ABSTRACT

Over the last several years the CMOS technology has progressed from a digitally oriented technology to one which is best suited for microwave and RF applications at high levels of integration. The primary reason behind this evolution is credited to extensive scaling and upcoming of SOI devices. However, the evolution is restricted by high parasitics. The works presented in this dissertation analyze some of the structural and material modification techniques for further improving the performance of CMOS devices for mixed signal system on chip application. Also, for analog and RF circuit applications Harmonic distortion (HD) is an important reliability issue that arises due to non-linear performance of devices. In this dissertation the impact of different structural modifications and ambient conditions on the HD characteristics of the devices is analysed for better application reliability. In the analysis the devices are compared for their primary distortion components designated by the second order distortion (HD2), the third order distortion (HD3) and the total harmonic distortion (THD). The distortion characteristics of the device are studied as a function of the gate voltage (Vgs) and the transconductance generation factor (gm/Id) considering the influence of drain current (Id) and the transconductance (gm). In addition to this, the distortion in the output characteristics of Cascode and differential amplifier circuits designed with the structurally modified devices is also analyzed.