

基于锗硅 BiCMOS 工艺的低噪声差分放大器设计

张华斌¹, 刘萍^{1,2}, 邓春健^{1,3}, 杨健君¹, 刘黎明¹, 陈卉¹, 王红航¹, 熊召新⁴

(1 电子科技大学 中山学院, 广东 中山 528402; 2 电子科技大学 物理电子学院, 四川 成都 610054; 3 电子科技大学 计算机科学与工程学院, 四川 成都 610054; 4 陕西理工大学 物理与电信工程学院, 陕西 汉中 723000)

摘要: 针对无线局域网前端接收机 2.5 GHz 的应用, 提出了一种硅锗工艺低噪声差分放大器. 采用差分级联放大器结构既能抑制输入端的共模噪声信号, 又能因级联结构的高增益而抑制电路的噪声, 确保电路的高性能; 同时选用 JAZZ 0.35 μm 1P4M 锗硅 BiCMOS 工艺来制作. 该放大器能有效地提供了 $50\ \Omega$ 输入阻抗匹配且具备良好的温度特性. 在频点 2.5 GHz 时, 放大器的最大小信号电压增益为 29.1 dB, 噪声系数 1.3 dB, 输入/输出回波损耗都优于 -11 dB, 输入 3 阶交调点为 -0.24 dBm. 在直流电源电压 3 V 供应下, 低噪声放大器消耗电流为 3.7 mA. 仿真结果表明, 与其他文献相比, 该放大器有更高的电压增益和更低的噪声, 可以更加有效地应用于无线局域网及相关频点领域.

关键词: 无线局域网; 锗硅; BiCMOS; 低噪声放大器

Design of a Differential Lower Noise Amplifier Using

SiGe BiCMOS Technology

ZHANG Hua-bin¹, LIU Ping^{1,2}, DENG Chun-jian^{1,3}, YANG Jian-jun¹,

LIU Li-ming¹, CHEN Hui¹, WANG Hong-hang¹, XIONG Zhao-xin⁴

(1 Zhongshan Institute, University of Electronic Science and Technology, Zhongshan 528402, China; 2 School of Physical and Electronics, University of Electronic Science and Technology, Chengdu 610054, China; 3 School of Computer Science and Engineering, University of Electronic Science and Technology, Chengdu 610054, China; 4 Department of Physical and Telecommunication Engineering Dept, Shaanxi Sci-Tech University; Hanzhong 723000, China)

Abstract: A differential lower noise amplifier (LNA) for wireless local network (WLAN) in front-end receiver is presented, which is fabricated with a JAZZ 0.35 μm 1P4M SiGe BiCMOS process. It can not only reject the common-mode noise signal in input port and but also depress circuit noise for using cascade topology, and realize its high performance. The LNA provides effectively a $50\ \Omega$ input impedance matching and good temperature characteristic. At 2.5 GHz, the LNA exhibits a maximum small signal voltage gain of 29.1 dB, noise figure of 1.3 dB, input/output return loss better than -11 dB, and input IIP3 of -0.24 dBm, respectively. The LNA consumes 3.7 mA from a 3.0V DC supply. The simulation results show that, in comparison with the other LNAs, this LNA has higher voltage gain, lower noise and more efficaciously be utilized in WLAN and related fields. **Key words:** WLAN; SiGe; BiCMOS; low noise amplifier

作者简介:

张华斌 男, (1968-), 博士, 讲师. 研究方向为射频电路设计和器件建模. E-mail: hbzhang533@yahoo.com.

刘萍 女, (1980-), 博士, 副教授. 研究方向为微波电子学与技术.

邓春健 男, (1980-), 博士, 教授. 研究方向为信息显示技术.