Abstract

In wireless communication system where it is necessary to control the bandwidth of the signal path, filters are frequency-selective electronic circuits designed to pass a band of wanted signals and stop or reject unwanted signals, noise or interference outside the pass band. The pass band of a filter is the range of frequencies over which signals are transmitted from input to output without attenuation or gain. For higher frequencies, however, Operational amplifiers designs become difficult due to their frequency limit, so at those high frequencies, operational transconductance amplifiers (OTAs) replace operational amplifier as the building blocks. Using OTAs as the building blocks for analog applications and scaling-down semiconductor technologies, OTAs can work up to several hundred MHz. Currently, high frequency, high linearity, and low power are the three main concerns of CMOS OTAs. Tradeoffs have to be made among these aspects in designing practical OTAs. Amongst all the topologies of OTA, on the basis of literature survey, Folded Cascode OTA is chosen as it allows negligible swing limitations.

Continuous-time filters implemented with transconductance amplifiers and capacitors known as Gm-C Filter or OTA-C Filter. Rapidly growing mobile and wireless communication market, fully integrated filters for very high frequency and low power consumption applications have received considerable attention. In most continuous-time filters, an on-chip automatic tuning system is incorporated to overcome performance degradation due to process variations and fabrication tolerances as well as the effects of parasitic, temperature, and environment changes.

This research work involve research studies to realize CMOS Folded Cascode OTA and implement on chip High frequency gm-C IF Filter for Dual Band FM band and GSM band. An array of Band selection filters in a Multi Mode design is not power efficient and it would occupy large chip area, so it is decided to realize single band select filter that meets the requirement of dual band applications.

CMOS Folded Cascode OTA design is characterized to layout level based on TSMC 0.18μm process technology with the BSIM3V3 Level 49 MOSFET model. Designed folded cascode OTA has gain of 52 dB and a wide bandwidth of 400 MHz with phase margin of 50 degrees and power consumption 288μw.

Design of a 2^{nd} order gm-C dual-band IF filter to be used in a down conversion receiver for FM band and GSM band, as design is carried out in the TSMC 0.18 μm CMOS technology and the filter operates form 1.8V single supply. Designed 2^{nd} order gm-C dual-band IF filter Gm-C filter for GSM band work at a center frequency 70MHz(Bandwidth 5.10MHz) and for FM band work at a center frequency 10.6Mhz(bandwidth 1.73MHz) with power consumption 575μw

The designed filter has tuning ratio 6.6 and suitable for IF channel selection of Wireless System. Gm-C architecture also using an Automatic Tuning system for tuning purpose. The circuit does not need any external biasing circuit, only need to apply V_{DD} (1.8V).