**SYNOPSYS®**

# SiliconSmart
## A Smarter Way to Get PrimeTime Signoff-Quality Timing Models

## Accurate library characterization for successful digital implementation

## Overview

Accurate library characterization is the foundation of successful digital implementation. Synthesis, place-and-route, verification and signoff tools rely on precise model libraries to accurately represent the timing, noise and power performance of digital and memory designs. Cell library characterization complexity has dramatically increased as libraries migrate to more advanced process nodes. Low-power design further complicates the characterization process by introducing complex cells such as multi-bit flip-flops, level shifters and retention logic, which must be accurately characterized to ensure effective digital implementation across multiple power domains. In addition, process variability on these nodes requires fast and accurate characterization to model the effects on timing.

## Introduction

The SiliconSmart® solution includes a comprehensive array of library characterization and QA capabilities that are tuned to produce PrimeTime® sign-off quality libraries with maximum throughput on available compute resources. SiliconSmart's innovative technologies utilize embedded gold reference SPICE engines to provide a characterization speed up of advanced Liberty™ models used by PrimeTime static timing analysis (STA) to accurately account for effects seen in ultra-low voltage FinFET processes that impact timing. This includes PrimeTime parametric on-chip variation (POCV), advanced waveform propagation (AWP) and electromigration (EM) analysis.

## Key Features and Benefits

- Tuned to produce PrimeTime sign-off quality libraries
- Single license includes everything required for cell library characterization and QA
- Simple multi-core licensing enables easy adaptation to constantly changing characterization workload requirements
- Embedded gold reference SPICE engines for best accuracy with fastest throughput Innovative technologies provide high characterization throughput
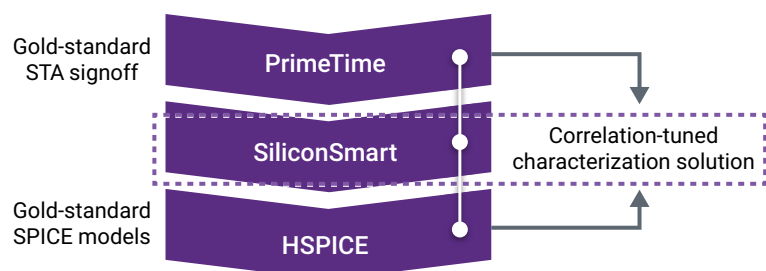


Figure 1: Platform-level integration of SiliconSmart with HSPICE and PrimeTime ensures signoff-quality libraries

## PrimeTime Signoff Quality Libraries

Advanced process node standard cell libraries require accurate timing and noise models to ensure confident static timing analysis signoff — especially for mobile IC and IoT applications operating at ultra-low voltages. To meet the accuracy needs for advanced node characterization, SiliconSmart model generation has been tightly calibrated with PrimeTime and HSPICE® models to provide the best correlation and accuracy results.

## Complete Characterization and QA Solution

SiliconSmart includes a comprehensive set of capabilities for characterization and quality assurance all within a single product. This simplifies license management and offers flexible configuration setup.

## Simple Multi-Core Licensing

SiliconSmart's unique licensing approach easily adjusts to varying workload profiles thereby eliminating the burden on characterization teams to predict future workload requirements and having to operate within the constraints associated with traditionally cumbersome licensing methods.

## Embedded Gold Reference SPICE

SiliconSmart includes built-in HSPICE and FineSim® SPICE models to provide golden accuracy with high throughput. Dedicated SPICE availability for characterization teams is another added benefit.
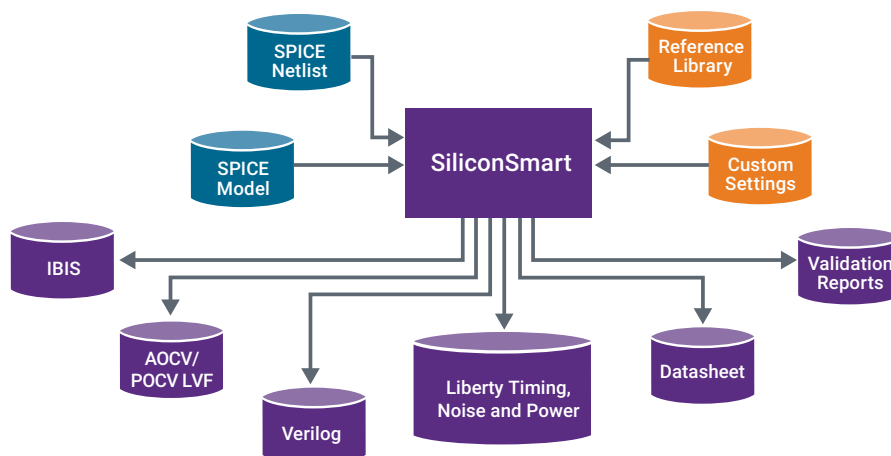


Figure 2: SiliconSmart inputs and outputs

## High Characterization Throughput

SiliconSmart provides high throughput on a wide range of computing environments with its many performance-focused features. This includes netlist optimization, automatic function recognition with vector generation, vector optimization and efficient compute farm utilization.

## SiliconSmart ADV

SiliconSmart ADV provides additional features for advanced node cell libraries.

- Comprehensive Liberty Variation Format (LVF) characterization and modeling capabilities enable best-in-class PrimeTime POCV variation analysis. Smart LVF performance optimization technology provides highest throughput and accuracy.
- Support for the latest Liberty EM model extensions are included for cell-level EM characterization.
- A suite of tools to accelerate the manual and error-prone QA process for sign-off quality libraries is provided. The entire library qualification process is automatically parallelized to provide quick turnaround time and identify problems early on. Visualization aids and intelligently organized results help to quickly isolate problem areas and provide QA management metrics.

# Memory Characterization

The SiliconSmart memory characterization solution provides accurate memory instance re-characterization using a simulation-based approach. Dynamic simulator-based netlist reduction eliminates inactive portions of the memory netlist to speed up simulation without compromising accuracy. It provides ease of setup using internal node identification and templates for memory function description. Memory re-characterization applications include embedded SRAM, register file and ROM. User-defined customization is available for special applications.