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论文

SiC CMOS OPAMP 高温模型和Hspice 仿真

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摘要：

为研制具有高温稳定性的SiC CMOS(complementary metal鄄oxide鄄semiconductor) OPAMP(operational amplifier),对PMOST(P鄄type metal鄄oxide鄄semiconductor transistor)输入标准6H鄄SiC CMOS 两级运算放大器的高温 等效电路模型进行了推导,并对电路进行了Hspice 仿真. 仿真结果表明,在SiC MOS 器件中,因受SiC/SiO2 界面导带附近高界面态密度的影响,阈值电压随温度的变化并不像Si MOS 器件那样呈线性变化,其沟道有效迁移率也并不与温度的-1. 5 次方成正比. 此外,SiC MOS 器件的沟道迁移率低,导致其跨导比相同尺寸下的Si 器件的低,所以其开环增益也小于相同结构和尺寸的Si OPAMP. 虽然标准的OPAMP 单元对Si 器件来说具有温度稳定性,但对SiC 基材料来说需进一步修正.

关键词： SiC CMOS OPAMP 高温模型 Hspice 仿真

SiC CMOS OPAMP High Temperature Model and Hspice Simulation

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Abstract:

The high temperature equivalent circuit of standard silicon carbide (SiC) CMOS (complementary metal-oxide-semiconductor) OPAMP (operational amplifier) with PMOST (P-type metal-oxide-semiconductor transistor) as input was drawn and its Hspice simulation was conducted to provide a foundation to further develop SiC CMOS OPAMP with temperature stability. The simulation result shows that because a high interface trap exists, variation of threshold voltage with temperature is not linear as that of Si MOS devices, and effective channel mobility is not proportional to temperature to the minus 1. 5th power. Furthermore, a low effective channel mobility results in a low conductance, so SiC OPAMP has a lower open loop gain than that of Si counterpart with the same structure and size. Although standard OPAMP cell has a temperature stability to Si-based MOST, a further modify should be done to SiC-based MOST

Keywords: SiC CMOS OPAMP high temperature model Hspice simulation

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