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电力电子与电力传动

基于深度优先搜索的潜在电路计算机辅助分析法

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摘要: 潜在电路分析(sneak circuit analysis，SCA)对系统安全可靠运行有重大意义，电力电子变换器的潜在电路分析处于手工分析阶段。该文对电力电子变换器潜在电路计算机分析方法进行研究。根据电路原理建立电力电子变换器矩阵模型，由此采用深度优先搜索算法，对变换器中所有可能的路径进行搜索，再通过判断函数对搜索到的路径进行识别，得到变换器中的潜在电路。基于该方法开发的计算机软件应用表明，它具有方法简单、搜索时间短、无冗余路径、准确性高、通用性强等优点，适用于复杂电力电子变换器的潜在电路分析。以谐振开关电容(resonant switched-capacitor，RSC)变换器为例，验证提出的潜在电路计算机辅助分析方法的正确性。

关键词： 潜在电路分析 图论 深度优先搜索 邻接矩阵

Computer-aided Sneak Circuit Analysis Method Based on Depth-first Search Algorithm

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Abstract: Sneak circuit analysis (SCA) is significant in system safety and reliability engineering, but SCA in power electronics systems is still in the manual analysis period. An computer-aided sneak circuit analysis method was studied for power electronics converters in this paper. Based on the matrix model of power electronics converter, all of the possible circuit paths in converter can be found out by the depth-first search algorithm. Then the sneak circuits can be identified by some criteria. A program was developed to realize the above process automatically. The proposed SCA method has the advantages of easy manipulation, short searching time, no redundant paths, high veracity, wide application, etc. It is also suitable for complex converters. Resonant switched-capacitor (RSC) con- verters were used as examples to validate the proposed SCA program. The operating results confirm its correctness.

Keywords: sneak circuit analysis graph theory depth-first search adjacency matrix

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参考文献：

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