Active-R Dual Input Integrator With Enhanced Time Constant Using a CDBA : Quadrature Oscillator Design

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Abstract— A new dual-input integrator using a current differencing buffered amplifier (CDBA) element is presented ; the circuit needs a grounded capacitor and the time constant (τ) has an enlargement factor being tunable by a single resistor. A sinusoid quadrature oscillator is realized thereafter with a double-integrator loop involving two such integrators. The designs are tested satisfactorily in a frequency-range of 1MHz-20MHz by both hardware implementation and PSPICE macromodel simulation.

Index Terms— CDBA, Differential integrator, Quadrature oscillator.

1 Introduction

WITH the advent of the recent CDBA active element [1], several analog signal processing/conditioning circuit design schemes are being proposed recently [2],[3],[4],[5]. The element may be easily configured [5] using a pair of AD-844 type current feedback amplifier (CFA) ; this amplifier provides extended bandwidth and slew rate capabilities over the ubiquitous voltage operational amplifier [6],[7],[8]. Some active-RC integrators using voltage/current mode devices were reported earlier [9],[10],[11] wherein the usefulness of enhanced value of τ is cited. An integrator design with dual-input capability at an enlarged-τ utilizing a single CDBA had not yet been presented. Previously reported differential integrators with single resistor-tunability, use at least two active elements [9],[10],[11].

Here we utilize the transimpedance capacitor (C_z) of the device ; this component is inherently available in the device and hence can be used so that the design becomes active-R without an external capacitor[12],[13]. Since the proposed integrator is compatible to either polarity input signals, a double integrator loop oscillator may be formed by connecting one inverting and the other noninverting stages. As an application, we cascaded two such integrators in a feedback loop so as to derive a quadrature oscillator (QO) ; such oscillators find numerous applications as electronic functional blocks [14],[15]. Satisfactory test results are obtained for the proposed designs in a frequency-range of 1MHz~20MHz.

2 Analysis

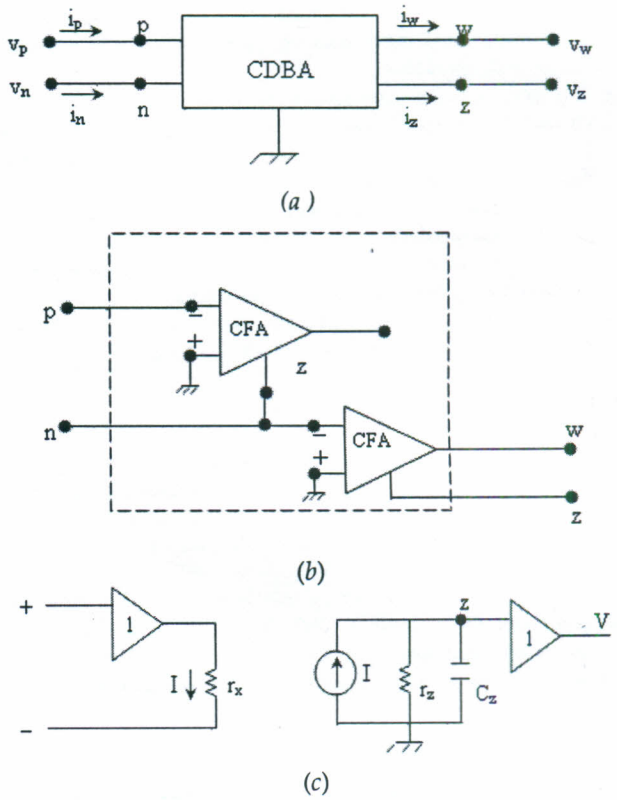

Fig.1 Symbol of CDBA
(*a*) Four-terminal CDBA building block
(*b*) CFA based implementation of CDBA
(*c*) AD-844 equivalent circuit model

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