Fully Differential Amplifiers - 3

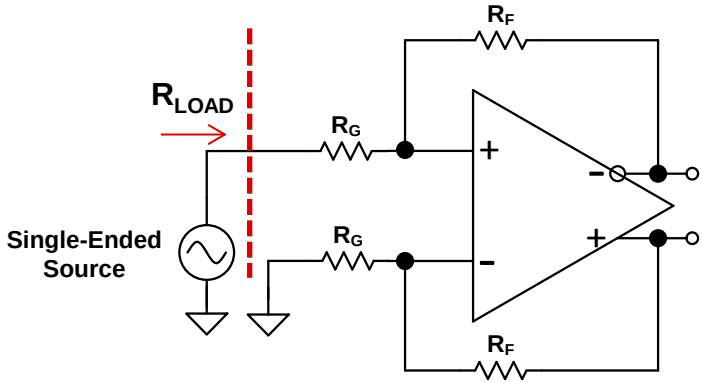
Exercises

TI Precision Labs: Op Amps

Questions

1. How would you AC couple a single-ended input source to an FDA?

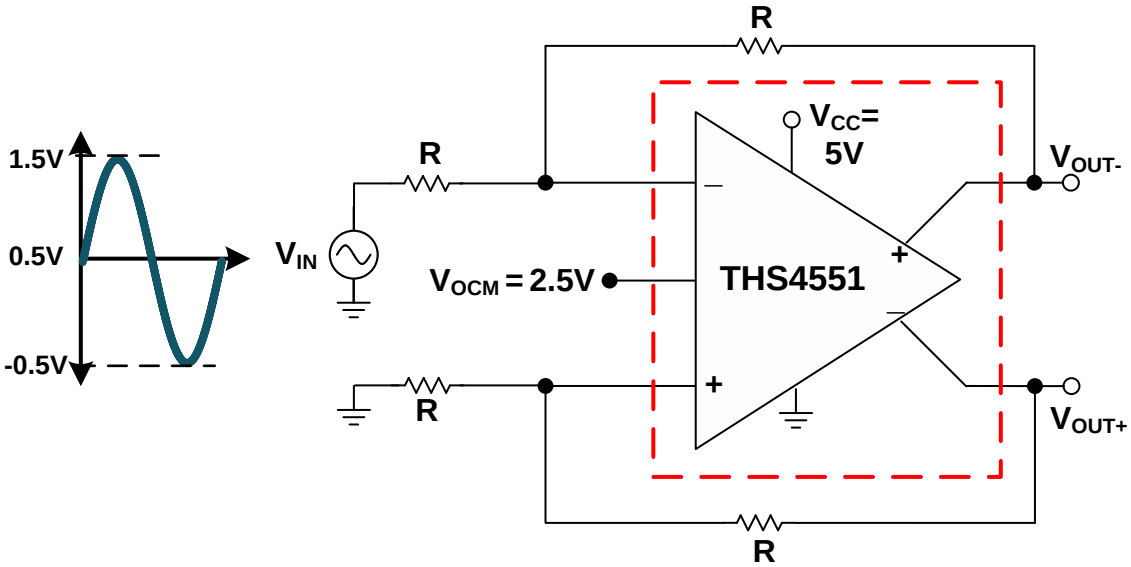
2. What is the load seen by the single-ended input source? (HINT: It is not R_G). Assume that both the VOCM = 0V and the input signal common-mode is 0V.



3. For the circuit shown below what is the,

- Output signal (differential and common-mode), and
- Input signal (differential and common-mode)

(HINT: The signal input common-mode is 0.5V while the non-driven input is at GND.)



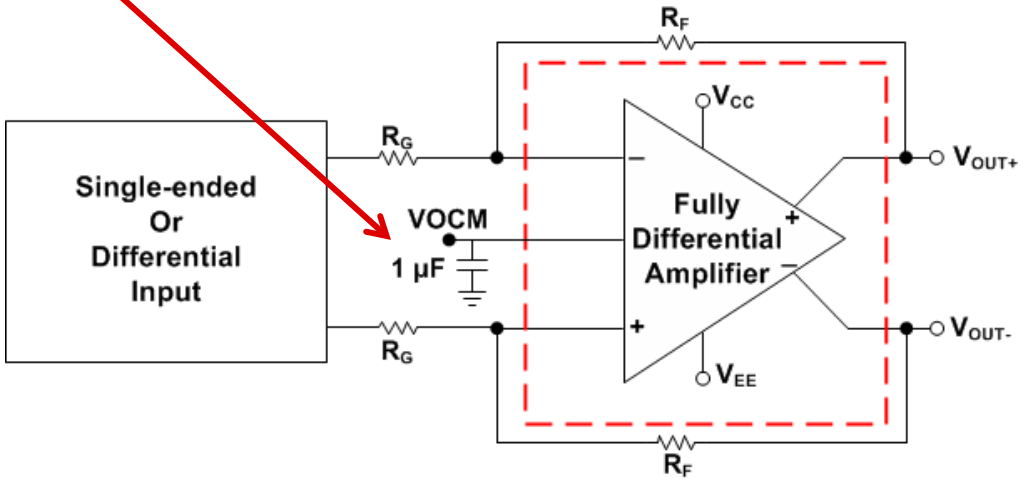
Answers

1. How would you AC couple a single-ended input source to an FDA?

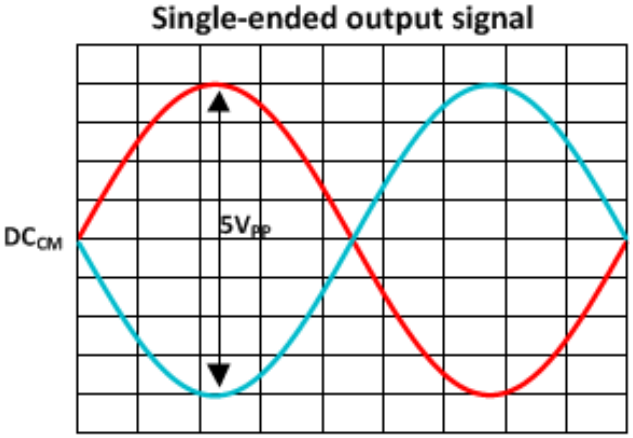
The circuit is shown below. This circuit configuration is useful when the DC and low-frequency signal content can be ignored. If the single-ended input common-mode is not GND, then using this circuit configuration precludes the need for a 2nd opamp to match the common-mode of the input signal.

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* $5V_{PP}$ =$10V_{PP}$**