On-Chip Sensor Ellipse Distribution Method and Equivalent Mapping Technique for Real-Time Hardware Trojan Detection and Location

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Abstract : Hardware Trojan becomes great concern as integrated circuit (IC) technology advances and not all manufacturing steps of an IC are accomplished within one company. Real-time hardware Trojan detection is proven to be a feasible way to detect randomly activated Trojans that cannot be detected at testing stage. On-chip sensors serve as a great candidate to implement real-time hardware Trojan detection, however, the optimization of on-chip sensors has not been thoroughly investigated and the location of Trojan has not been carefully explored. On-chip sensor ellipse distribution method and equivalent mapping technique are proposed based on the characteristics of on-chip power delivery network in this paper to address the optimization and distribution of on-chip sensors for real-time hardware Trojan detection as well as to estimate the location and current consumption of hardware Trojan. Simulation results verify that hardware Trojan activation can be effectively detected and the location of a hardware Trojan can be efficiently estimated with less than 5% error for a realistic power grid using our proposed methods. The proposed techniques therefore lay a solid foundation for isolation and even deactivation of hardware Trojans through accurate location of Trojans.

Keywords : hardware trojan, on-chip sensor, power distribution network, power/ground noise

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