A Technique of Analog Circuits Testing and Diagnosis Based on Neuromorphic Classifier

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Abstract The technique of functional testing the analog integrated circuits based on neuromorphic classifier (NC) has been proposed. The structure of NC providing detection both catastrophic and parametric faults taking into account the tolerance on parameters of internal components has been described. The NC ensures the associative fault detection reducing a time on diagnosis in comparison with parametric tables. The approach to selection of essential characteristics used for the NC training has been represented. The wavelet transform of transient responses, Monte Carlo method and statistical processing are used for the essential characteristics selection with maximum distance between faulty and fault-free conditions. The experimental results for the active filter demonstrating high fault coverage and low likelihood of alpha and beta errors at diagnosis have been shown.

1 Introduction

The testing plays essential role at design and manufacturing the electronic circuits. The actions on the integrated circuits test take about 40-60 % of total time and 40-70 % of total costs required for development. The testing and diagnosis of analog circuits are more complex and expensive in contrast to digital ones. The main reasons of such complexity are dealt with the component tolerances, nonlinearities and poor fault models, etc. As rule, the component tolerances make the parameters of circuit elements uncertain; together with nonlinearities this provides the complexity of computational equations. There are two main types of faults for analog circuits – catastrophic and parametric. The set of catastrophic faults determined by the opens and shorts is finite, and set of parametric faults is infinite.

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