Category: Integrators **CIRCUIT IDEAS FOR DESIGNERS** Schematic no. int_42004.0

Inverting Switched Capacitor Integrator

Description

This circuit charges and discharges sampling capacitor Cs 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 Cs is charged by V_{IN}, which is connected to Cs through the analog switch and enabled by V_A (CLOSED). Next, V_{IN} is disconnected from Cs when V_A disables (open) the analog switch. V_B then enable Cs to be switched across the input terminals of the integrating amplifier. V_{OUT} is determined by the amount of charge on Cs transferred across to the integration capacitor Cf. 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 Cs 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 $I_{IN} = V_{IN}/R = V_{OUT} \times Cs \times f$, where f is the switching clock frequency of V_A and V_B. The feedback integration capacitor Cf 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 Cs. 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 Cf.

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