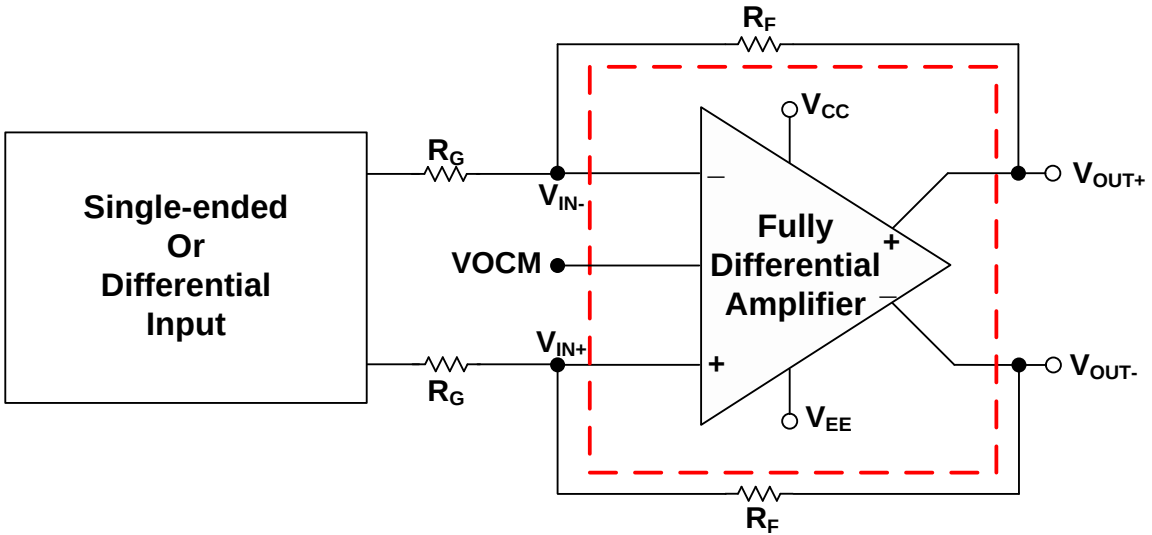
Fully Differential Amplifiers - 1

Exercises

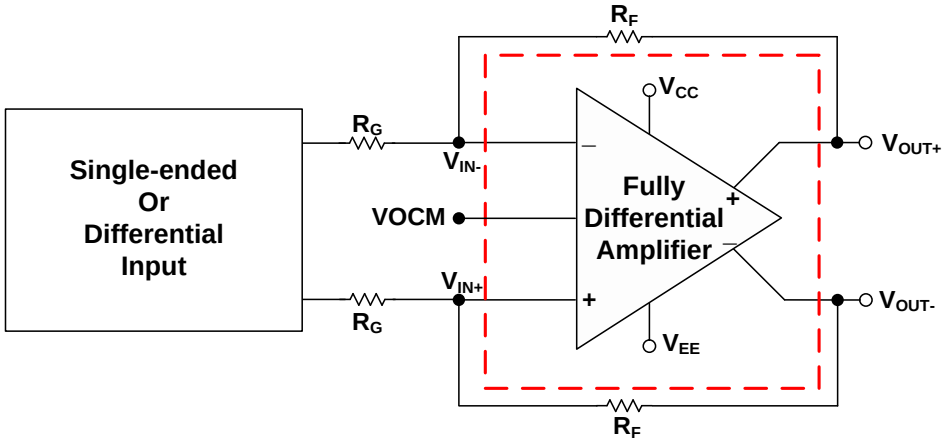
TI Precision Labs: Op Amps

Questions

1. An FDA circuit has VOCM = 3V and its instantaneous differential output is equal to 0.5V. What is the instantaneous voltage at Vout+ and Vout-?



2. An FDA circuit is setup as shown below. The desired VOCM is equal to mid-supply which occurs by default due to the internal resistors. What would you change in the design in order to minimize the noise from the internal resistors.



3. An FDA is operating on 5V supplies and its outputs have the ability to swing rail-to-rail. What is the maximum differential output voltage of the FDA (assume a sinusoidal signal and VOCM at mid-supply)?

Answers

1. An FDA circuit has VOCM = 3V and its instantaneous differential output is equal to 0.5V.

   What is the instantaneous voltage at Vout+ and Vout-?

VOCM by definition is the average of the two output voltages, so

$$VOCM = \frac{V_{OUT+}(t) + V_{OUT-}(t)}{2} = 3V$$

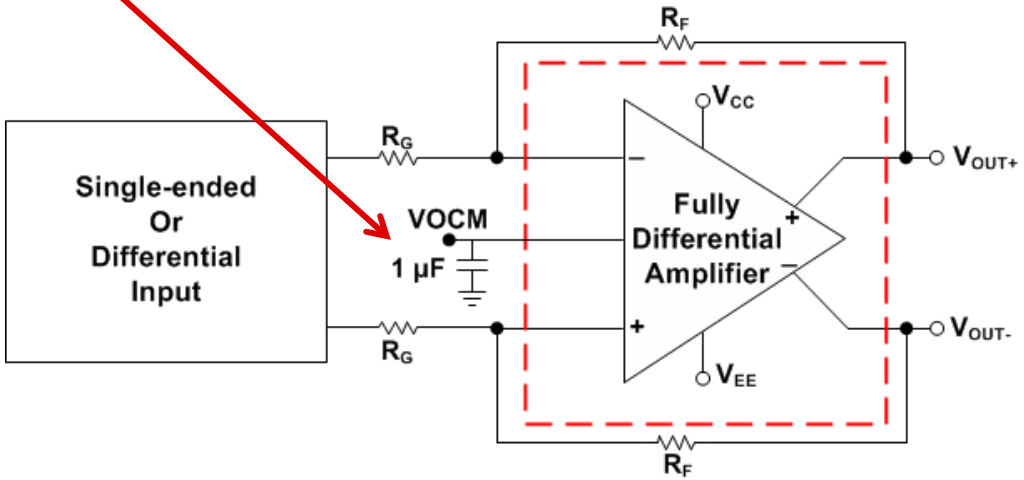
Also, the problem states that

$$V_{OUT+}(t) - V_{OUT-}(t) = 0.5V$$

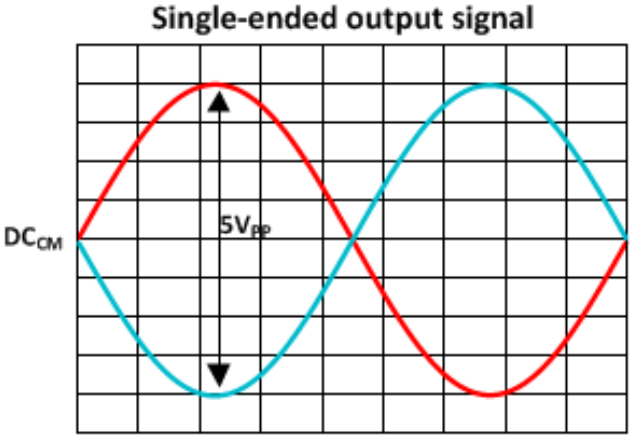
Solving the above two equations gives Vout+ and Vout- as 3.25V and 2.75V respectively.

2. An FDA circuit is setup as shown below. The desired VOCM is equal to mid-supply which occurs by default due to the internal resistors. What would you change in the design in order to minimize the noise from the internal resistors.

Answer: Add a large external capacitor (1nF to 1µF) to the VOCM pin. This will act as a low impedance path at high frequencies and shunt the noise from the internal resistors to GND.



3. An FDA is operating on 5V supplies and its outputs have the ability to swing rail-to-rail. What is the maximum differential output voltage of the FDA (assume a sinusoidal signal)?



Answer: Since each single-ended output signal can swing completely between the amplifiers supplies, each output's is capable of a $5V_{PP}$ swing.

Since the two outputs are 180^0 out of phase with each other the **Differential Output Swing = 2* $5V_{PP}$ =$10V_{PP}$**