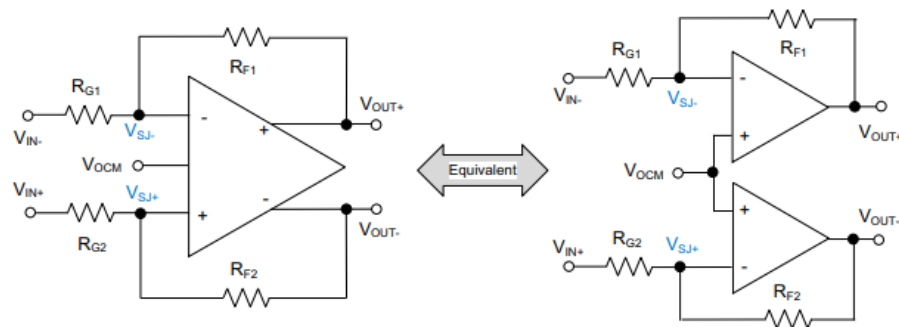
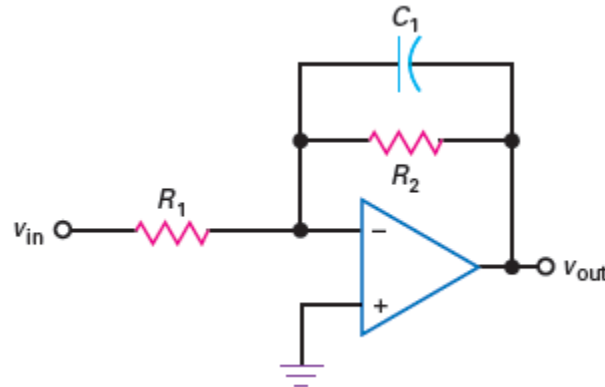


# Design Review

## 1. Gain on differential amp

- I removed the RC filter after the sensor output and integrated it into the differential ADC driver, as I believe my initial setup did not logically have meaning



- Each side of the differential ADC driver has  $C1 = 200 \text{ pF}$  and  $10\text{k ohms}$  for an  $80\text{kHz}$  cut off frequency

## 2. Sensor signal conditioning

- In place of cascading amplifiers, I now have op amp voltage followers on each output of the sensor
- My logic is to isolate my lines and to avoid any gain changes caused by the sensor, as well as hopefully any input/output impedance loading issues for the sensor

## 3. Output common mode voltage S+,S-

- Calculations

$$\text{Input Voltage Range}_{\text{differential}} = \sim [-0.01, 0.1]V$$

$$V_{cm} = 2.5$$

$$\text{Differential Gain} = 10$$

$$\text{Out Voltage Range}_{\text{differential}} = \sim [-0.1, 1]V$$

### 16-Bit ADC

ENOB = 12 bit

Differential Range =  $[-V_{ref}, V_{ref}]$

$V_{ref} = 2.5 \text{ V}$

Resolution = 1.22 mV/step

Available steps @10 gain= 900       $[0, 1] \text{ V}$

Available steps @15 gain = 1351       $[0, 1.5] \text{ V}$

Available steps @20 gain = 1800       $[0, 2] \text{ V}$

If we apply our limits to our  $V_{ocm}$  from our driver (min 1V)

+1 V

Input limit =  $[0, V_{ref}]$

Peaks and troughs of signal =  $[-V_{pp}/2, V_{pp}/2]$

10G =  $[0.5, 1.5]$

15G =  $[0.75, 1.75]$

20G =  $[0, 2]$

### 12-Bit ADC

ENOB 8 bit

$V_{ref} = 1.8 \text{ V}$

Shunt Resistance = 200

$V_{ocm} = 1 \text{ V}$

10G =  $[0.5, 1.5]$

- b. I have opted to use a 1 V common mode for my driver outputs
  - c. This is the minimum allowed, and can also keep our signal within the ADC  $V_{ref}$  limitations for both ADCs
  - d. I have added a voltage divider to the output of the 1.8V regulator with a voltage follower op amp to supply the  $V_{ocm}$  to all of the drivers
    - i. My goal was to avoid adding another component, but if you feel that this configuration is unsatisfactory I can find another way to supply 1V
  - e. I do notice there is still room to push the gain if we want more available steps while still having leftover
- 4. MCU inputs/Shunt outputs**
- a. I added the differential terminals of the shunt output to MCU and added new nets
  - b. I noticed this issue after consulting the driver data sheet more thoroughly