

三模冗余在高性能抗辐射 DSP 中的应用

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摘 要: 单粒子翻转 (SEU, single event upset) 是当高能粒子击中半导体元器件时, 引起逻辑发生 “0” “1” 改变, 进而导致逻辑错误的现象. 在诸如外太空等电磁辐射恶劣的环境中, 芯片常常会受到 SEU 的破坏, 由于高性能的 DSP 规模较大, 这种情况发生的概率会更高. 针对 SEU 发生的原理, 在抗辐射 DSP 结构上可以采取多种加固技术. 本文基于国产高性能 DSP “魂芯” 的架构, 从可测性和工程性的角度出发, 提出了对片上 SRAM 存储器的加固方案. 通过对 SRAM 采用自刷新和三模冗余技术, 可以对 SEU 进行有效的抑制.

关键词: 单粒子翻转; DSP; 存储器加固; 自刷新; 三模冗余

The application of TMR on the high performance and anti radiation DSP

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Abstract: Single event upset is something when high energy particles hit the semiconductor device, it will cause the ‘1’ ‘0’ transformation, and cause errors. In the harsh environment such as outer space, the chip will always be destroyed by SEU, the probability of this situation is higher since the larger scale of high performance of DSP. In view of SEU principle, anti radiation DSP will adopt a variety of reinforcement schemes. This article is based on the domestic high performance DSP ‘HunXin’ architecture, from the perspective of testability and engineering, puts forward the scheme of SRAM reinforcement on chip. Through the self-refresh and trip modular redundancy technology, SEU can be effectively suppressed.

Key words: single event upset; DSP; memory reinforcement; self-refresh; trip modular redundancy

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