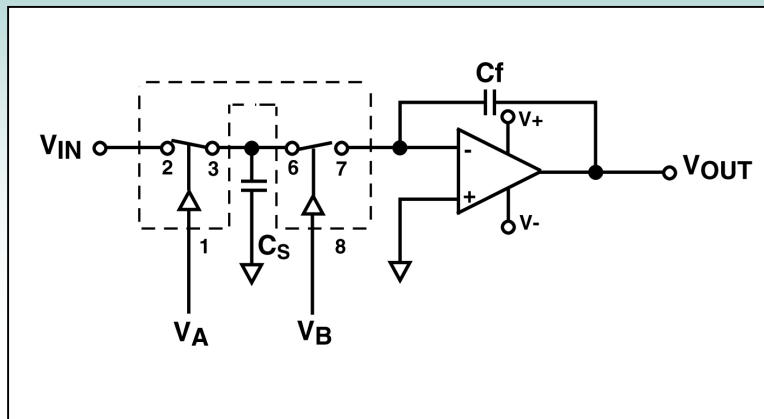




Inverting Switched Capacitor Integrator



Description

This circuit charges and discharges sampling capacitor C_s by alternately switching it between input V_{IN} and the inverting terminal of the operational amplifier configured as an integrator. Frequency input is provided by digital inputs V_A and V_B , which are out-of-phase non-overlapping digital clocks. Initially C_s is charged by V_{IN} , which is connected to C_s through the analog switch and enabled by V_A (CLOSED). Next, V_{IN} is disconnected from C_s when V_A disables (open) the analog switch. V_B then enable C_s to be switched across the input terminals of the integrating amplifier. V_{OUT} is determined by the amount of charge on C_s transferred across to the integration capacitor C_f . It is important to select an analog switch that has very low charge injection specifications, such as the ALD4201. Switching by analog switch introduces charge injection that adds or subtracts extraneous charge to C_s and introduces errors to the signal charge stored on it. Clocks V_A and V_B required to drive a quad analog switch such as the ALD4201 can also be replaced with a single clock driving an ALD4213 quad analog switch. The integration current I_{IN} produced by input V_{IN} is proportional to it, given by $I_{IN} = V_{IN}/R = V_{OUT} \times C_s \times f$, where f is the switching clock frequency of V_A and V_B . The feedback integration capacitor C_f is charged with this integration current. The time required in charging the integrating capacitor depends directly on the magnitude of $1/V_{IN}$ and is directly proportional to the product of R ($R = k \times 1/f$) and C_s . Select an operational amplifier with a) extremely low input leakage current b) low input offset voltage c) sufficient slew rate and output current to charge the C_f .

Recommended Components

1/2 ALD2701+ALD4201; ALD1702+ALD4201; ALD1701+ALD4201; ALD1706+ALD4201

Precision version: 1/2 ALD2711+ALD4213; ALD1722+ALD4213; ALD1704A+ALD4213; ALD1726+ALD4213

Other Related Circuit Ideas

Schematic no. int_42005.0 Precision Charge Integrator