DATASHEET

TSO.ai

Fewer Patterns, Higher Coverage, Reduced TAT

AI-driven autonomous system for ATPG configuration and QoR optimization

Overview

Synopsys TSO.ai is the industry's first autonomous artificial intelligence application for semiconductor test that addresses the test challenges associated with complex designs such as increasing pattern counts, higher silicon test costs and longer ATPG runtime.

Standard ATPG requires setting many tool parameters and options and as a result, greater expertise is required to operate the tool efficiently and produce optimal results in the shortest time possible. TSO.ai addresses these challenges by using an AI-powered optimization engine to intelligently automate the ATPG parameter tuning and achieve design-specific QOR optimization consistently.

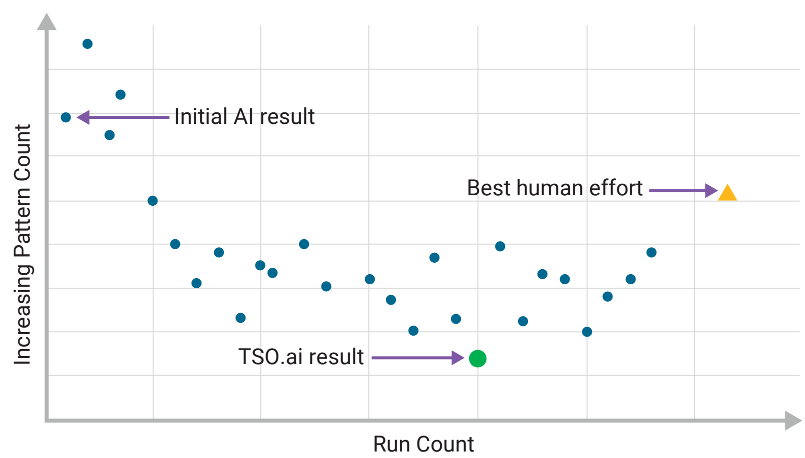

Figure 1: TSO.ai Test Pattern Reduction

Intelligent Search Space Convergence

Multiple ATPG settings and values, complex relationships with test metrics, user test targets and design characteristics create a large search space to determine the ideal configuration for optimal results. Traditional test metric optimization is an iterative and time-consuming process due to inefficient manual attempts to converge many search space factors simultaneously.

For greater efficiency, TSO.ai learns and determines the correlation between these factors through parallel ATPG runs, intelligently tunes the setting based on the learnings and continuously reduces the search space with successive runs to reach optimal values. With target test coverage as the goal, TSO.ai consistently produces the fewest number of test patterns or test cycles and eliminates iterations to accelerate time-to-results for any design. While TSO.AI can minimize pattern count, it can also maximize coverage for a fixed pattern count for limited tester memory.

User Specified Workers and Multiplier

For TSO.ai runs, users specify the number of parallel TestMAX ATPG runs and the number of learning iterations. The parallel runs are referred to as workers that run across multiple machines, and the number of learning iterations on those machines is called the multiplier. More workers with a lower multiplier decrease the turnaround time to produce the result, however, fewer workers with a higher multiplier value can also be used depending on available compute resources to achieve the same outcome with runtime trade-off.

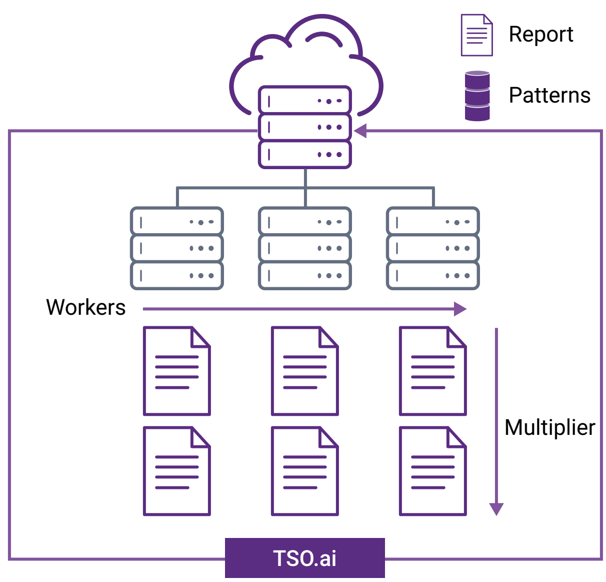

Figure 2: Parallel runs and iterations on user-defined compute resources

Cold Start and Warm Start

Initial TSO.ai runs without prior learning about design and parameters is known as a cold start. Warm start utilizes the knowledge learned from prior runs and is used to save time after small design or ATPG modifications. Cold start can also be performed on a subset of faults with more workers and higher multiplier for quick learning followed by warm start on full fault set with less workers and single run. This significantly reduces the overall runtime and delivers similar results.

Key Benefits

- Reduced digital test costs, proportional to pattern count
- Fewer defective parts in the field as part of wider Silicon Lifecycle Management (SLM)
- Reduced turnaround time for higher productivity
- Automated ATPG parameter tuning for optimal QoR
- Maximizes coverage for a fixed number of patterns

Key Features

- Test-AI technology with access to multiple, dynamic setting to the engine
- Intelligent reduction of parameter search space using AI
- Adapts to available compute resources
- Cold and warm start to reduce time-to-results
- Scalable AI-engine to handle large number of parameters

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