

一种 FPGA 在轨单粒子翻转监测方法研究

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论文摘要: 随着航天器上 FPGA 等大规模集成电路的大量应用, 由于单粒子效应导致的星上设备异常的事件越来越多。本文对一种具有广阔的在轨应用前景的 FLASH FPGA 器件 (Actel 公司的 A3PE3000L-FG484I) 的在轨单粒子翻转事件监测方法进行研究。通过采用反熔丝 FPGA (Actel 公司的 A54SX32A) 和提高可靠性的设计方法监测 A3PE3000L-FG484I 的在轨单粒子翻转事件, 可以得出卫星运行轨道上单粒子翻转事件的空间分布情况, 为被测器件的后续在轨应用提供信息。

关键词: FPGA 单粒子效应 单粒子翻转

Abstract: FPGA (A3PE3000L-FG484I) is increasingly important in military and aerospace applications because of its excellent performance. In radiation environments, however, FPGA is vulnerable to Single Event Upset (SEU), which may lead to logic faults or function interrupts. This paper proposes a method to monitor Single Event Upset (SEU) of A3PE3000L-FG484I by using A54SX32A, in which special SEU-tolerant designs are incorporated to address high-reliability application. A single Event Upset (SEU) performance of A3PE3000L-FG484I in certain space environment is obtained by adopting this monitoring method in satellite.

key words: FPGA single Event Effect (SEU) single Event Upset (SEU)