

Product Overview

Silvaco delivers a comprehensive set of TCAD-to-Signoff tools for a wide range of applications:

- Displays: TFT, LCD, OLED
- Power (high voltage/current): DMOS, IGBT, SiC, GaN, Switching regulators
- Reliability: Soft-error reliability (SEE), Radiation (Total Dose), Aging (NBTI, HCI)
- Optical: CCD, CIS, Laser
- Advanced Process Development: FinFET, FDSOI, 3D NAND Flash
- Analog, High-speed I/O Design: PLL, ADC, SERDES
- Foundation Library, Memory Design: Standard Cell, SRAM, DRAM, Flash

Silvaco's core products can be classified into the following areas: 2D/3D TCAD, 3D RC Extraction, SPICE Model Extraction, Custom Design, Characterization, SPICE Simulation, Variation Analysis, Extracted Netlist Analysis & Reduction, Power Integrity Signoff & IP. A sampling of the core products and their capabilities are described below:

- Power integrity signoff from block (analog, SRAM, custom digital) to full chip level including power, EM/IR and thermal analysis- InVar
- Full custom design flow including schematic entry, layout, simulation and verification
- Large portfolio of PDKs across many foundries with emphasis on AMS, HV, BCD and CIS processes
- 16nm and 10nm FinFET ready Parallel SPICE simulator being extended to support FastSPICE applications
- Variation-aware design tools comprising of Fast Monte Carlo, Local mismatch, statistical corners, high sigma analysis and statistical verification of standard cell libraries
- Extracted netlist analysis & reduction tools providing parasitic reduction, design analysis & verification, comparison of extracted netlists including parasitics
- Automated standard Cell & SRAM characterization environment
- 3D parasitic RC extractor used for detailed and accurate FinFET SRAM extraction
- SPICE modeling for large set of model types including HiSIM_HV for power devices and UOTFT for organic and oxide TFTs
- Pixel and interconnect RC extraction for TFT displays

- 3D TCAD products used for large application space, including rapid FinFET prototyping, large structure parallelized simulations for multi-cell IGBTs, robust, stable oxidation simulation for trench MOS power devices and CMOS image sensors, high precision SiC/GaN simulation, advanced etch for 3D NAND Flash and STT MRAM, SEE and total dose reliability simulation

Silvaco's TCAD-to-Signoff flow is visualized in the picture below. It encompasses a flow that initiates from TCAD process simulation (driven via a layout if desired). TCAD device simulation enables device characterization I-V/C-V data to be created that can be used as an input into a SPICE model characterization tool where a scalable compact or macro model is generated for utilization in a SPICE circuit simulator. This part of the flow encompasses the process development/integration side.

On the design side the flow can initiate with a schematic or netlist and lead to a schematic/netlist driven layout. The layout can be extracted via a rule based extractor or where detailed parasitics are required a 3D RC extractor. Extracted netlists in combination with model files are used to simulate and verify the circuit. The design can also be made more robust in order to handle process variation. In order to achieve a faster simulation runtime, an optimized extracted netlist can be used with control over accuracy & reduction tradeoffs. In the final stage the design is verified and signed-off physically for DRC and LVS violations and for power integrity via EM/IR/thermal analysis. The entire flow enables a "paper technology & design" cycle well before manufacturing cycles are possible or available. As actual measured data is available during the evolution of a process technology development cycle, the various steps in this flow can be augmented with a combination of simulated and measured data. For example measured data can be used to calibrate the TCAD simulation and can be used for SPICE model extraction. The complete TCAD-to-Signoff flow can be integrated with Silvaco's statistical analysis or design-of-experiments tools to enable path finding analysis, what-if scenarios, and optimization.

Silvaco TCAD Manual is below:

<https://dynamic.silvaco.com/dynamicweb/jsp/downloads/DownloadManualsAction.do?req=silvaco-manuals&nm=atlas>

Silvaco TCAD Website:

<https://www.silvaco.com/products/tcad.html>