

CHOPPER STABILIZATION TECHNIQUES. PART I: CHOPPER AMPLIFIER TOPOLOGIES OVERVIEW

Andrei DANCHIV¹, Mircea BODEA², Claudiu DAN³

Rezumat. *Lucrarea prezintă proiectarea optimă, bazată pe analiza manuală susținută de simularea SPICE a unui amplificator cu modulare-demodulare (chopper). În prima parte a lucrării sunt trecute în revistă metodele de reducere a tensiunii de offset și a zgomotului unui amplificator prin folosirea tehnicii de modulare-demodulare punându-se în evidență rezultatele importante pentru proiectarea amplificatorului de bază. Sunt comparate performanțele care se pot obține folosirea unui amplificator de bandă largă și respectiv a unuia selectiv în frecvență analizându-se cauzele offsetului rezidual și performanțele de zgomot.*

Abstract. *This paper presents the chopper amplifier optimal design flow, based on manual analysis and backed up by SPICE simulation. The first part is a tutorial like overview of chopper technique effects on offset voltage and noise reduction, highlighting the significant results for the base amplifier design. The performances of a wide band amplifier and respectively a frequency selective base amplifier are compared. The residual offset and noise performances are analyzed.*

Keywords: chopper amplifier, offset voltage, frequency selective amplifier.

Introduction

For precision amplifier design, the noise and offset become critical issues, especially for MOS technologies. For MOS transistor both mismatch and flicker noise level are generally higher than that of similar area bipolar transistor. Taking into account only process and layout induced mismatching, the typical value of a MOS amplifier offset voltage is limited to a few milivolts. To further reduce the offset voltage, special techniques have been implemented, namely *chopper stabilization* and *autozero*.

The *chopper stabilization technique* uses modulation to shift the signal spectrum to a frequency domain where it is not affected by the amplifier's offset and low frequency noise. This way, the useful signal is separated from offset and low frequency noise which now can be filtered out while the signal is amplified.

¹Res. Dr. Eng., Infineon Technologies Romania.

²Prof. Dr. Eng., University "Politehnica" Bucharest, Department of Electronics, Telecommunication and Information Technology; corresponding member of the Academy of Romanian Scientists (mirceabodea@yahoo.com).

³Prof. Dr. Eng., University "Politehnica" Bucharest, Department of Electronics, Telecommunication and Information Technology.