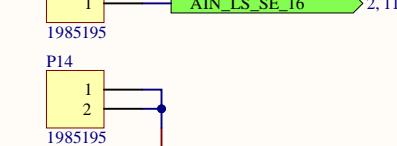
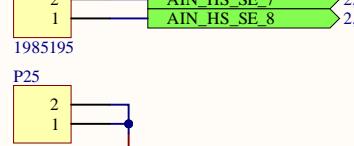
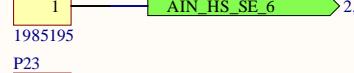
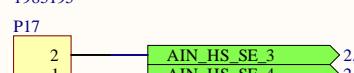
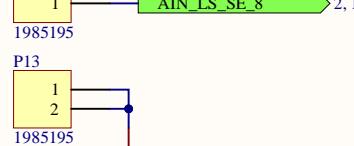
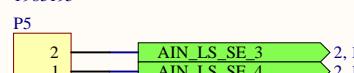
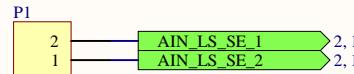


## High Speed Analog

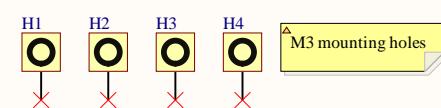
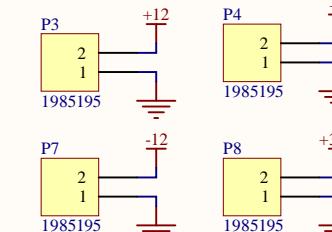


# Connectors - Analog

Terminal blocks are used alongside DB25 and DB37 connectors to allow quick connections, e.g. during prototyping, and full expansion use.



## Power



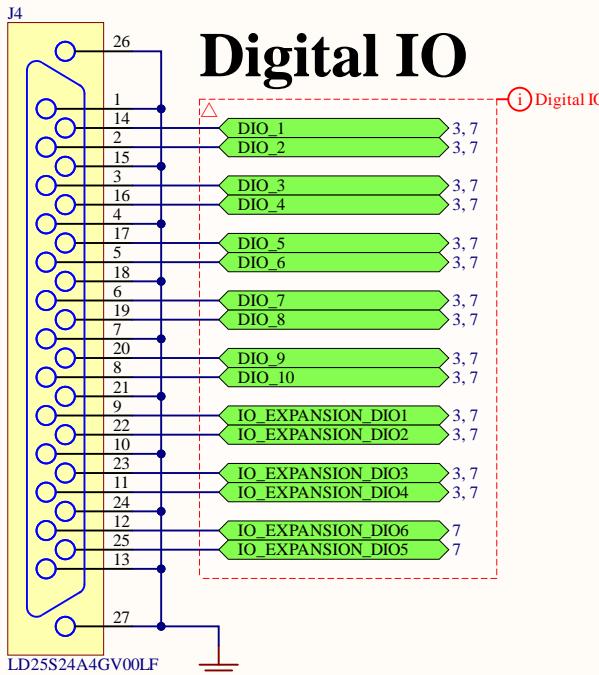
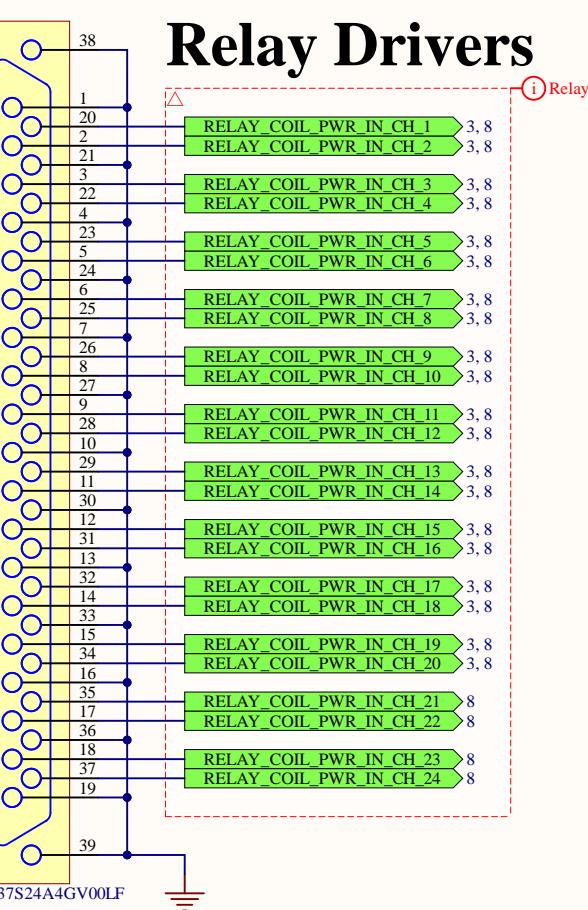
Title  
**Connectors - Analog**

Size: B Revision: \* Drawn By: Jasper Yun

Date: 2023-01-07 Time: 4:25:44 PM Sheet 2 of 13

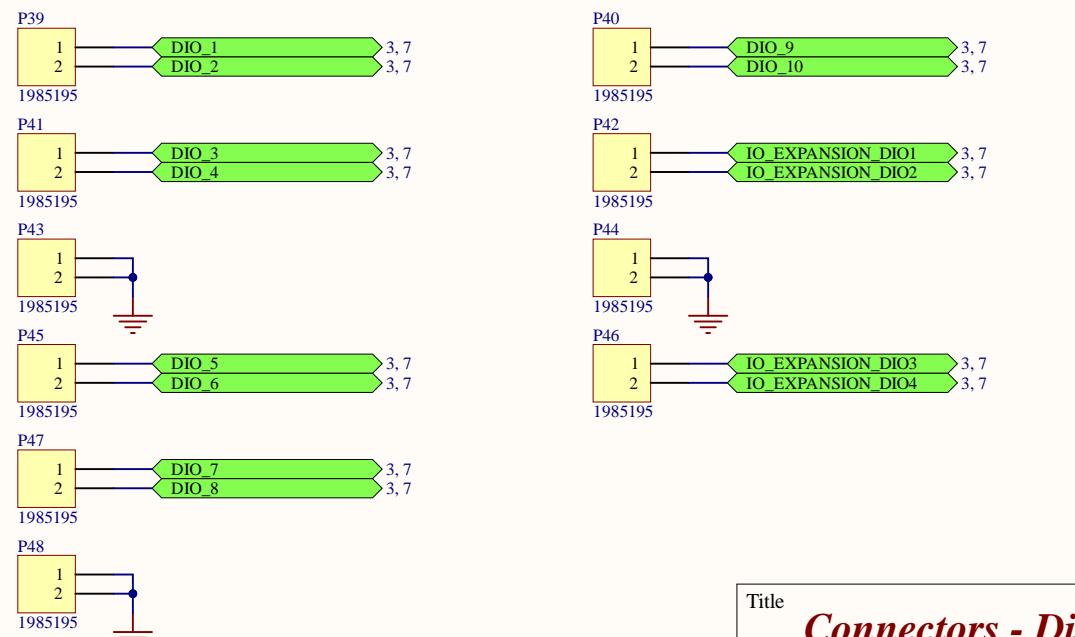
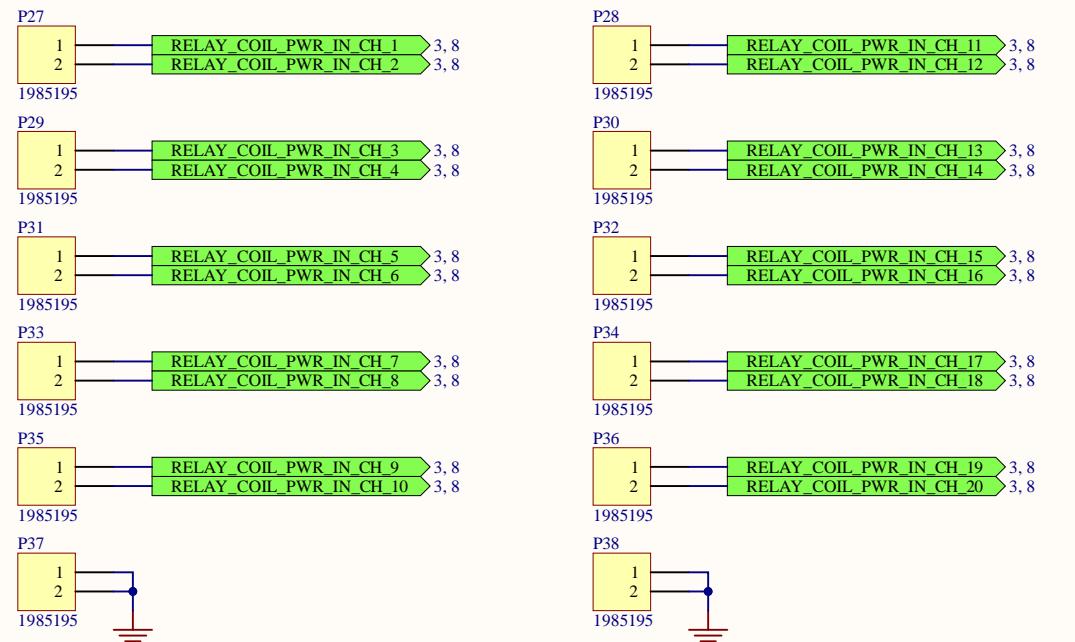
File: C:\Users\jaspe\Desktop\ecse478\_honours\_thesis\1 Hardware\Connectors - Analog.SchDoc





# Connectors - Digital

Terminal blocks are used alongside DB25 and DB37 connectors to allow quick connections, e.g. during prototyping, and full expansion use.



Title  
**Connectors - Digital**

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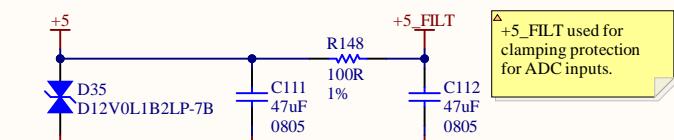
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File: C:\Users\jaspe\Desktop\ecse478\_honours\_thesis\1\_Hardware\ECSE478 - DAQ Device\Connectors - Digital.SchDoc

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# Power



Place D35 close to connector.

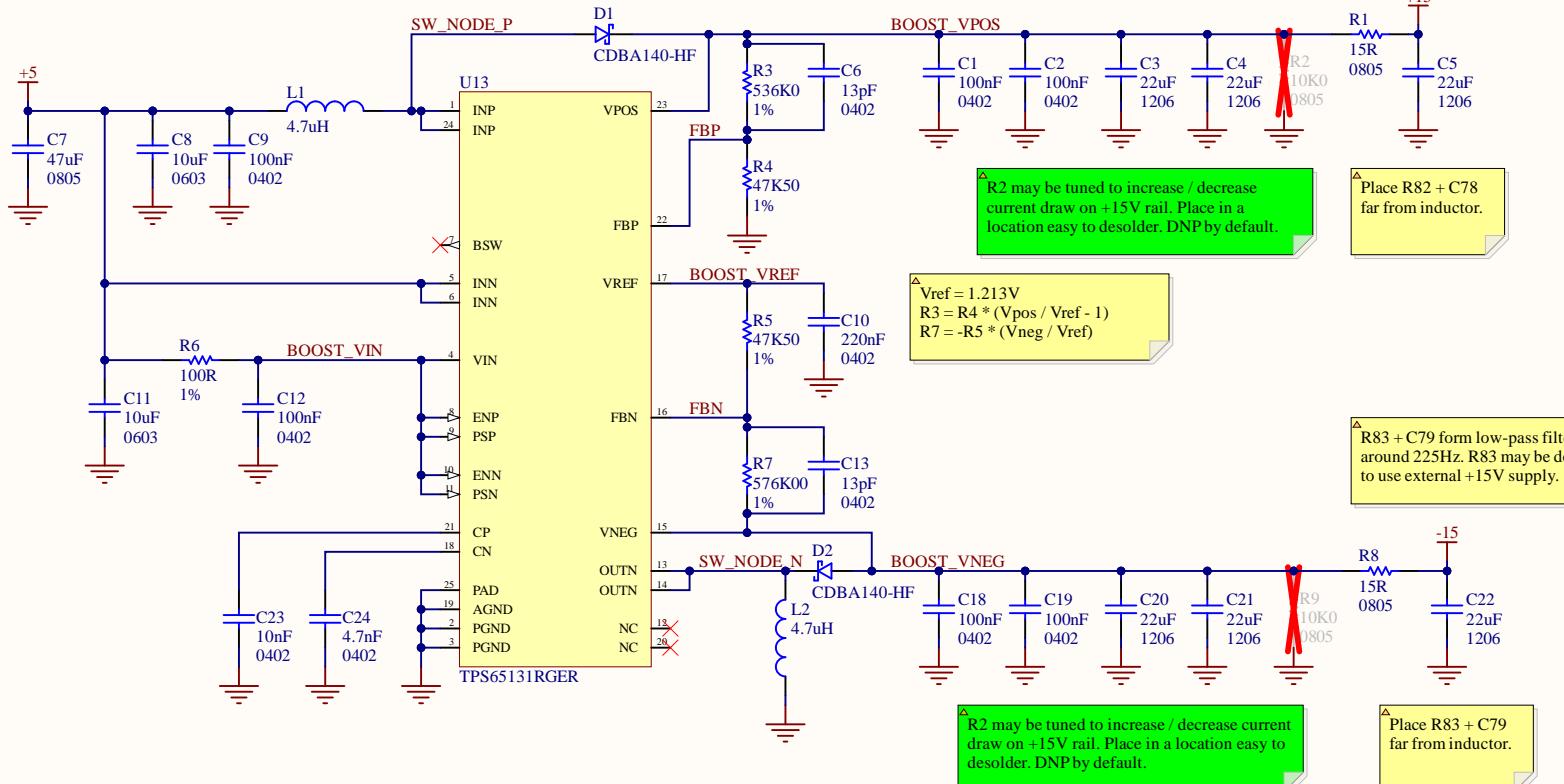
**+/- 15V**

Rail	Min	Nom	Max
+15 V	14.47 V	14.90 V	15.33 V
-15 V	-15.15 V	-14.71 V	-14.26 V

R82 + C78 form low-pass filter, cutoff around 225Hz. R82 may be depopulated to use external +15V supply.

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

Nothing to be done.



R2 may be tuned to increase / decrease current draw on +15V rail. Place in a location easy to desolder. DNP by default.

Place R82 + C78 far from inductor.

Vref = 1.213V  
R3 = R4 \* (Vpos / Vref - 1)  
R7 = -R5 \* (Vneg / Vref)

R83 + C79 form low-pass filter, cutoff around 225Hz. R83 may be depopulated to use external +15V supply.

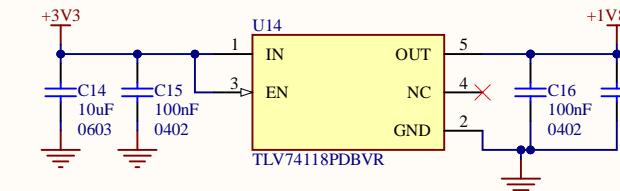
Place R83 + C79 far from inductor.

**+3V3 (from Teensy :))**

Nothing to be done.  
Place D36 close to connector.

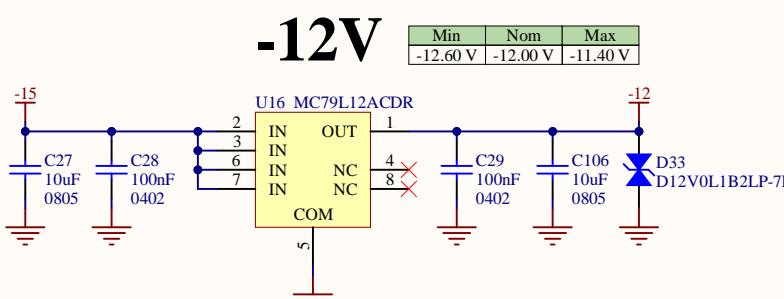
**+1V8\_A (ADC)**

Min	Nom	Max
1.77 V	1.80 V	1.83 V



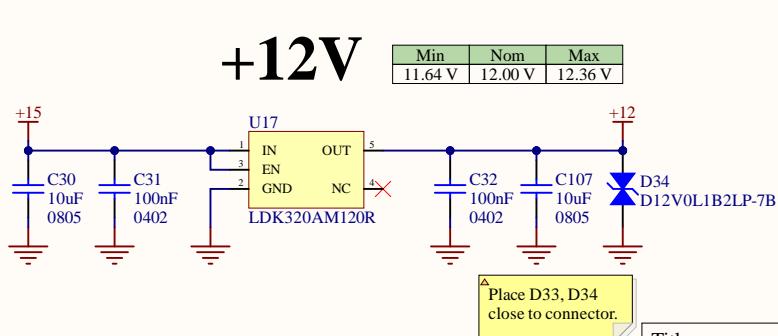
Place +1V8\_A regulator close to ADCs.

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



**-12V**

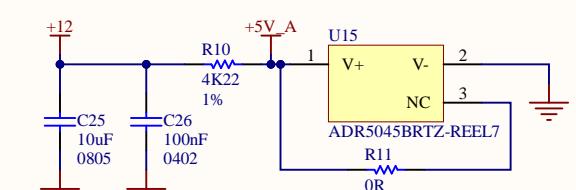
Min	Nom	Max
-12.60 V	-12.00 V	-11.40 V



**+12V**

Min	Nom	Max
11.64 V	12.00 V	12.36 V

Place D33, D34 close to connector.



Title **Power**

Size: B Revision: \* Drawn By: Jasper Yun

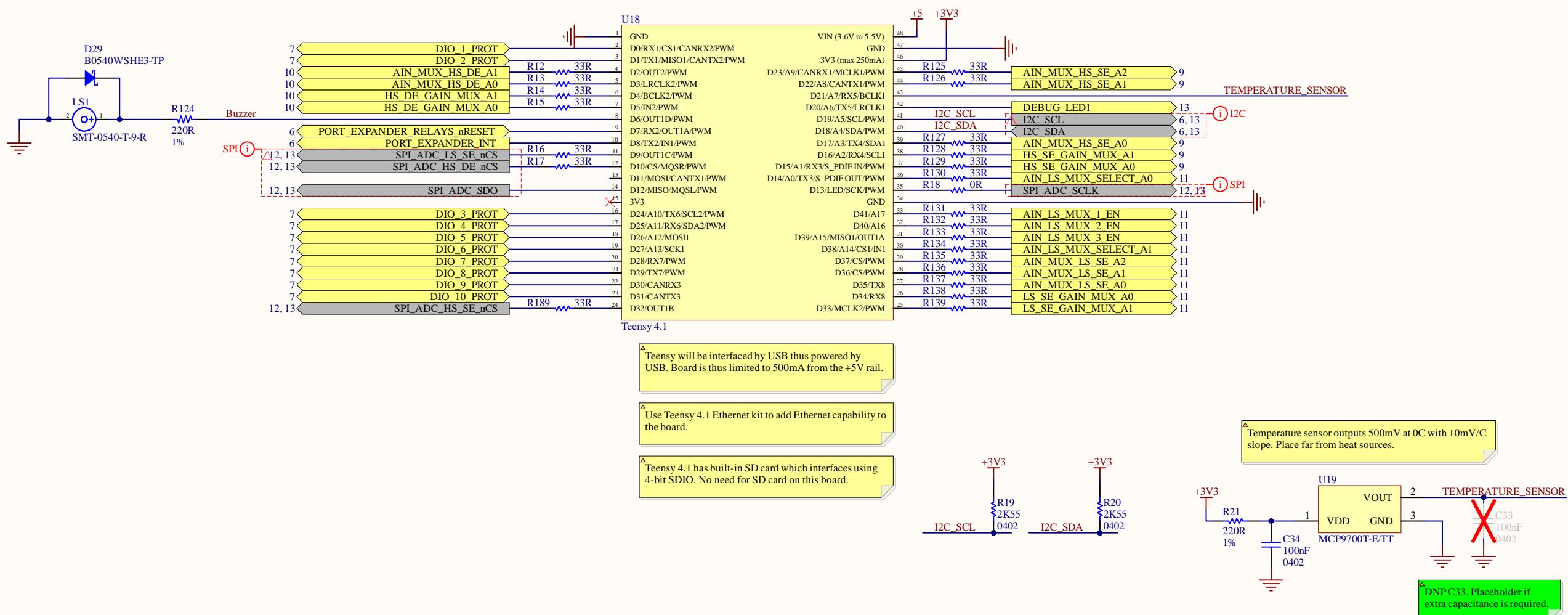
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Montreal, Quebec



# Microcontroller



Title

## Microcontroller

Size: B | Revision: \* | Drawn By: Jasper Yun

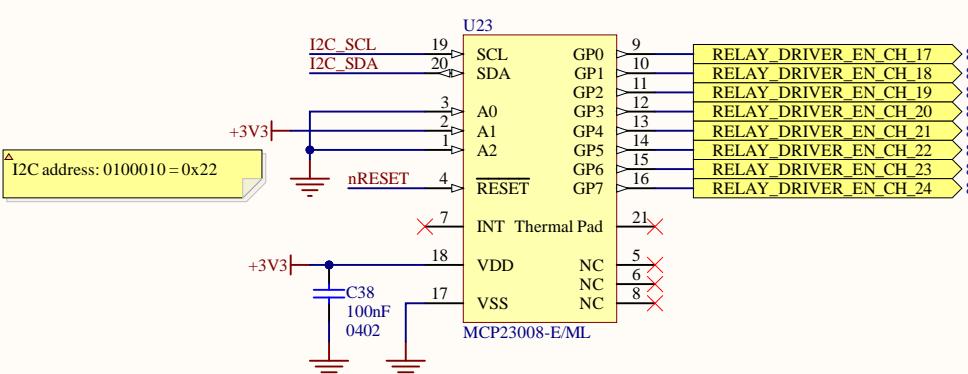
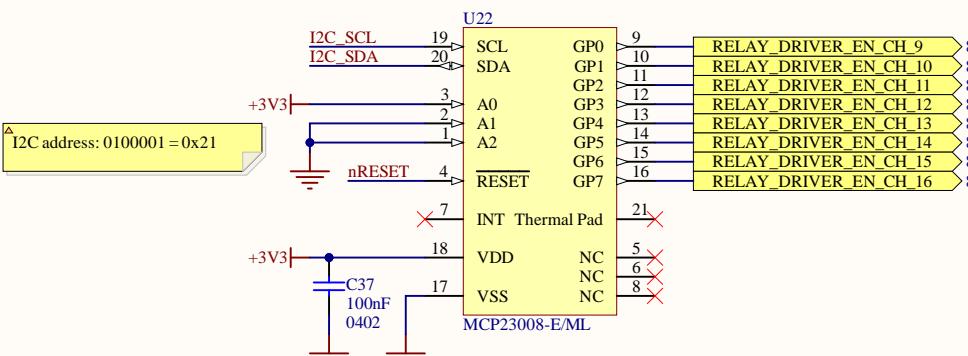
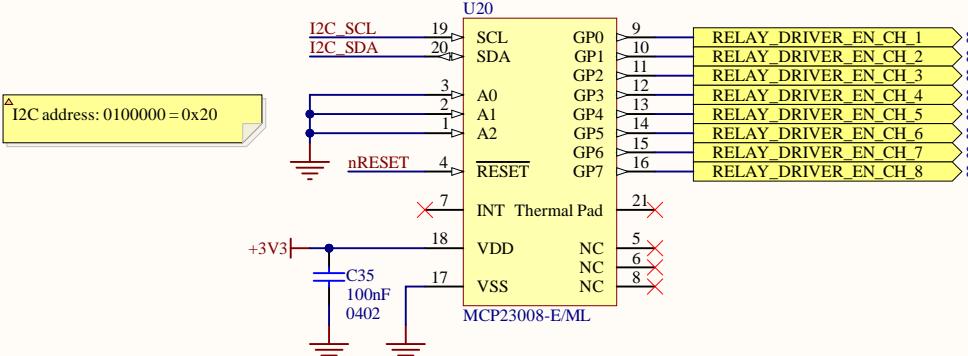
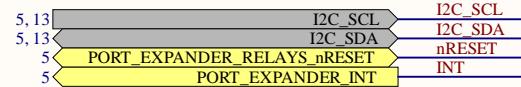
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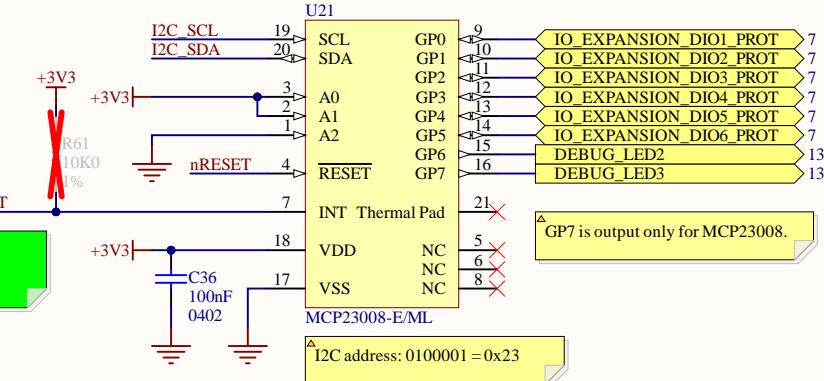
# IO Expansion



These 24 IO expansion pins can be set as inputs or outputs. They will be configured as outputs only for relay driver control, as relay actuation does not require high speed actuation from microcontroller pins. Interrupts not needed.

GP7 is output-only on MCP23008.

I<sub>2</sub>C address is of format: 0100 (A2) (A1) (A0)



Title  
**IO Expansion**

Size: B Revision: \* Drawn By: Jasper Yun

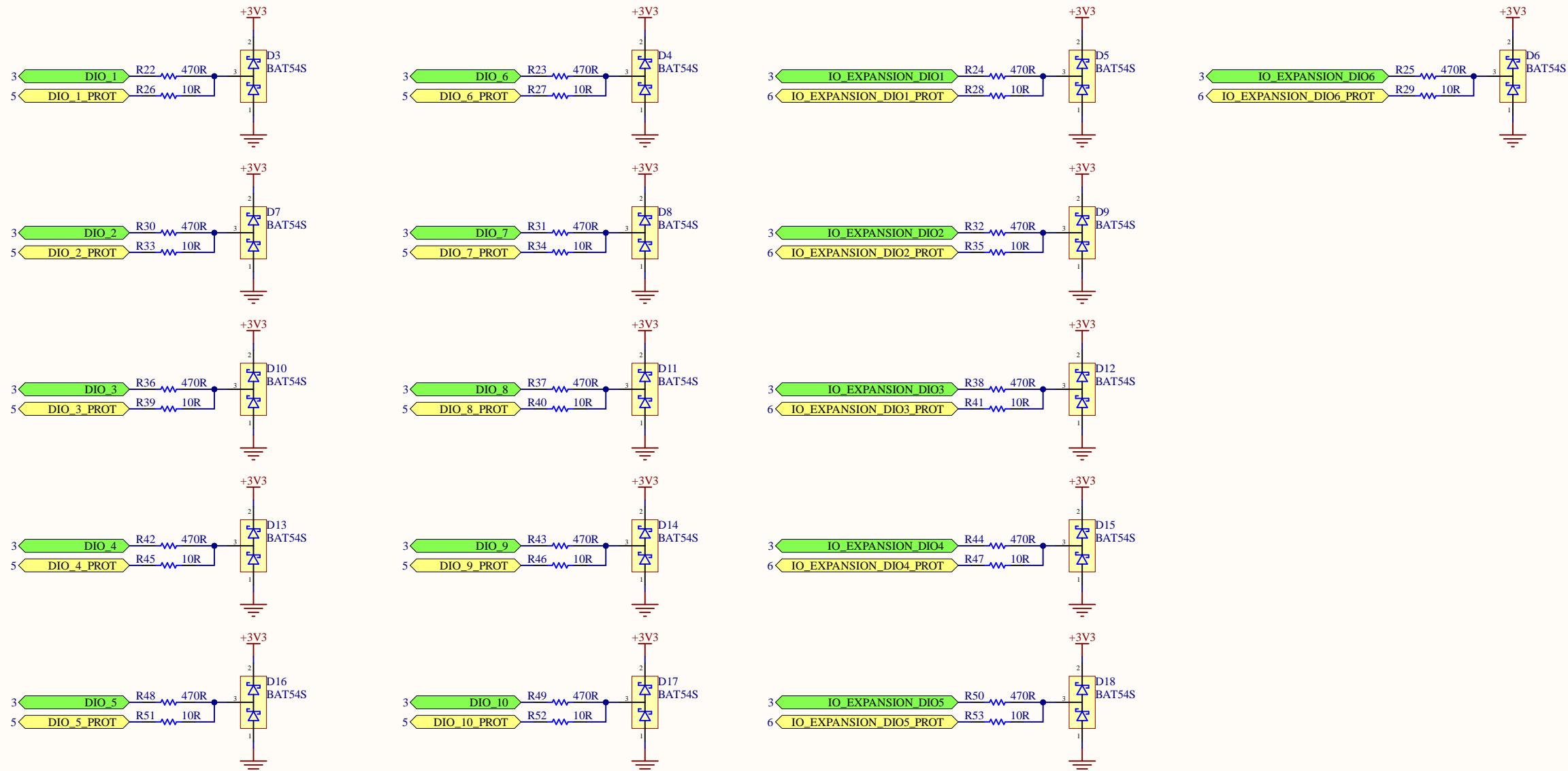
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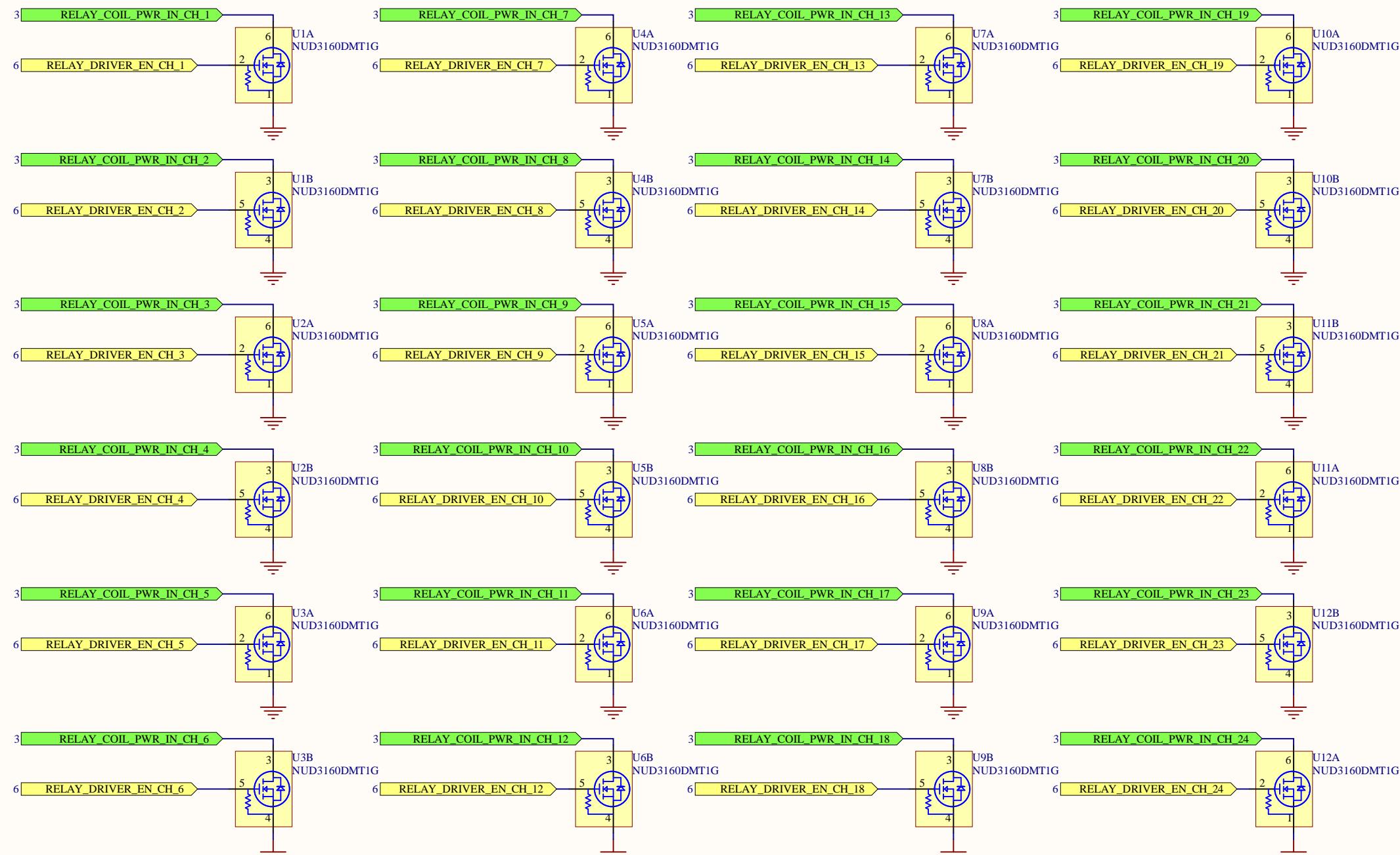
# Digital IO Protection



Title <b>Digital IO Protection</b>			Avionics McGill Rocket Team McGill University Montreal, Quebec	<b>MRT</b>
Size: B	Revision: *	Drawn By: Jasper Yun		
Date: 2023-01-07	Time: 4:25:45 PM	Sheet 7 of 13		
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Digital IO Protection.SchDoc				

# 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.



Title

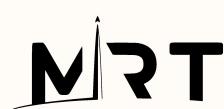
## Relay Drivers

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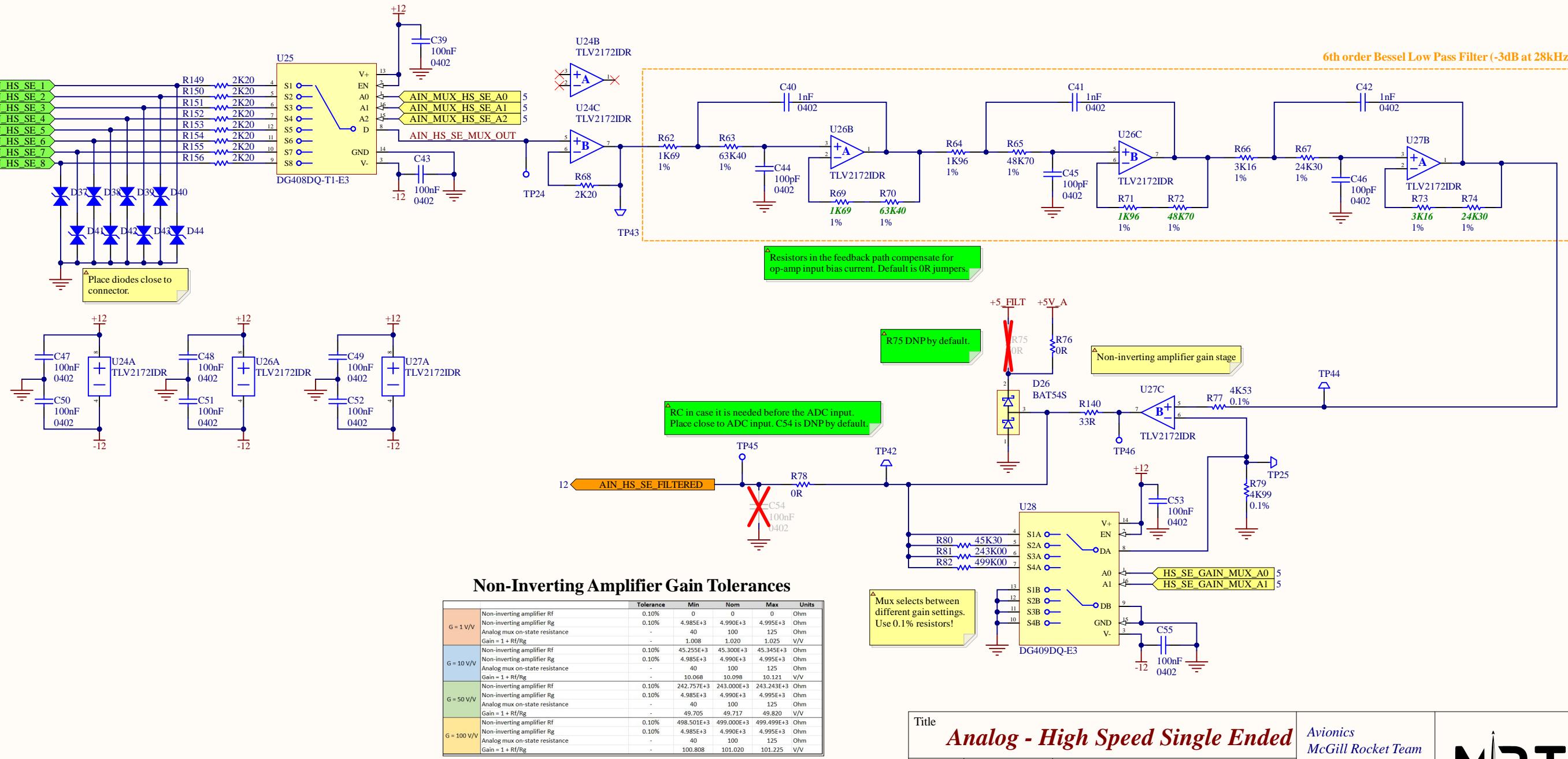
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Montreal, Quebec



# Analog - High Speed Single Ended



Title **Analog - High Speed Single Ended**

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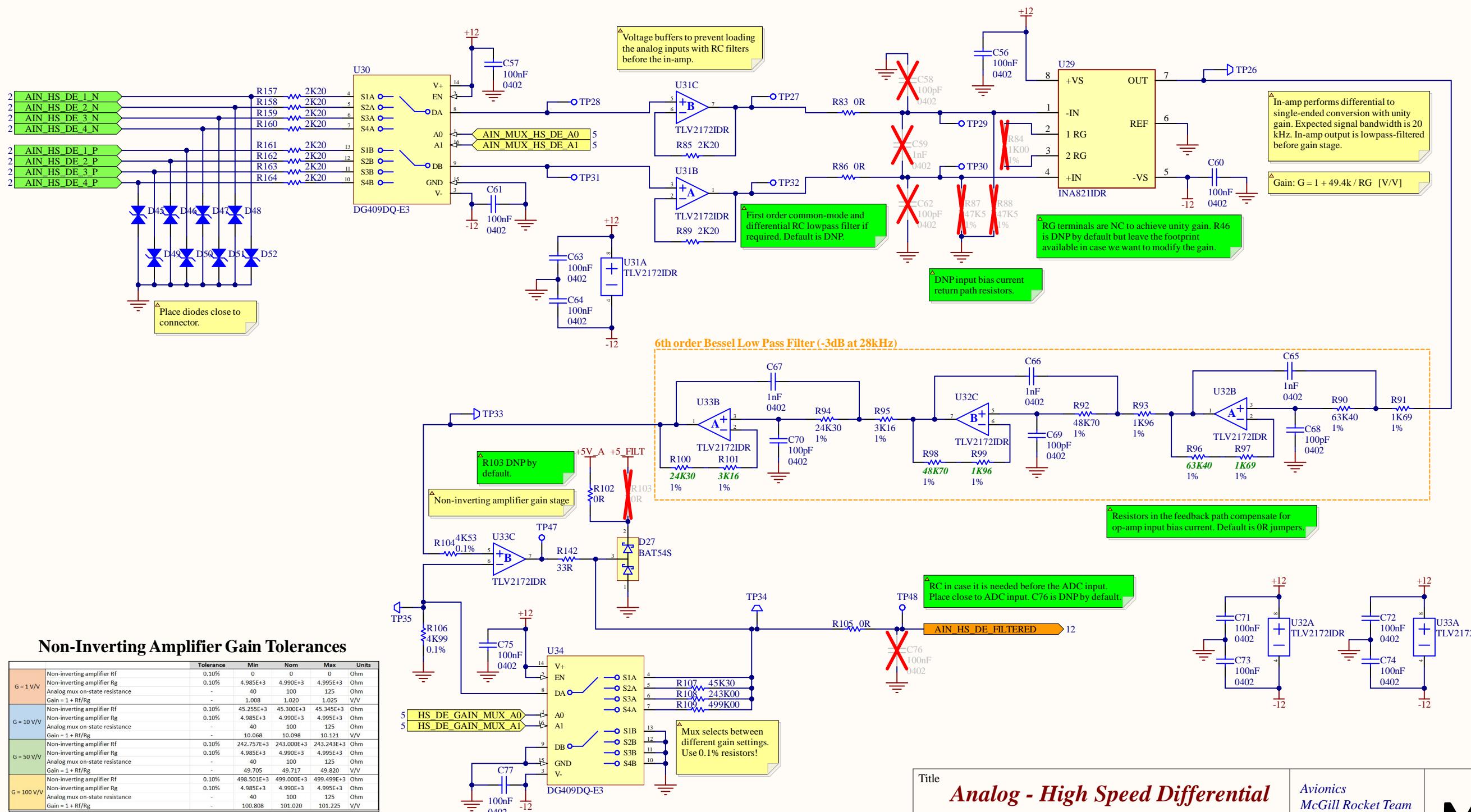
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McGill University  
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# Analog - High Speed Differential



Title  
**Analog - High Speed Differential**

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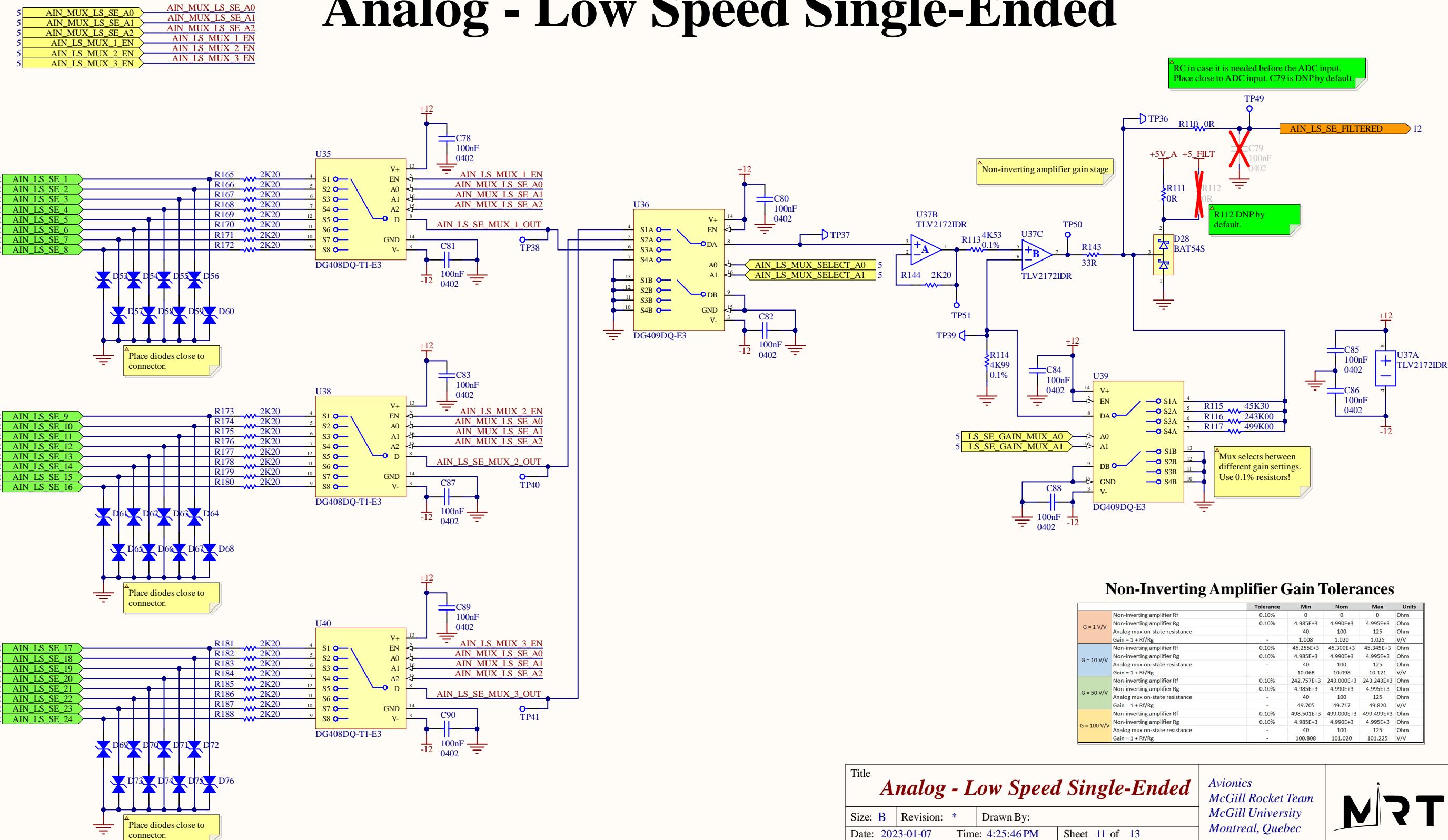
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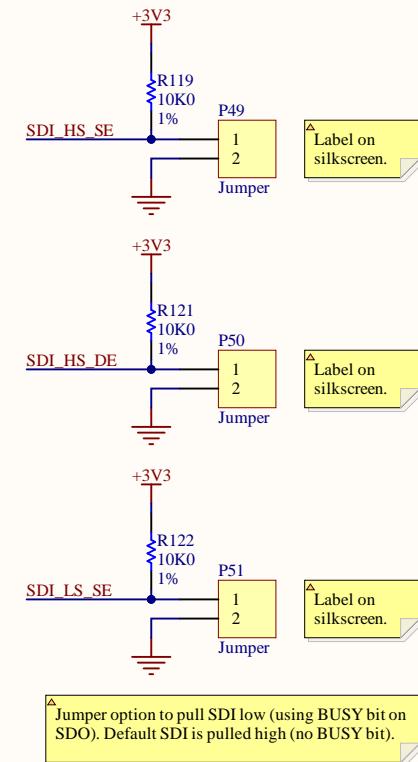
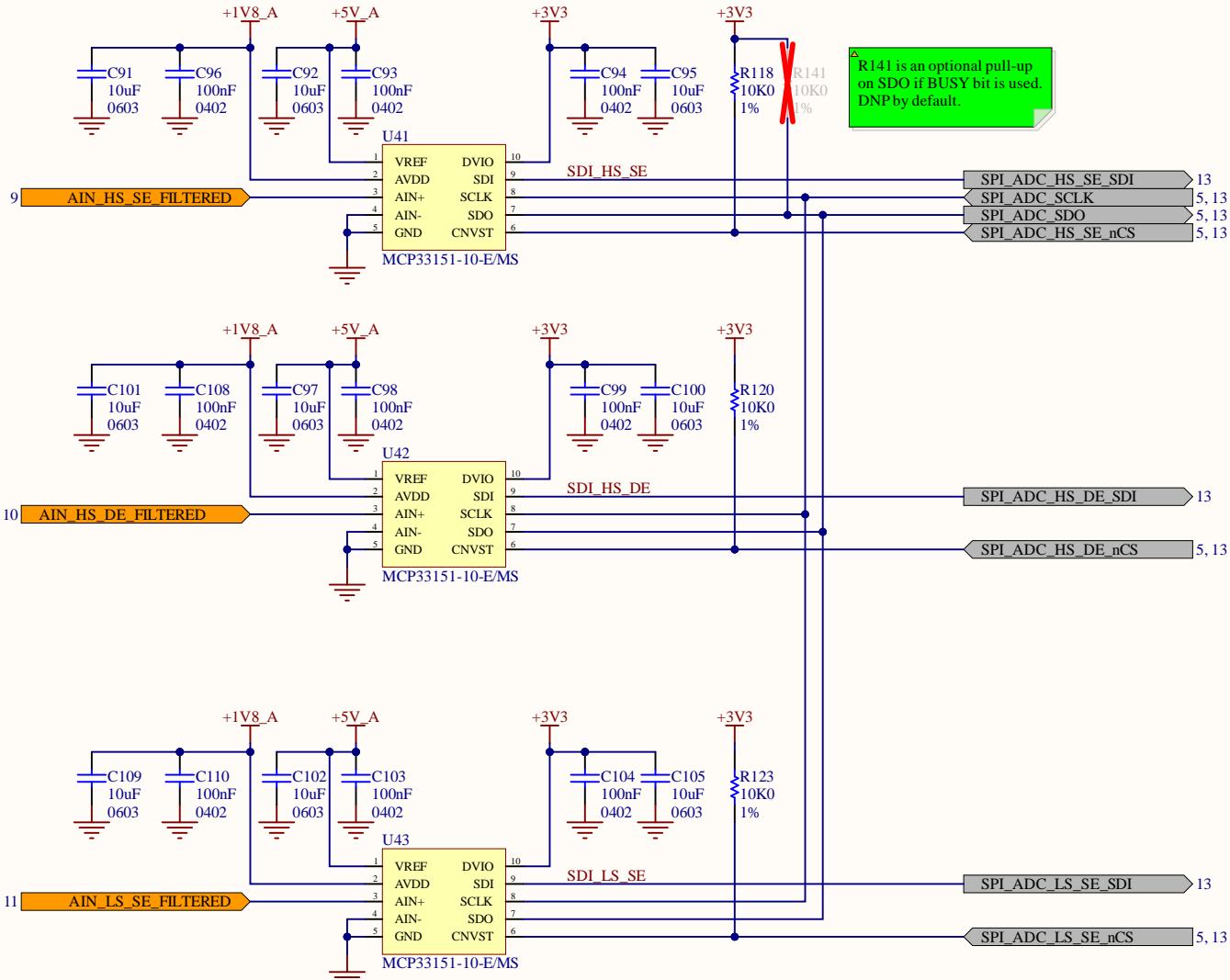
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# Analog - Low Speed Single-Ended



# Analog to Digital Conversion



Title

## Analog to Digital Conversion

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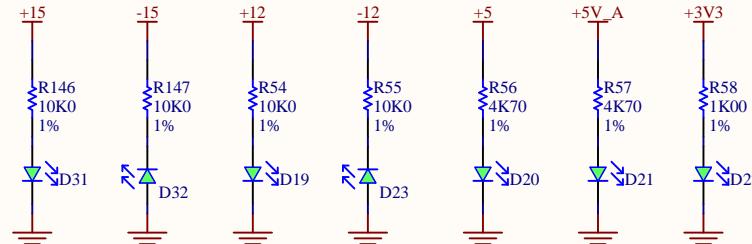
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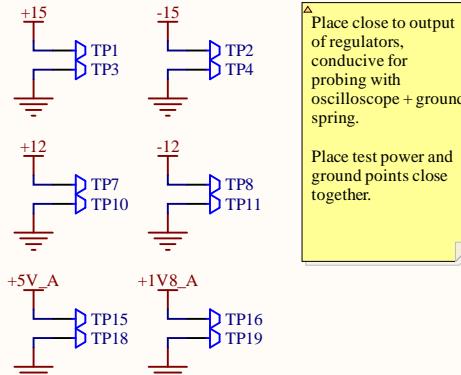
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# Debug

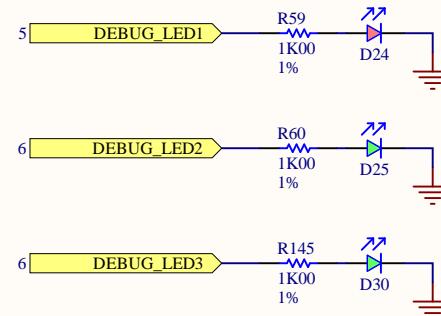
## Power LEDs



## Power Rails Test Points



## Program Debug LEDs



## Analog Test Points

