

技术及应用

光电耦合器4N49单粒子瞬态脉冲效应的试验研究

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摘要

通过脉冲激光模拟单粒子效应, 对光电耦合器4N49的单粒子瞬态脉冲 (SET) 效应进行了试验研究。在10 V工作电压下, 获取了4N49在特定线性能量传输 (LET) 值下的SET波形特征及其变化规律, 得到了器件SET效应的等效LET阈值为10 MeV·cm²·mg⁻¹, 而饱和截面数值则高达1.2×10⁻³cm²。试验验证了4N49的SET效应对后续数字电路的影响状况, 定量研究了SET效应减缓电路的有效性, 通过设计合理的电路参数可将器件在5 V工作电压下的SET效应阈值由7.89 MeV·cm²·mg⁻¹提高至22.19 MeV·cm²·mg⁻¹。4N49的SET效应试验研究为光电耦合器SET效应的测试及防护措施的有效性验证提供了新的试验方法。

关键词 [脉冲激光](#) [光电耦合器](#) [单粒子瞬态脉冲](#)

分类号

Experimental Study on Single Event Transients of 4N49 Optocoupler

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Abstract

The single event transient (SET) effect of the 4N49 optocoupler was tested by pulsed laser experimental methodology. The characteristic of SET as amplitude and width was qualitatively investigated with the simulation of pulsed laser. A liner energy transfer (LET) threshold of 10 MeV·cm²·mg⁻¹ was measured when the bias voltage was 10 V. The saturated SET cross-section is about 1.2×10⁻³cm². The SET effect of 4N49 optocoupler on the following digital gate circuit was validated. The circuit-level design technique for mitigation of SET is reasonable and effective, and the threshold LET of 7.89 MeV·cm²·mg⁻¹ can be improved to 22.19 MeV·cm²·mg⁻¹. The experimental study on the SET of 4N49 optocoupler provides an appropriate methodology to the SET test of the optics and their hardness assurance.

Key words [pulsed laser](#) [optocoupler](#) [single event transient](#)

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