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Current-Mode Instrumentation Amplifier Based on Supply Current Sensing Technique

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Abstract: In this paper a new low-voltage low-power current-mode instrumentation amplifier (CMIA) is presented. The proposed CMIA is based on supply current sensing technique where Op-Amps in traditional CMIA are replaced with voltage buffers (VBs). This modification results in a very simplified circuit, robust performance against mismatches and high frequency performance. To reduce the required supply voltage, a low-voltage resistor-based current mirror is used to transfer the input current to the load. The input and output signals are of voltage kind and the proposed CMIA shows ideal infinite input impedance and a very low output one. PSPICE simulation results, using 0.18 μm TSMC CMOS technology and supply voltage of ±0.9V, show a 71dB CMRR and a 85 MHz constant -3dB bandwidth for differential-mode gain (ranging from 0dB to 18dB). The output impedance of the proposed circuit is 1.7 Ω and its power consumption is 770 μW. The method introduced in this paper can be applied to traditional circuits based on Op-Amp supply current sensing technique.

Keywords: Current-Mode, Instrumentation Amplifier, CMRR, Op-Amp supply current sensing technique.

1-Introduction:

The technique of Op-Amp supply current sensing was introduced in 1979 to implement voltage controlled current sources and current controlled current sources [1]. It is a simple and effective technique, first employed by Toumazou and Lidgey [2] and then by other researchers, to design Current-Mode Instrumentation Amplifiers (CMIA) [3-9], implemented by connecting current mirrors to Op-Amp supply leads from which it is possible to detect Op-Amps output transistor current.

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