

Third Order Lowpass Butterworth Filters using Current Mode Amplifiers

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Abstract

Realisation of a third order lowpass(LP) Butterworth filter using the recent current differencing buffered amplifier (CDBA) cascaded by a current feedback amplifier stage is proposed. The transadmittance pole parameters of the devices had been utilised in the design to obtain extended frequency operation in the range of $1\text{MHz} \leq f_o \leq 20\text{MHz}$. An additional bandpass (BP) type Butterworth characteristic could also be obtained in the same topology with suitable design. The circuit exhibits low sensitivity relative to the port tracking errors (ϵ) of the devices. The Filter response had been verified using PSPICE simulation and hardware test.

Keywords : Butterworth filter, CDBA, Third-order filter.

Introduction

The topic on the realization of third order lowpass (LP) Butterworth filters with maximally flat frequency response had been considered by many authors based on various types of active devices viz., voltage operational amplifier, current conveyor and current feedback amplifier (CFA) [1-5]. With the availability of the recent current differencing buffered amplifier (CDBA) [6] as an active building block, there has been renewed interest on designing analog signal processing circuits and filters using this element [6-13]. Both the CDBA and CFA blocks are essentially current mode devices with unity gain which are suitable for monolithic implementation with bipolar and CMOS technologies[8]. The CDBA element can be conveniently modeled by a pair of CFA devices[10-13]. There are various other advantages[14] of these devices in view of their usability to signal processing and filtering circuit design, viz., extended bandwidth (BW) capability that is practically independent of closed-loop