

Abstract

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Project Title: Integrated Active Inductor and Its Applications for Wireless Communications
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This project is concerned with the investigation and development of analogue integrated circuits which operate at the technology limits of silicon CMOS, and thus are suitable for implementation of RF front-end circuits, particularly for use in wireless applications. The main objectives of this project are to develop high frequency active inductor topologies for implementation in silicon CMOS technology, and to develop these CMOS active inductor topologies into front-end bandpass filter circuits in the low microwave frequency range. The motivation for implementing active inductors is the increased tuneability, plus reduced chip area and processing cost, when compared to implementing an on-chip passive inductor.

The objectives of this project have been met through the development of novel low-voltage tuneable CMOS active inductor architectures tailored for high frequency applications. These inductors exhibit tuneable inductance varying from several nH up to several hundred nH, with independently tuneable quality factor (Q) values up to more than 100. These values far exceed those currently achievable using passive integrated inductors in standard silicon CMOS technology. This project has also demonstrated the use of these active inductor structures in various front-end circuits, including tuneable bandpass filters and bandpass amplifiers. Again the performance of these circuits compares well with previously reported implementations using passive inductors, with the added benefit of tuneability and reduced silicon area. This research confirms the feasibility of using CMOS integrated active inductors for RF applications, and the circuits developed further extends the library of architectures available to designers of front-end RF CMOS circuits and systems.

Keywords: Analogue circuits, Active filters, Inductorless, Active inductor

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