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A New Active Resistor and Its Application to a CMOS Transconductor

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Abstract

In this paper a new active resistor is proposed which is suitable for tunable linear voltage to current converters. The proposed resistor is composed of the main and auxiliary triode-mode transistors in which the resistance of auxiliary transistor adds to that of main transistor at a specific tune voltage. By this way the triode operation of both transistors is ensured throughout the tuning range. The proposed resistor is used in a tunable linear transconductor. The proposed transconductor which is implemented in 0.13μm CMOS technology works with 1.2V supply voltage and its power consumption changes between 682 and 980 μW. Simulation results show 20dB improvement in THD of transconductor thanks to using proposed resistor rather than conventional one for input voltage amplitude of 1Vpp at 1MHz. The transconductance can be tuned from 68 to 177.4 μA/V and the THD remains less than -55 dB for input voltage amplitudes up to 1.2Vpp and for the entire tuning range.

Keywords: transconductor, tunable, triode-mode transistor, linearity, THD

1. Introduction

Nowaday the necessity to use low volume power efficient communication and medical systems has motivated researchers to seek for more integrated circuit design techniques. Using tunable building blocks makes it feasible to support several applications by hardware sharing [1, 2, 3, 4]. Tunable transconductor is an essential building block of the analog front end circuits such as Gm-C filters and oscillators, variable gain amplifiers, and data converters [5]. In most applications the linear conversion of voltage to current is vital for the tunable transconductor [5, 6].

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