Accepted Manuscript

A Compact Low-Noise Broadband Digital Picoammeter Architecture

M. Crescentini, M. Tartagni, H. Morgan, P.A. Traverso

PII: S0263-2241(16)30739-4
DOI: http://dx.doi.org/10.1016/j.measurement.2016.12.040
Reference: MEASUR 4502

To appear in: *Measurement*

Received Date: 7 October 2016
Revised Date: 22 December 2016
Accepted Date: 25 December 2016

Please cite this article as: M. Crescentini, M. Tartagni, H. Morgan, P.A. Traverso, A Compact Low-Noise Broadband Digital Picoammeter Architecture, *Measurement* (2016), doi: http://dx.doi.org/10.1016/j.measurement.2016.12.040

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

A Compact Low-Noise Broadband Digital Picoammeter Architecture

M. Crescentini[1], M. Tartagni[1,2], H. Morgan[3], and P.A. Traverso[4]

[1]Department of Electrical, Electronic and Information Engineering (DEI) "Guglielmo Marconi", Cesena Campus, University of Bologna, Cesena IT-47521, IT.

[2]Advanced Research Center on Electronic Systems (ARCES), Cesena Campus, University of Bologna, Cesena IT-47521, IT.

[3]Electronics and Computer Science & Institute for Life Sciences, University of Southampton, Southampton SO17 1BJ, U.K.

[4]Department of Electrical, Electronic and Information Engineering (DEI) "Guglielmo Marconi", Bologna Campus, University of Bologna, Bologna IT-40136, IT.

Corresponding author is M. Crescentini: tel: 0039 0547-339236; fax: 0039 0547-339208; e-mail: marco.crescentini3@ unibo.it; address: Via Venezia 52, Cesena 47521 (FC), Italy.

Abstract

A low-noise (≤ 4 fA/√Hz), broadband (≥ 100 kHz) compact architecture and related operation solutions are proposed for portable and low-cost time-domain acquisition of currents with effective resolution in the order of 1 pA and below. The front-end architecture is based on an integrating-differentiating scheme to achieve the optimal performance in terms of input-referred equivalent noise, but it overcomes the typical noise/bandwidth trade-off by making the sampling frequency of the A/D conversion independent from the rate at which the analog front-end is reset. In order to strongly mitigate the main drawback, i.e., the introduction in the system of an inherent time-variance, a Track-and-Hold circuit synchronized with the reset is exploited.

For validation purposes, a dual-channel prototype was implemented in a low-cost CMOS technology. The prototype is characterized by standard figures of merit and is experimentally validated by two simple case studies, which are typical of practical applications.

Index Terms

Download English Version:

https://daneshyari.com/en/article/5006568

Download Persian Version:

https://daneshyari.com/article/5006568

Daneshyari.com