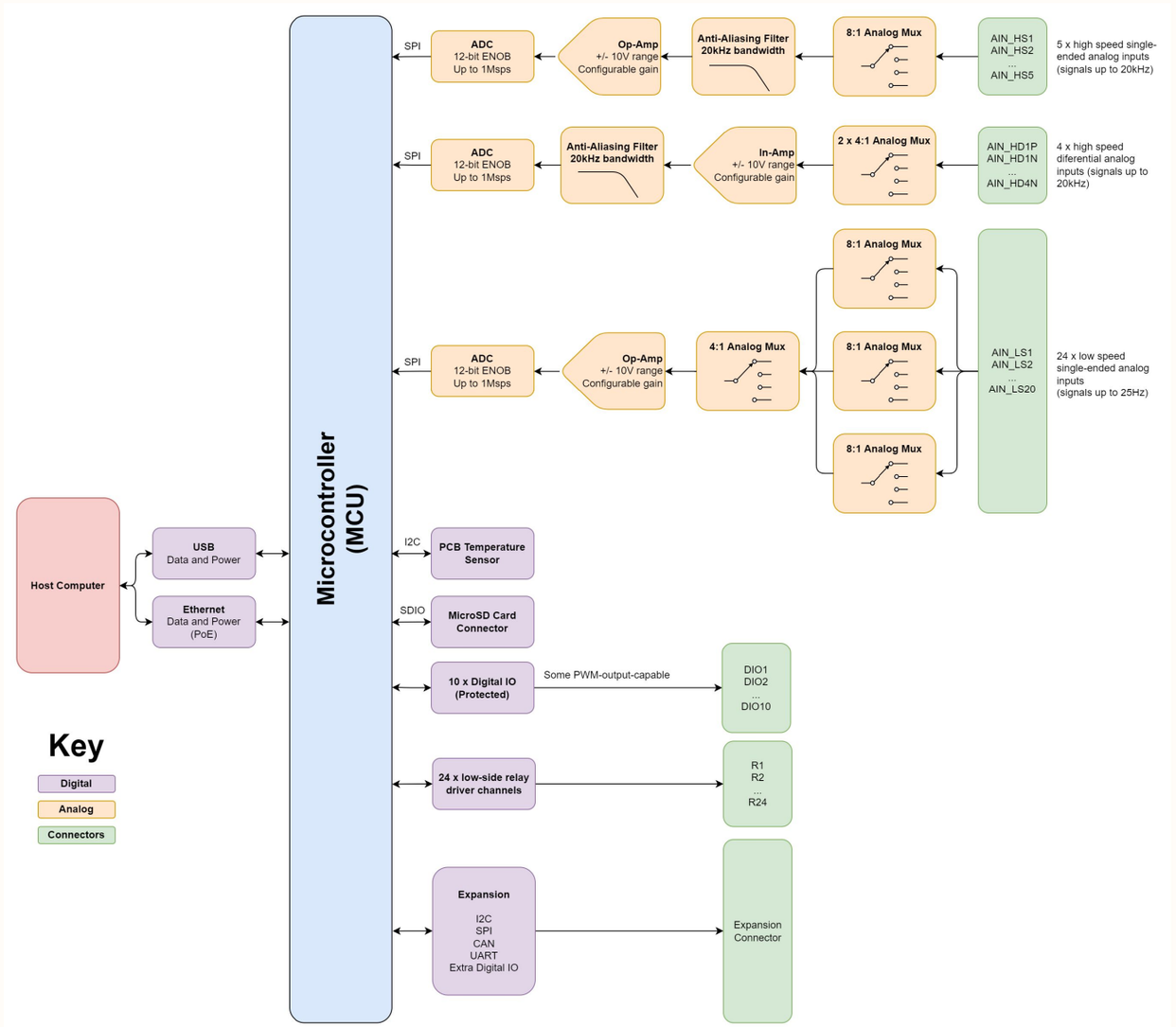
ECSE478 - DAQ Device

Table of Contents

Port Colors

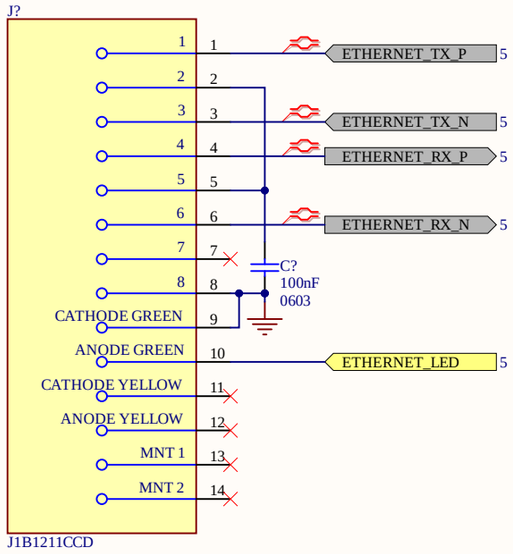
Connector
Digital
Analog
Communication



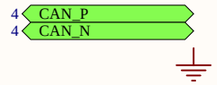
Title	*ECSE478 - DAQ Device*		*Avionics* *McGill Rocket Team* *McGill University* *Montreal, Quebec*
Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:31 PM	Sheet 1 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Cover.SchDoc			

Connectors

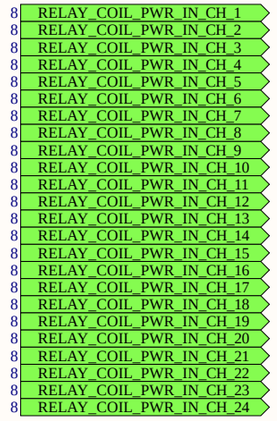
Ethernet



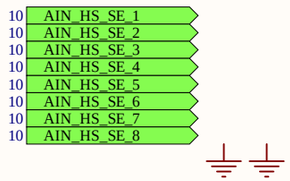
Expansion



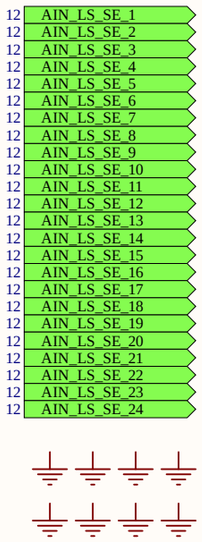
Relay Drivers



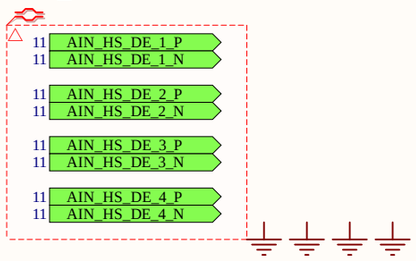
High Speed SE Analog



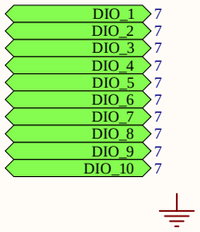
Low Speed SE Analog



High Speed DE Analog



Digital IO Pins



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Date: 2022-10-31	Time: 12:13:31 PM	Sheet 2 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Connectors.SchDoc			

Power

+12V -12V

Need to do a power budget for +12/-12V rails to see if we can boost from USB power on Teensy. Consider expansion to provide +12/-12V on connector for external usage up to X mA.

+5V (CAN)

+5V_A (Analog)

Voltage reference IC. keep away from noisy sources, place close to ADCs.

+3V3 (from Teensy :))

Voltage reference IC. keep away from noisy sources, place close to ADCs.

+1V8 (ADC)

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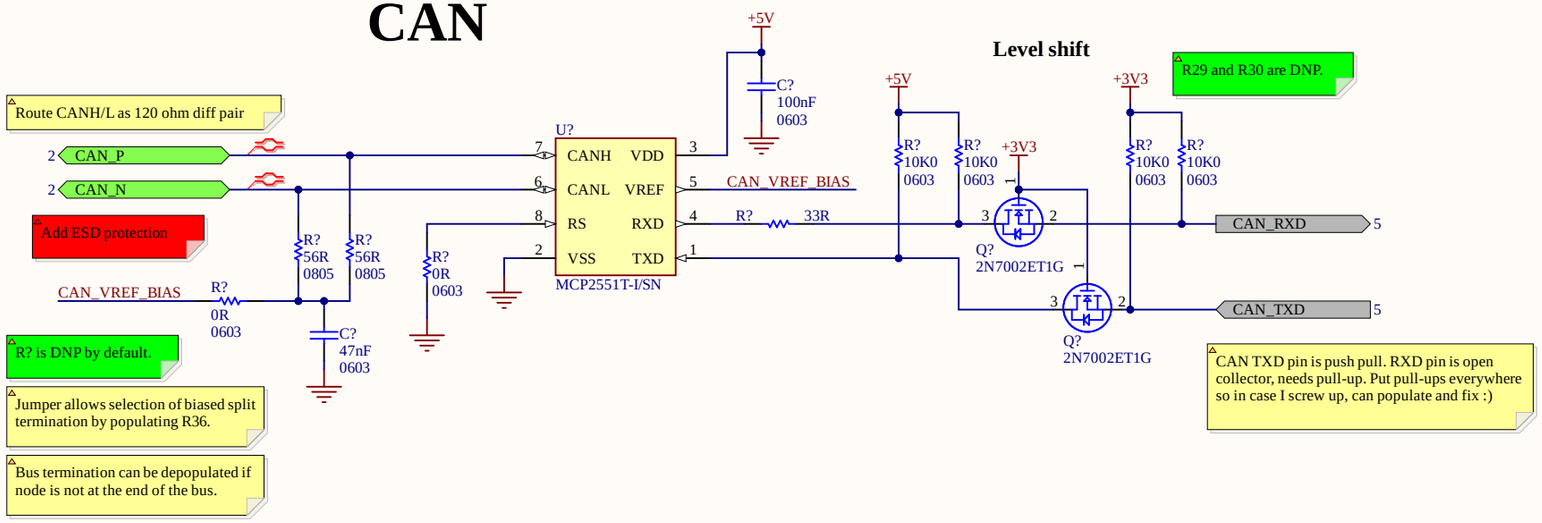
Date: 2022-10-31	Time: 12:13:32 PM	Sheet 3 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Power.SchDoc			

Communication

CAN



SPI

UART

I2C

USB

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Size: B	Revision: *	Drawn By:	
Date: 2022-10-31	Time: 12:13:32 PM	Sheet 4 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Communication.SchDoc			

Microcontroller

Teensy will be interfaced by USB thus powered by USB. However, leave option to power via VIN pin for standalone operation.

Analog MUX address select pins should be directly connected to microcontroller, want minimum latency.

U?

1	GND	VIN (3.6V to 5.5V)	48
2	D0/RX1/CS1/CANRX2/PWM	GND	47
3	D1/TX1/MISO1/CANTX2/PWM	3V3 (max 250mA)	46
4	D2/OUT2/PWM	D23/A9/CANRX1/MCLK1/PWM	45
5	D3/LRCLK2/PWM	D22/A8/CANTX1/PWM	44
6	D4/BCLK2/PWM	D21/A7/RX5/BCLK1	43
7	D5/IN2/PWM	D20/A6/TX5/LRCLK1	42
8	D6/OUT1D/PWM	D19/A5/SCL/PWM	41
9	D7/RX2/OUT1A/PWM	D18/A4/SDA/PWM	40
10	D8/TX2/IN1/PWM	D17/A3/TX4/SDA1	39
11	D9/OUT1C/PWM	D16/A2/RX4/SCL1	38
12	D10/CS/MQSR/PWM	D15/A1/RX3/S_PDIF IN/PWM	37
13	D11/MOSI/CANTX1/PWM	D14/A0/TX3/S_PDIF OUT/PWM	36
14	D12/MISO/MQSL/PWM	D13/LED/SCK/PWM	35
15	3V3	GND	34
16	D24/A10/TX6/SCL2/PWM	D41/A17	33
17	D25/A11/RX6/SDA2/PWM	D40/A16	32
18	D26/A12/MOSI1	D39/A15/MISO1/OUT1A	31
19	D27/A13/SCK1	D38/A14/CS1/IN1	30
20	D28/RX7/PWM	D37/CS/PWM	29
21	D29/TX7/PWM	D36/CS/PWM	28
22	D30/CANRX3	D35/TX8	27
23	D31/CANTX3	D34/RX8	26
24	D32/OUT1B	D33/MCLK2/PWM	25
55	5V	ETH RX+	49
56	USB HOST D-	ETH RX-	50
57	USB HOST D+	ETH LED	51
58	GND	GND	52
59	GND	ETH TX-	53
		ETH TX+	54

Teensy 4.1

D? Schottky Diode

+5

+3V3

+5

13 SPI_ADC_SCLK
13 SPI_ADC_HS_SE_SDO
13 SPI_ADC_HS_SE_nCS
13 SPI_ADC_HS_DE_nCS
13 SPI_ADC_LS_SE_nCS

USB HOST

USB_TEENSY_HOST_D_N
USB_TEENSY_HOST_D_P

ETHERNET

ETHERNET_RX_P 2
ETHERNET_RX_N 2
ETHERNET_LED 2
ETHERNET_TX_N 2
ETHERNET_TX_P 2

IO to assign

10 AIN_MUX_HS_SE_A0
10 AIN_MUX_HS_SE_A1
10 AIN_MUX_HS_SE_A2

11 AIN_MUX_HS_DE_A0
11 AIN_MUX_HS_DE_A1

11 HS_DE_GAIN_MUX_A0
11 HS_DE_GAIN_MUX_A1

10 HS_SE_GAIN_MUX_A0
10 HS_SE_GAIN_MUX_A1

12 AIN_MUX_1_LS_SE_A0
12 AIN_MUX_1_LS_SE_A1
12 AIN_MUX_1_LS_SE_A2

12 AIN_MUX_2_LS_SE_A0
12 AIN_MUX_2_LS_SE_A1
12 AIN_MUX_2_LS_SE_A2

12 AIN_MUX_3_LS_SE_A0
12 AIN_MUX_3_LS_SE_A1
12 AIN_MUX_3_LS_SE_A2

DEBUG_LED1 14
DEBUG_LED2 14

12 AIN_LS_MUX_SELECT_A0
12 AIN_LS_MUX_SELECT_A1

LS_SE_GAIN_MUX_A0 12
LS_SE_GAIN_MUX_A1 12

6 I2C_SCL
6 I2C_SDA
6 PORT_EXPANDER_RELAYS_nRESET

4 CAN_RXD
4 CAN_TXD

DIO_1_PROT 7
DIO_2_PROT 7
DIO_3_PROT 7
DIO_4_PROT 7
DIO_5_PROT 7
DIO_6_PROT 7
DIO_7_PROT 7
DIO_8_PROT 7
DIO_9_PROT 7
DIO_10_PROT 7

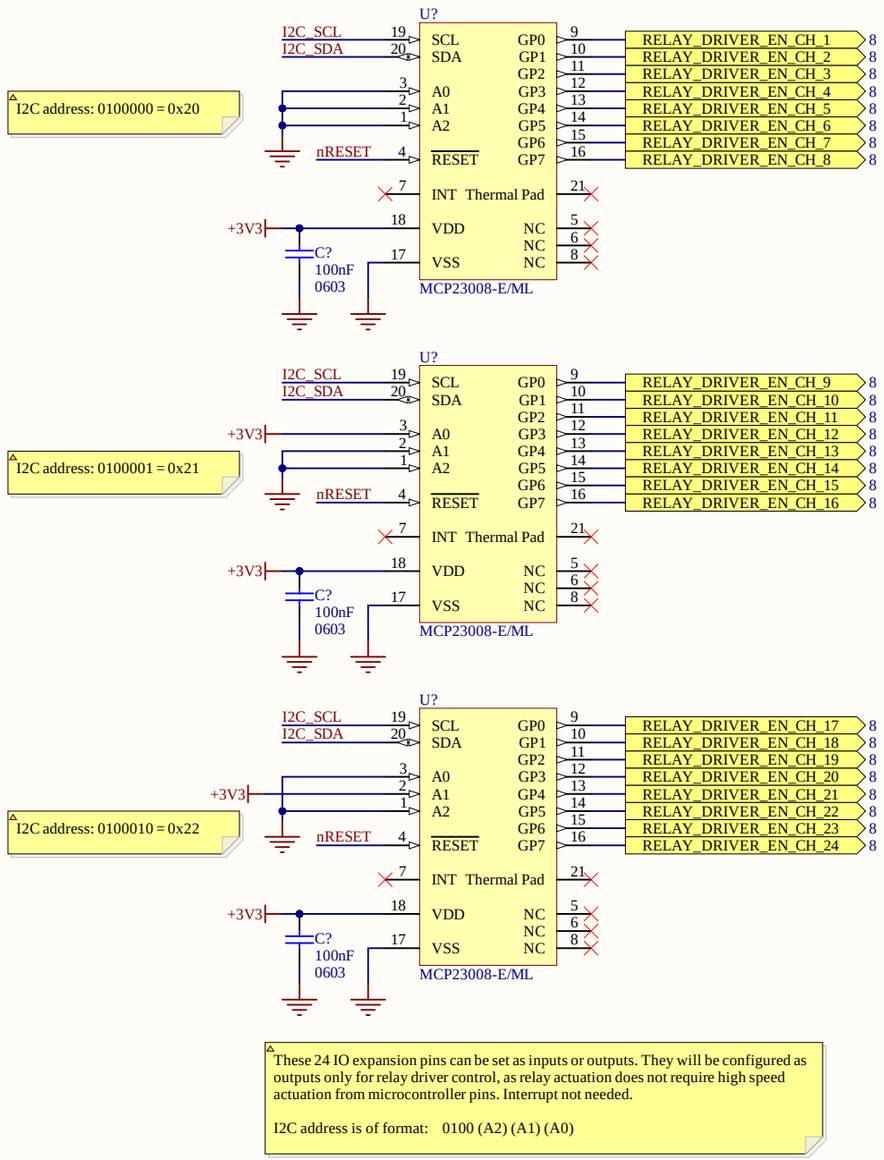
DIO should be connected to micro if possible

Title	*Microcontroller*		
Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:32 PM	Sheet 5 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Microcontroller.SchDoc			

Avionics
McGill Rocket Team
McGill University
Montreal, Quebec

IO Expansion

5 I2C_SCL → I2C_SCL
5 I2C_SDA → I2C_SDA
5 PORT_EXPANDER_RELAYS_nRESET → nRESET

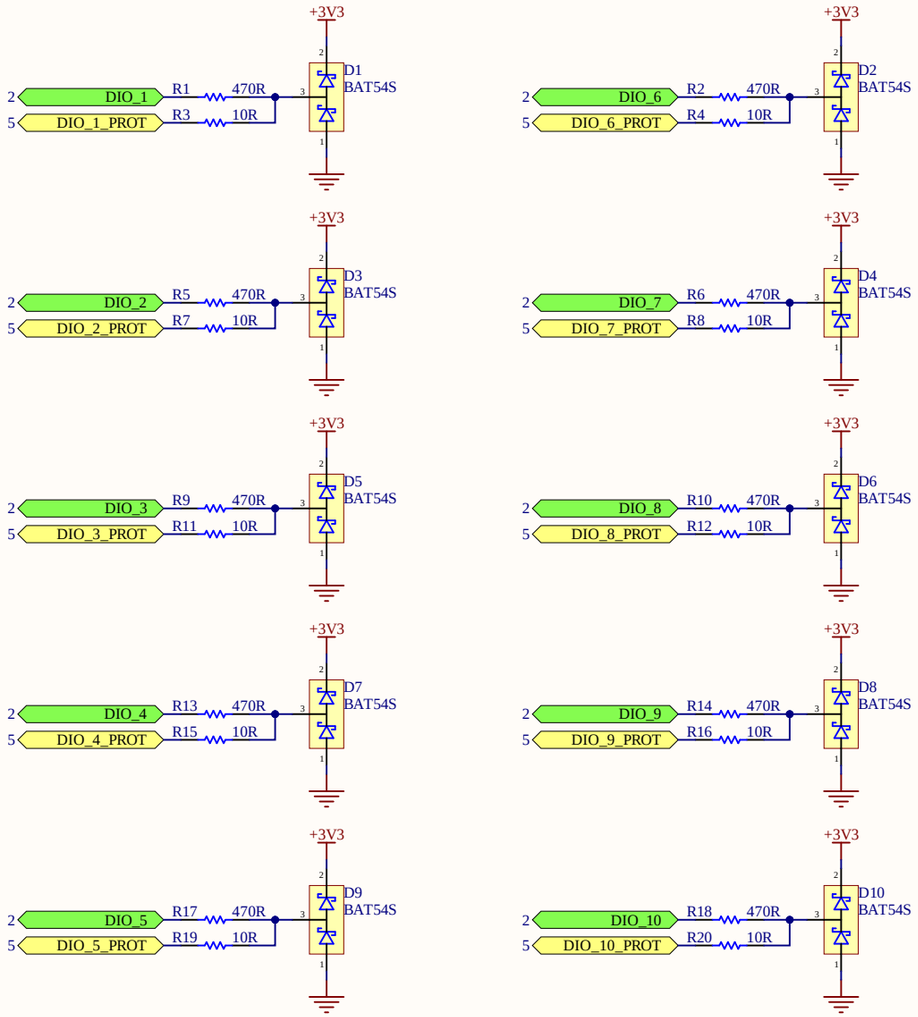


These 24 IO expansion pins can be set as inputs or outputs. They will be configured as outputs only for relay driver control, as relay actuation does not require high speed actuation from microcontroller pins. Interrupt not needed.

I2C address is of format: 0100 (A2) (A1) (A0)

Title: *IO Expansion*			*Avionics* *McGill Rocket Team* *McGill University* *Montreal, Quebec*
Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:33 PM	Sheet 6 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\IO Expansion.SchDoc			

Digital IO Protection



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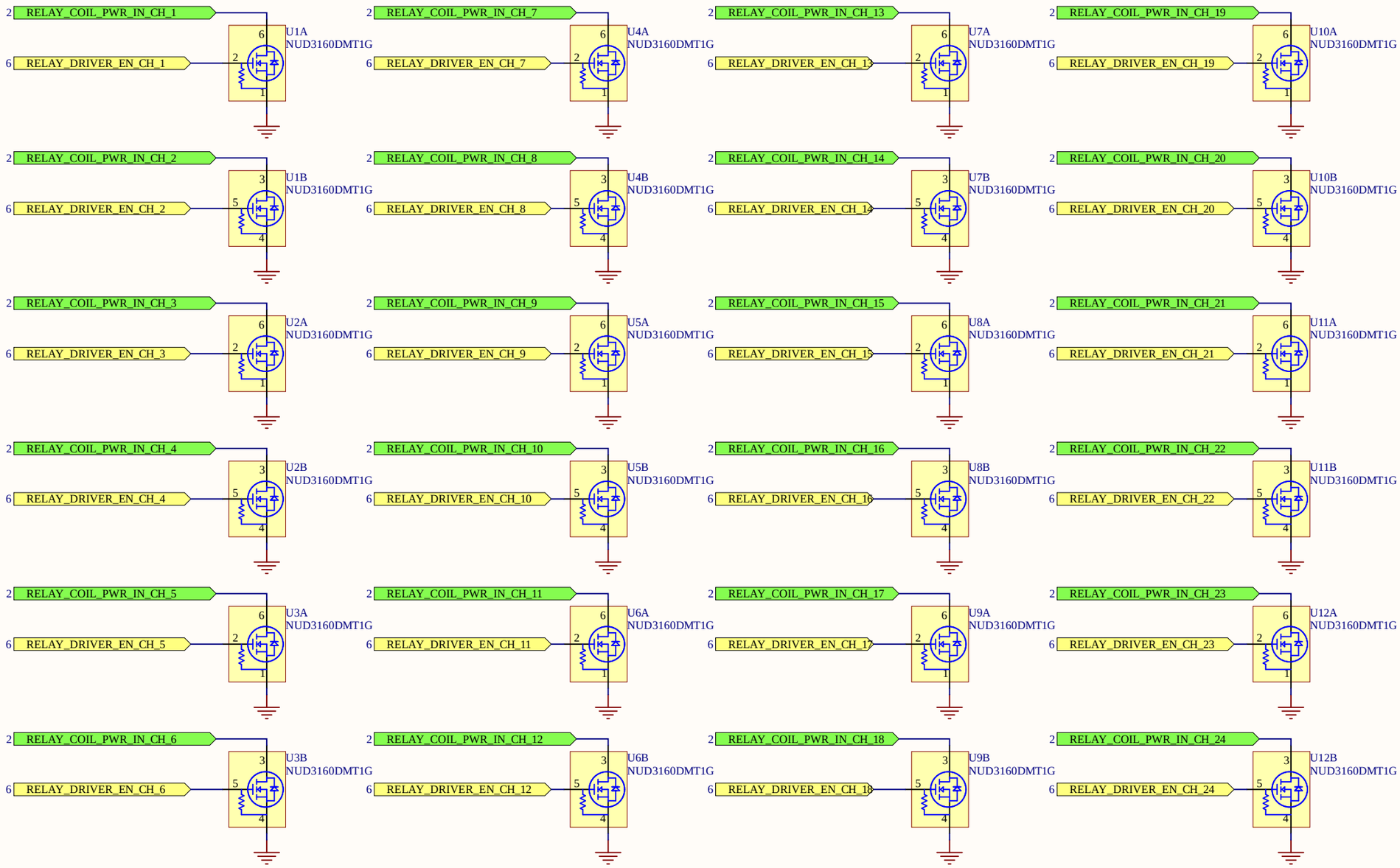
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Digital IO Protection.SchDoc			

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.



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File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Relay Drivers.SchDoc			

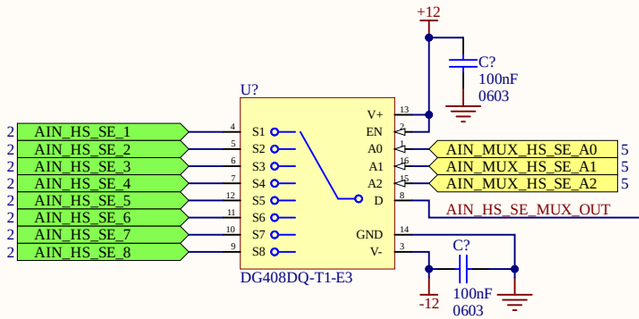
Data Storage

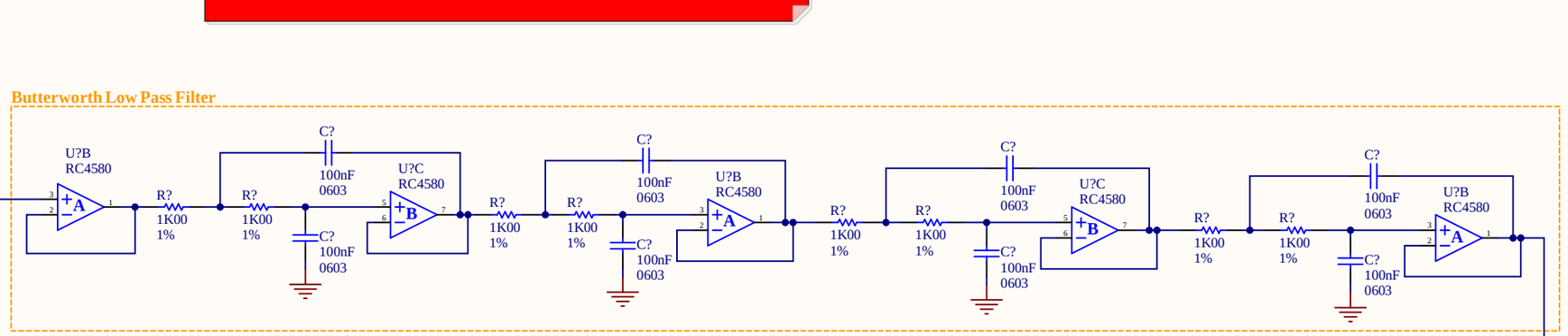
SD card connector is provided on Teensy 4.1 and interfaces over 4-bit SDIO.

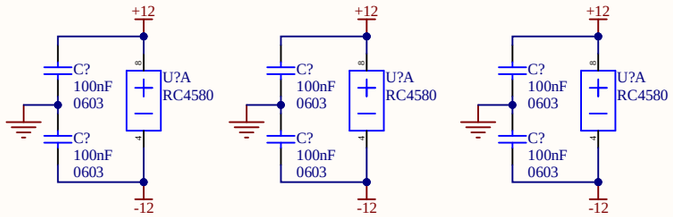
Title: *Data Storage*			*Avionics* *McGill Rocket Team* *McGill University* *Montreal, Quebec*
Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:33 PM	Sheet 9 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Data Storage.SchDoc			

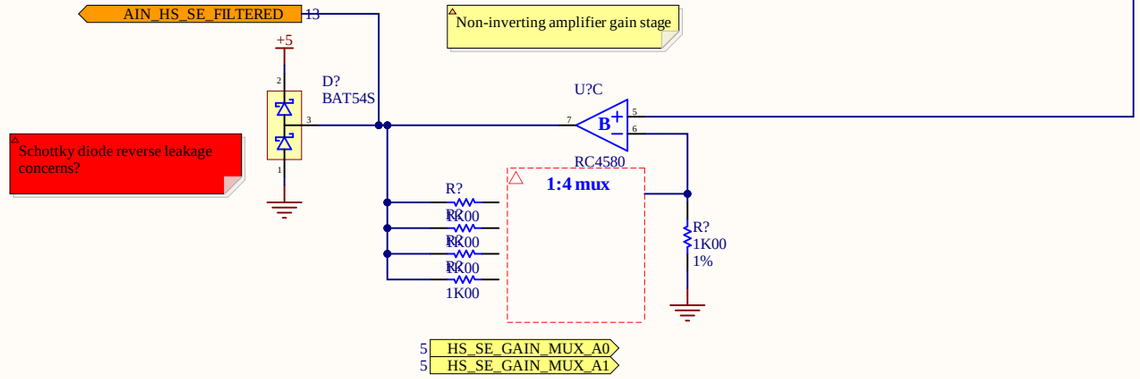
Analog - High Speed Single Ended

Choose all values and simulate.









Title: *Analog - High Speed Single Ended*			*Avionics* *McGill Rocket Team* *McGill University* *Montreal, Quebec*
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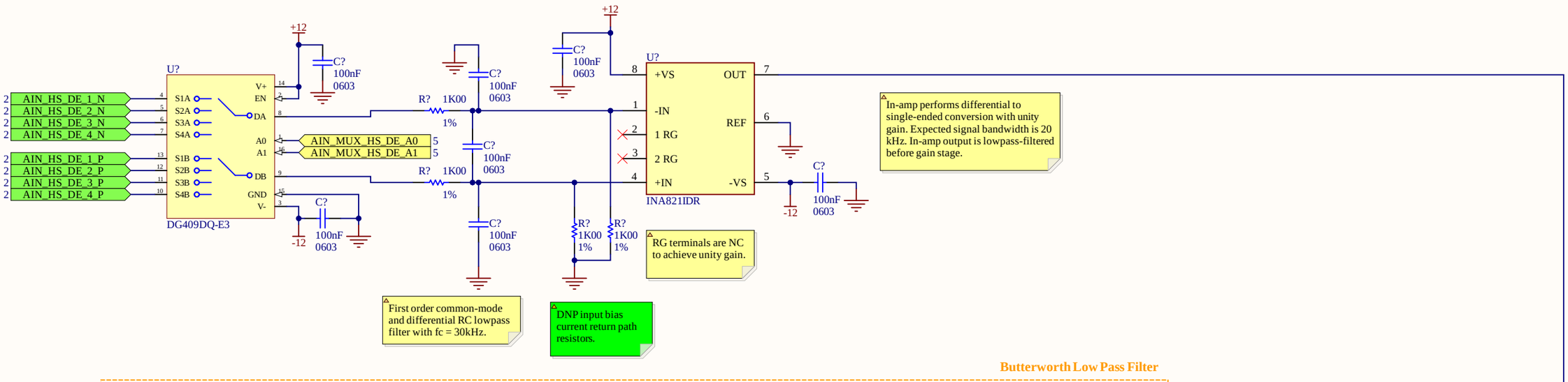
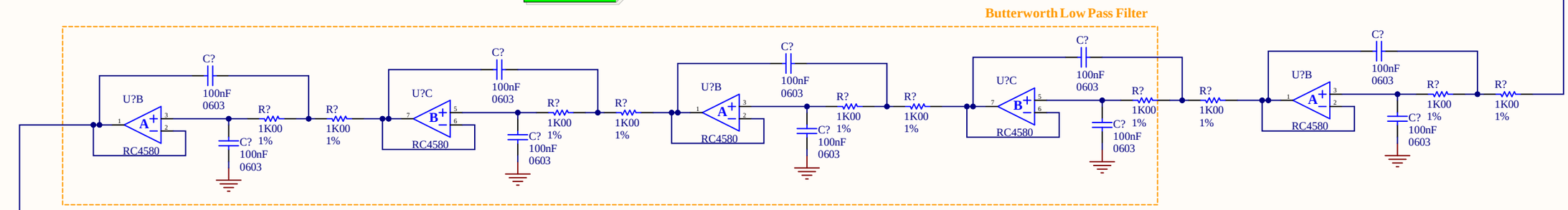
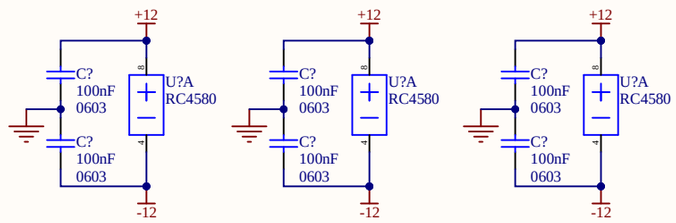
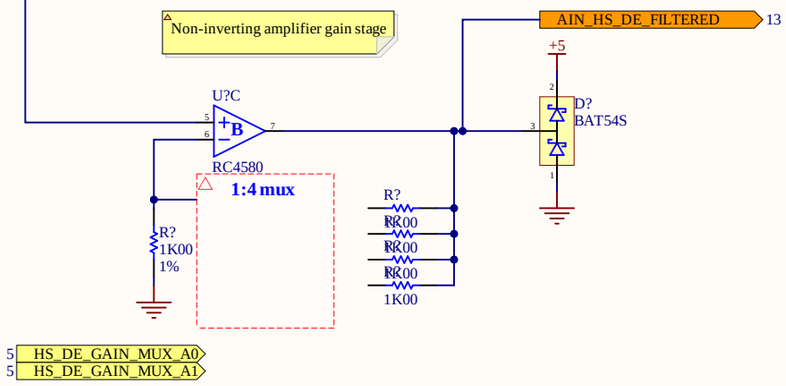
Date: 2022-10-31	Time: 12:13:34 PM	Sheet 10 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Analog - High Speed SE.SchDoc			

Analog - High Speed Differential









Choose all values and simulate.

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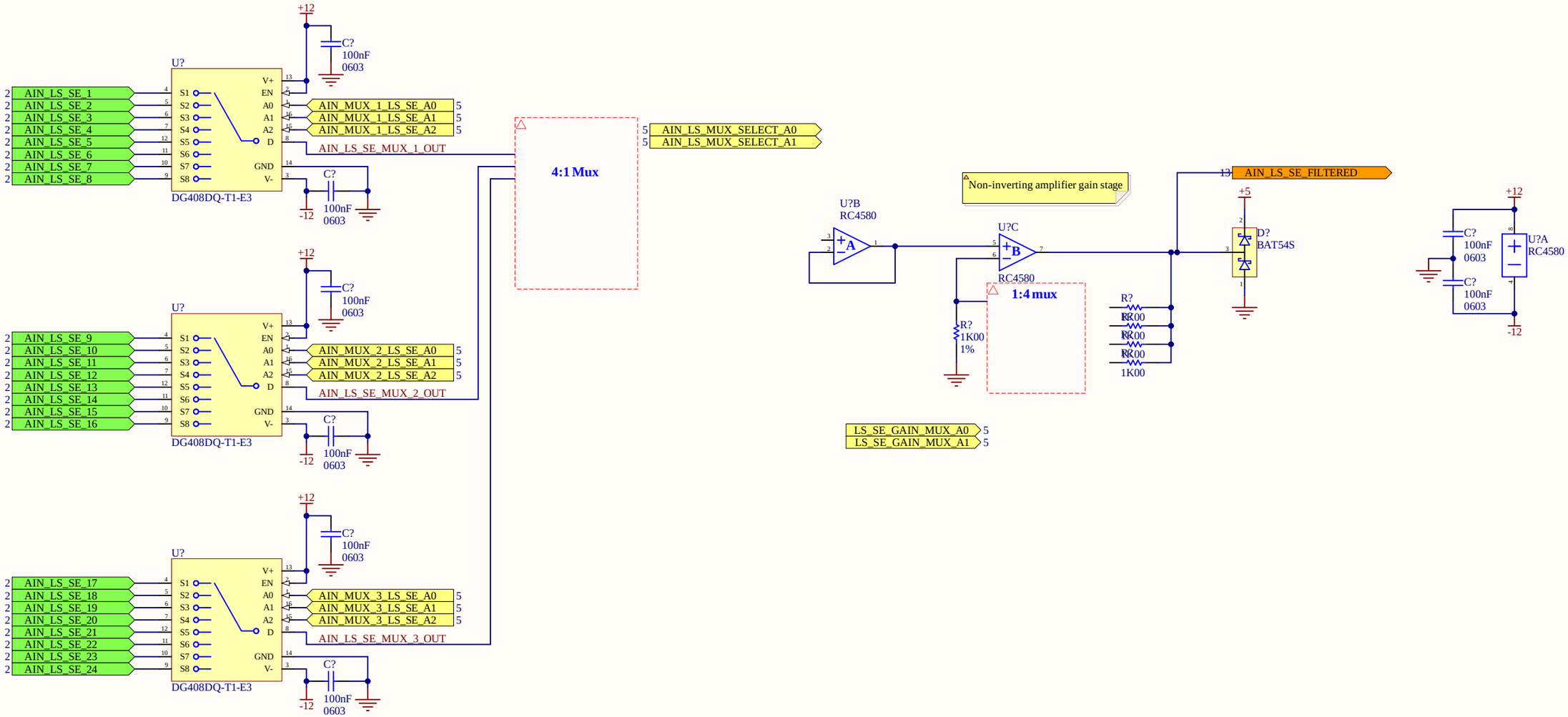
Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:34 PM	Sheet 11 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Analog - High Speed DE.SchDoc			

Analog - Low Speed Single-Ended



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Date: 2022-10-31	Time: 12:13:34 PM	Sheet 12 of 14	
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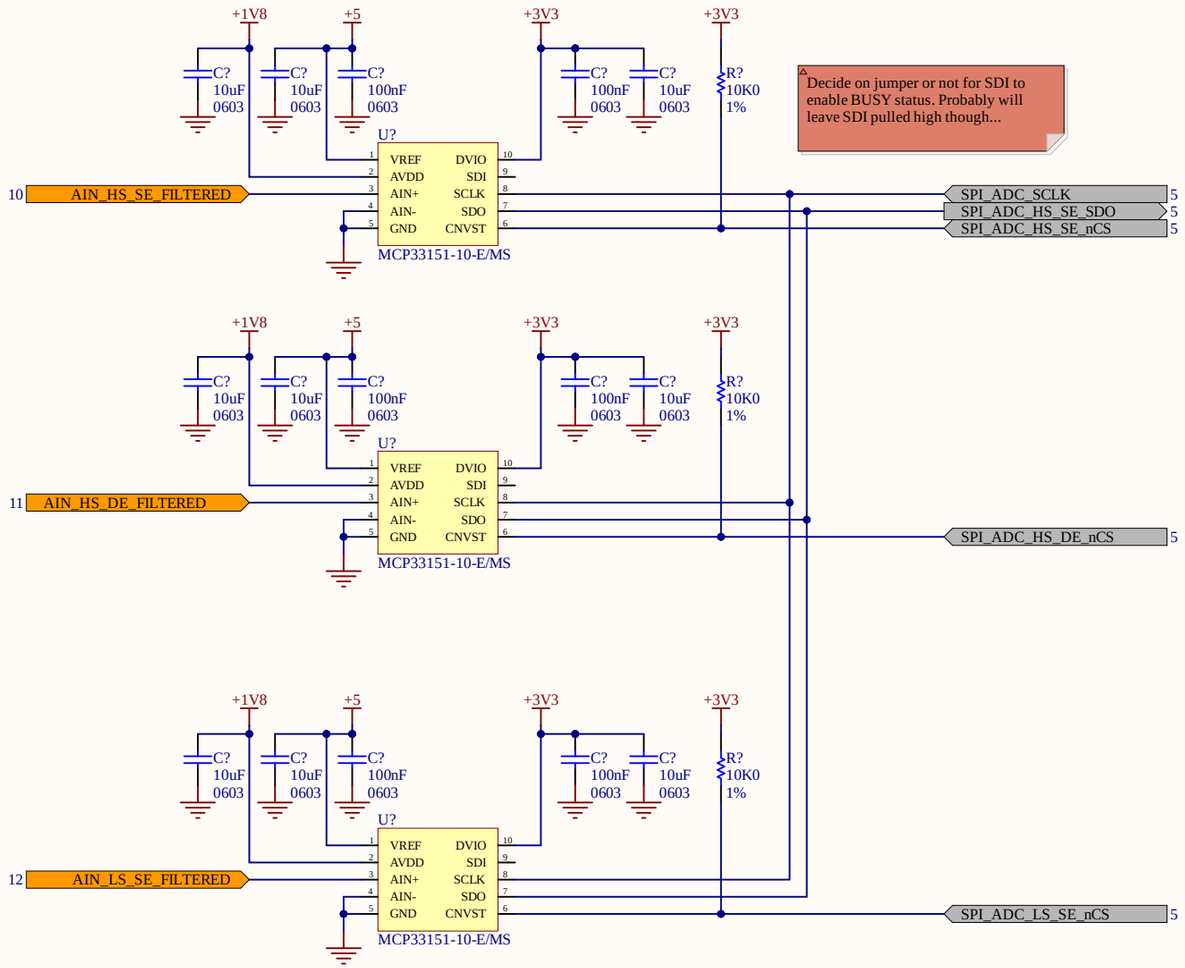
Analog to Digital Conversion



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Size: B	Revision: *	Drawn By: Jasper Yun	
Date: 2022-10-31	Time: 12:13:34 PM	Sheet 13 of 14	
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\ADC.SchDoc			

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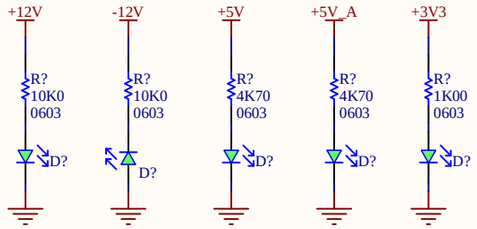
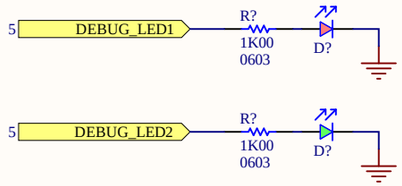
McGill Rocket Team
McGill University
Montreal, Quebec

Debug

Power LEDs



Program Debug LEDs



Test Points

Title	***Debug***			*Avionics* *McGill Rocket Team* *McGill University* *Montreal, Quebec*	MRT
Size: B	Revision: *	Drawn By: Jasper Yun			
Date: 2022-10-31	Time: 12:13:35 PM	Sheet 14 of 14			
File: C:\Users\jaspe\Desktop\ecse478_honours_thesis\1 Hardware\ECSE478 - DAQ Device\Debug.SchDoc					