

基于多种群改进量子进化算法的 3D NoC 测试功耗优化

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摘要: 针对在测试过程中芯片产生较大的热效应会破坏芯片的可靠性, 本文在进行测试规划获得最短测试时间的基础上, 将测试时间作为约束, 采用多种群改进量子进化算法优化测试功耗, 以降低测试成本, 防止功耗过高造成芯片不可逆的损坏. 算法中, 为了避免单一种群不能保证种群多样性, 将多种群操作与算法相结合, 并引入优体交叉策略, 以提高算法的全局寻优能力. 以 ITC'02 基准电路作为实验对象, 实验结果表明, 该算法能迅速收敛到最优解, 缩短了测试时间, 提高了测试效率, 并在测试时间约束下, 优化了测试功耗.

关键词: 三维片上网络; 测试功耗; 量子进化算法; 优体交叉; 多种群

Optimizing Test Power Consumption in 3D NoC Based on Improved

Quantum-Inspired Evolutionary Algorithm of Multi Populations

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Abstract: Considering that the large thermal effect produced by chips in the process of testing will damage the reliability of the chips, in this paper, a new method using improved quantum-inspired evolutionary algorithm of multi populations is proposed to optimize the test power consumption. The proposed method is meant to reduce the test cost and prevent the chip from being damaged due to excessive power consumption. In order to avoid the single population can't guarantee the diversity of populations, this paper combines multiple populations operation with algorithm and adopts the strategy of crossover in excellent individuals to improve the ability of global optimization. Taking ITC'02 standard circuit as the test object, the experiment results demonstrate that the proposed method can converge to the optimal solution quickly, which can reduce the total test time and improve the test efficiency, in addition, the test power consumption is optimized under the constraint of the test time.

Key words: 3D NoC; test power consumption; quantum-inspired evolutionary algorithm; crossover of excellent individuals; multi populations

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