信号处理 2010, 26(2) 267-271 DOI: ISSN: 1003-0530 CN: 11-2406/TN

论文

两种系统级单粒子效应容错方法性能仿真分析

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摘要：

基于VLSI的信息处理系统空间应用时容易遭受单粒子翻转效应（SEU：Single Event Upset）的影响。基于结构冗余的三模冗余（TMR：Three Module Redundancy）和基于信息冗余的错误检纠错（EDAC：Error Detection and Correction）是两种常见的系统级抗单粒子翻转的容错方法，被广泛应用于空间信息处理系统中。从可靠性改进、存储资源占用、硬件实现代价以及实现延时等四个方面，对两种方法进行了性能分析和仿真实验。性能分析和仿真实验结果表明，EDAC方法适合应用于基本数据宽度较大、存储资源受限、实时性要求不高的应用中，结构TMR方法适合应用于基本数据宽度较小、存储资源充足、实时性要求较高的应用中。

关键词： 单粒子翻转效应；容错；失效率；仿真分析

Simulation and Analysis of Two Kinds of System Level Fault Tolerance Methods for SEU

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Abstract:

The space information processing systems based VLSI are easily suffered by SEU (Single Event Upset) .TMR (Three Module Redundancy) based structure redundancy and EDAC (Error Detection and Correction) based information redundancy are two kinds of system level fault tolerance methods for SEU. These methods are widely used in space aircraft electronic system. Simulation and analysis are implemented from four aspects: reliability, storage resource, hardware implement spending and time delay. The results show that EDAC is efficient when the data is long, the storage resource is limited and the demand of real time performance is not high, however the TMR is efficient when the data is short, the storage resource is enough and the desire of real time performance is high.

Keywords: SEU;Fault-Tolerance Failure Rate Simulation and Analysis

收稿日期 2009-07-09 修回日期 2009-10-28 网络版发布日期 2010-02-25

DOI:

基金项目:

“863”高技术计划基金资助课题（2008AA8050701）

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