

一种基于斩波技术的轨到轨运算放大器的分析与设计

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摘要: 采用 TSMC 0.18 μ m CMOS 工艺, 设计实现了一种低压、低失调、恒跨导的轨到轨运算放大器。运算放大器在保证输入级跨导在整个共模范围内恒定的前提下, 采用轨到轨的折叠共源共栅输入级, 输入管工作在亚阈值区, 采用反馈式 AB 类输出级以实现轨到轨的输出摆幅, 同时采用斩波稳定技术减小输入参考失调和噪声。电路工作在 1 V 单电源电压下, 仿真得到 119 dB 的直流增益和 5.6 MHz 的增益带宽积。蒙特卡罗仿真结果显示失调电压分布的标准差为 14 μ V, 输入噪声普密度为 18.19 nV/ \sqrt{Hz} 。

关键词: 低压; 低失调; 恒跨导; 斩波稳定技术

Analysis and Design of a Rail-to-Rail Operational Amplifier

Based on Chopper Technology

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Abstract : A rail-to-rail operational amplifier with low-voltage low-offset and constant transconductance is designed in TSMC 0.18 μ m CMOS process. The operational amplifier has a rail-to-rail folded cascode input stages, which ensures a constant transconductance over the available common-mode input range and all input transistors operate in sub-threshold region. A class-AB output stage with folded mesh feedback is used to achieve the rail-to-rail output range. The chopper stabilization technique is exploited to reduce the input referred offset and noise. The circuit is simulated in Cadence Spectre with a single 1 V supply. The simulation results show that the dc gain is 119dB and the GBW is 5.6 MHz. Montecarlo simulations demonstrate an offset distribution with 14 μ V standard deviation. The input noise spectral density is 18.19 nV/ \sqrt{Hz} .

Key words: low-voltage; low-offset; constant transconductance; chopper stabilization technique

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