SYNOPSYS®

Synopsys.ai: Building Products of Tomorrow, Today

Re-engineering Engineering

Overview

The Era of Pervasive Intelligence gives rise to the rapid and exponential increase in chip design complexity creating significant hurdles for the semiconductor industry. Companies must contend with the challenges posed by the march to angstroms, multi-die integration, and node migration, along with aggressive time-to-market targets, increasing manufacturing test costs, and the global engineering resource crunch. Advancements in artificial intelligence (AI) for electronic design automation (EDA) can address these challenges head on.

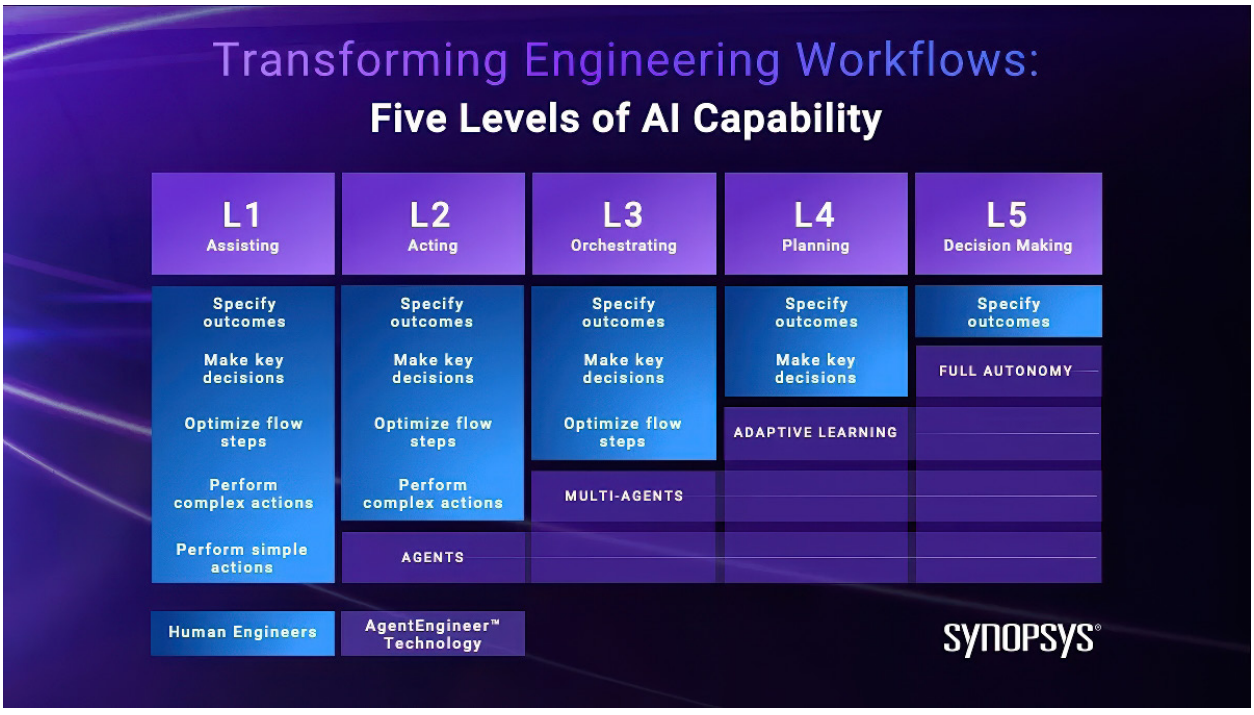
Synopsys.ai™, the industry's first full-stack, AI-powered EDA suite, is delivering significant Quality-of-Results (QoR) and productivity improvements across the entire stack. The suite's sustained differentiation to the chip design process includes comprehensive AI-powered design optimization, data analytics, generative AI and agentic AI capabilities. Synopsys.ai also includes our complete line of AI-enabled EDA solutions for every function including system architects, digital and analog designers, verification engineers through to manufacturing and test engineers. As the pioneer in AI-powered design, Synopsys.ai accelerates the chip design workflow by enabling companies to build more chips faster in the face of systemic complexity, shrinking talent shortages, and increased industry demands.

Agentic AI – Transform Engineering

Synopsys AgentEngineer™ is a trailblazing, advanced AI multi-agent workflow technology from Synopsys. As design complexity rises and time-to-market windows shrink, AgentEngineer transforms the way engineering teams work—dramatically boosting efficiency, productivity, and outcomes.

Built on Synopsys' industry-leading Agentic AI framework, AgentEngineer introduces a new era of AI-driven agents that surpass traditional automation. These intelligent agents can reason, plan, learn, and execute engineering tasks—working individually or as coordinated teams to tackle complex, multi-step challenges that once required extensive manual effort.

- **Intelligent Reasoning & Planning:** Agents assess goals, constraints, and resources to develop smart, adaptive strategies that evolve with project needs.
- **Continuous Learning:** With every project, agents learn from results and feedback, refining their approaches for greater effectiveness over time.
- **Autonomous Execution:** Agents handle tasks such as RTL generation, verification planning, and testbench creation—streamlining processes and freeing engineers to focus on strategic innovation.



As the first company to deliver GenAI agents and pioneer the Agentic AI L1–L5 framework, Synopsys leads the way in enabling customers to manage complexity, accelerate development, and achieve revolutionary productivity. Our framework evolves from basic, assistive automation (L1) to highly autonomous, self-directed agents (L5), empowering engineering teams with AI that adapts and grows with their organization.

Comprehensive Generative AI Solutions – Access 24/7 Expert Copilot

Synopsys enables chip designers to achieve unprecedented productivity gains with Synopsys.ai Copilot, the first EDA technology to leverage generative AI across the entire design stack to provide teams with expertise at their fingertips whenever needed. These capabilities provide:

- Expert guidance on tools, workflows, and script generation to enhance team efficiency
- Increased productivity with customers achieving 40% reduction in information retrieval and 10-20X reduction in time-to-solution
- Intelligent content creation that automates complex tasks such as RTL and formal testbench generation which streamline specialized design processes.

Synopsys.ai Copilot offers assistive and creative capabilities to transform design workflows, enabling teams of all experience levels to innovate faster and smarter.

Knowledge Assistant

Virtual Expert for Design Tools & Methodologies

Knowledge Assistant provides instant, on-demand guidance for users working with Synopsys design tools, flows, and methodologies. Acting as a virtual expert, it delivers timely answers, recommendations, and support tailored to current tasks or challenges.

- **Instant Answers:** Quickly access technical information about Synopsys tools, workflows, and best practices—no more searching through lengthy documentation.
- **Enhanced Productivity:** Receive real-time solutions and recommendations to resolve issues faster, helping reduce design cycle times.
- **Contextual Support:** Enjoy help that's specific to workflow or design scenario.
- **Seamless Integration:** Embedded within Synopsys design platforms for smooth, uninterrupted assistance.

Workflow Assistant

Effortless Workflow Automation, Zero Coding Required

Workflow Assistant simplifies and optimizes script configuration for engineering teams in electronic design automation (EDA). With AI-driven intelligence, it guides users through best practices for workflow automation and script optimization—all without manual code writing.

- **Guided Setup:** Step-by-step assistance for configuring and optimizing workflow scripts using intuitive, zero-code tools.
- **Efficiency Gains:** Automated suggestions to streamline workflows, minimize errors, and boost productivity.
- **Integrated Experience:** Directly embedded in Synopsys design environments for convenient automation and script optimization.
- **Continuous Improvement:** Real-time insights help identify bottlenecks and implement best practices for ongoing workflow enhancement.

Creative GenAI

Empowering Creativity & Productivity in EDA Workflows

Synopsys generative AI copilots empower teams to accelerate design exploration and documentation. Harnessing advanced AI models, Creative GenAI enables rapid innovation and insight generation for complex semiconductor designs.

- **Design Exploration:** Uncover new design alternatives and optimizations using project data and industry best practices.
- **Automated Documentation:** Instantly generate context-aware reports, summaries, and technical documentation to reduce manual work.
- **Natural Language Interaction:** Easily ask questions and receive guidance in everyday language.
- **Intelligent Recommendations:** Benefit from data-driven suggestions to enhance design quality, efficiency, and performance throughout development.

AI-Powered Design Optimization – Explore More in a Fraction of the Time

Design engineers looking to reach the best power, performance, and area (PPA) targets can utilize the Synopsys Design Space Optimization (DSO.ai™) solution. Verification engineers can achieve higher quality verification coverage faster with the Synopsys Verification Space Optimization (VSO.ai™) solution. Test engineers faced with the challenge of reducing the number of test patterns while optimizing defect coverage can employ the Synopsys Test Space Optimization (TSO.ai™) solution. Analog design engineers can use Synopsys Analog Space Optimization (ASO.ai™) to improve analog design performance and robustness by optimizing complex analog designs across multiple testbenches and hundreds of PVT (process, voltage, temperature) corners to quickly converge on the optimal design points that meet engineering specifications. Additional technologies included with Synopsys ASO.ai enable designers to rapidly migrate analog designs across technology nodes.

Design Space Optimization—Synopsys DSO.ai

Complexity brought on by advanced process nodes have opened the door to challenges in achieving optimal power, performance, and area. Manual methods are no longer viable given shrinking market windows. The need to drive for better results faster is increasing and traditional methods cannot keep pace often resulting in months of tuning using 100s of trials. Even then, results are not optimal. Synopsys DSO.ai can help.

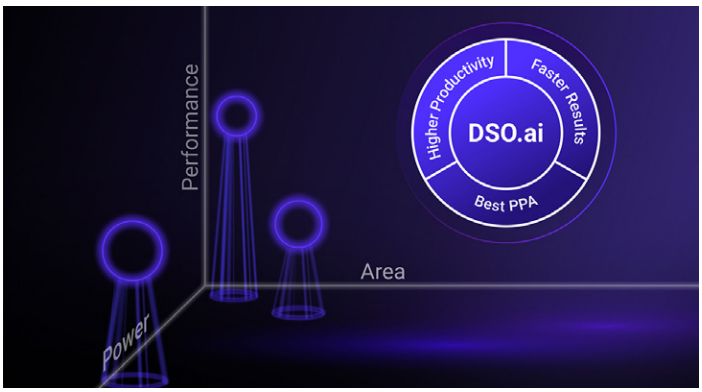


Figure 1: DSO.ai provides unbeatable PPA results and the fastest time to design

Synopsys DSO.ai, the industry's first autonomous artificial intelligence application and award-winning solution for chip design, searches for optimization targets in very large solution spaces of chip design, utilizing reinforcement learning to enhance power, performance, and area. RTL-to-GDSII full flow optimization unlocks PPA potential across both logical and physical domains. Breakthrough reinforcement learning engines can explore trillions of design recipes. These models continue to train and accelerate convergence throughout the design cycle and bleed over to impact efficiency and productivity on iterative designs.

- **Accelerate Productivity:** Users report over 3x productivity improvements and up to 15% power reduction.
- **Industry Proven:** Deployed by 9 out of 10 semiconductor companies for faster, superior results.
- **Comprehensive Optimization:** Unlocks PPA potential with trillions of design recipe explorations for the most challenging projects.

Verification Space Optimization—Synopsys VSO.ai

Logic and functional issues that undermine the readiness of SoCs require extensive verification that can quickly evolve into an endless verification and debug loop. Chip verification engineers need to check each of the design state spaces to ensure that the final SoC design will work. The number of design state spaces in which a digital design can operate is nearly infinite, making it virtually impossible for humans to check each of these spaces to validate that the design will function as intended. Achieving full verification coverage is a daunting if not impossible task using traditional methods.

The traditional coverage closure flow requires verification engineers to manually define coverage and stimulus, often running 1000's of regressions with unknown ROI. After collecting the coverage data, manual analysis of the enormous data set only leads to minimal insights. To close coverage, tests must be manually biased or directed tests must be written which is labor intensive and slow and can still lead to bug escapes.

Synopsys VSO.ai revitalizes the coverage process by using AI to examine the RTL and infer coverage while also highlighting areas where coverage is needed, ultimately helping verification engineers reach coverage targets faster and find more bugs.

Figure 2: VSO.ai delivers faster, higher coverage closure and analytics

- **Faster Coverage:** Achieve up to 10x reduction in functional coverage holes.
- **Boost Productivity:** Up to 30% improvement in IP verification efficiency.
- **Smarter Verification:** Regressions are optimized so high ROI tests are run first, and analysis is automated to define prescribed insights.

Test Space Optimization—Synopsys TSO.ai

Figure 3: Optimal pattern count achieved using TSO.ai

Growing design complexity and size also weigh down the silicon test process. Defect coverage, pattern count (which correlates directly to testing cost), and runtime are three key metrics to consider when evaluating the results from an automatic test pattern generation (ATPG) tool.

Traditionally, optimizing for one of these metrics (typically by hand) negatively impacts the others. Someone who is new to ATPG may not have a strong sense of how to tweak the tool to generate the desired program results. Conversely, someone with a lot of experience may have biases that cause tool set up to achieve a certain result, which may not prove optimal for a new design.

Synopsys TSO.ai is the industry's first autonomous AI application for semiconductor test to minimize test costs and time-to-market for today's complex designs. TSO.ai automatically searches for an optimal solution in a large test search space to minimize pattern count and ATPG turn-around time reducing test costs dramatically and accelerating time to results.

- **Lower Costs:** Dramatically reduce pattern count and testing expenses.
- **Accelerate Results:** Achieve faster time-to-market for today's complex designs.
- **Effortless Optimization:** Automatically finds optimal solutions for defect coverage and runtime.

Analog Space Optimization—Synopsys ASO.ai

There is a significant productivity gap when we compare traditional analog workflows which are highly manual and iterative with digital workflows that are typically automated. Synopsys ASO.ai brings a rich set of AI-powered analog automation features and solutions to improve productivity in analog design, simulation, verification, and implementation workflows. These new AI-based automations help analog design teams re-use decades of knowledge and experience for the development of state-of-the-art Analog IPs.

Synopsys ASO.ai introduces these new AI-based workflows:

- **Analog Design Migration:** Rapid migration of hierarchical analog IPs across technology nodes including automatic schematic migration and knowledge-based automatic layout migration.
- **Layout-aware Design Optimization:** Multi-objective optimization agent that learns while it runs, helping engineers center and further optimize analog design simultaneously across hundreds of PVT corners and across multiple tests. The AI-based optimizer can work on pre-layout and post-layout parasitic netlists to quickly converge and meet design specifications.
- **Intelligent Simulation Analysis:** Aid engineers to quickly understand intricate signal-level behavior in a massive corner and multi-testbench simulations dataset that cannot otherwise be caught in an expression-based simulation analysis and hard to identify by viewing waveforms.

Synopsys ASO.ai automation workflows aim to improve designers' Turnaround Time (TaT) and reduce Cost-of-Results (CoR) while improving Analog design Quality-of-Results (QoR).

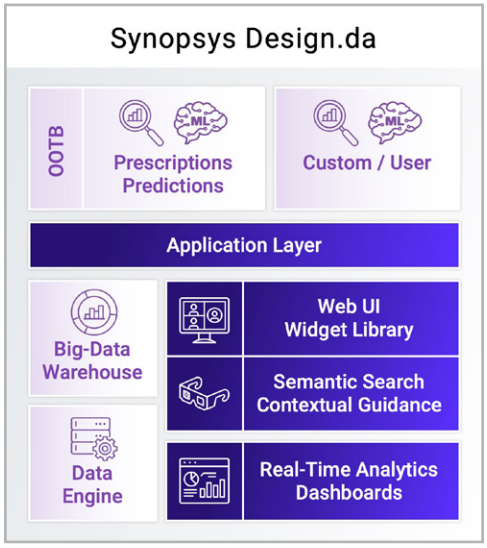
Full-Scale AI-Powered Data Analytics – Unlock, Connect, and Analyze Data

Engineering teams can now harness the vast amounts of data collected from design, manufacturing, test, and in-field operations with a comprehensive AI-powered, data analytics continuum for every stage of IC chip development. The Synopsys EDA Data Analytics solution unlocks, connects, and analyzes vast amounts of data to increase productivity across the full design-to-silicon lifecycle. Synopsys Design.da uncovers actionable design insights that accelerate the design process. Synopsys Fab.da improves fab yield and throughput enabling faster ramp and more efficient high-volume manufacturing (HVM). Synopsys Silicon.da automatically highlights silicon data outliers for improved chip quality, yield and throughput. A consolidated view of data automates root cause analysis enabling engineers to pinpoint areas of focus in real-time.

Design Analytics—Synopsys Design.da

The digital chip design flow carries with it an enormous wealth of untapped information regarding the health and status of your SoC design. The ability to efficiently mine this data provides chip designers with comprehensive visibility and actionable insights to uncover PPA opportunities.

Synopsys Design.da is the industry's first comprehensive data-visibility and machine intelligence-guided design optimization and signoff closure solution. The solution leverages vast datasets to bring unmatched productivity and a better, faster, and smarter way to design. Synopsys Design.da presents a holistic view of all project data and then efficiently and autonomously siphons metrics data while also intelligently curating the associated analysis data. It transforms and loads the data into always-on, industry-standard databases. Synopsys Design.da performs analysis not only to show what is happening but also why it is happening. The solution automatically classifies design trends, identifies limitations, and provides prescriptive guided root-cause analysis across the entire design flow.



Process Control Analytics—Synopsys Fab.da

Like the digital chip design flow, the manufacturing process creates volumes of data. The data collected during design, mask synthesis, process and device modeling, defect management, product testing, and cloud implementation goes largely unused. However, this data hides insights that can have significant productivity and quality implications.

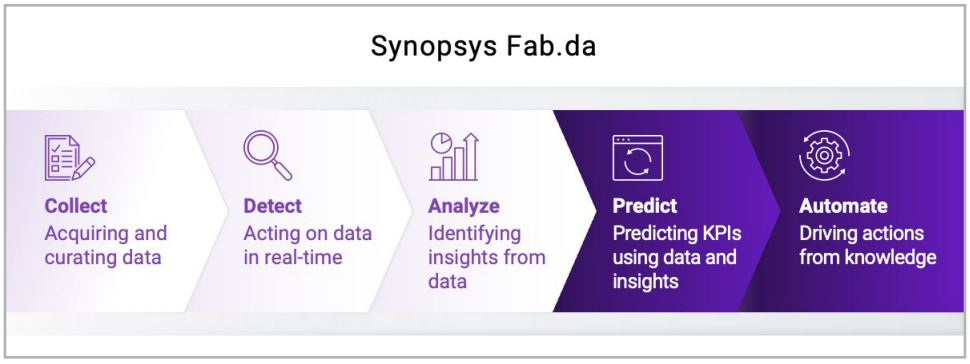


Figure 4: Synopsys Fab.da flow

Synopsys Fab.da is an AI-powered comprehensive process analytics and control solution. The solution enables customers to fully harness the immense potential harbored within the volumes of fab equipment process control data. Fab engineers are able to generate actionable insights and improve operational excellence within semiconductor fabs.

Synopsys Fab.da provides an adaptable and robust platform capable of scaling to collect, manage, analyze and adapt data. It is designed to seamlessly accept petabytes of data from diverse sources, encompassing product design, equipment sensors, fab operations, and product testing. This data continuum ensures a comprehensive and accurate foundation for analytics5 to simultaneously monitor equipment health, optimize process flows, rapidly identify underlying causes of failure, and predict outcomes to effectively mitigate manufacturing risks. As an advanced manufacturing platform, Synopsys Fab. da unifies disparate data elements into a singular, cohesive platform that continuously operates 24/7 avoiding the time-consuming and sub-optimal utilization of multiple analytics solutions. It adeptly meets the stringent data analytics demands of modern semiconductor fabs while managing the complete data lifecycle to drive insightful and data-powered decisions. Synopsys Fab.da helps to achieve faster process ramp and maximize product quality and fab yield.

Production Analytics—Synopsys Silicon.da

Semiconductor design, manufacturing and system deployment are being challenged on many fronts due to process variability, device aging effects, ever increasing performance expectations, and the continued reduction in time to volume. Synopsys is leading the industry to solve these challenges with its Synopsys Silicon.da solution.

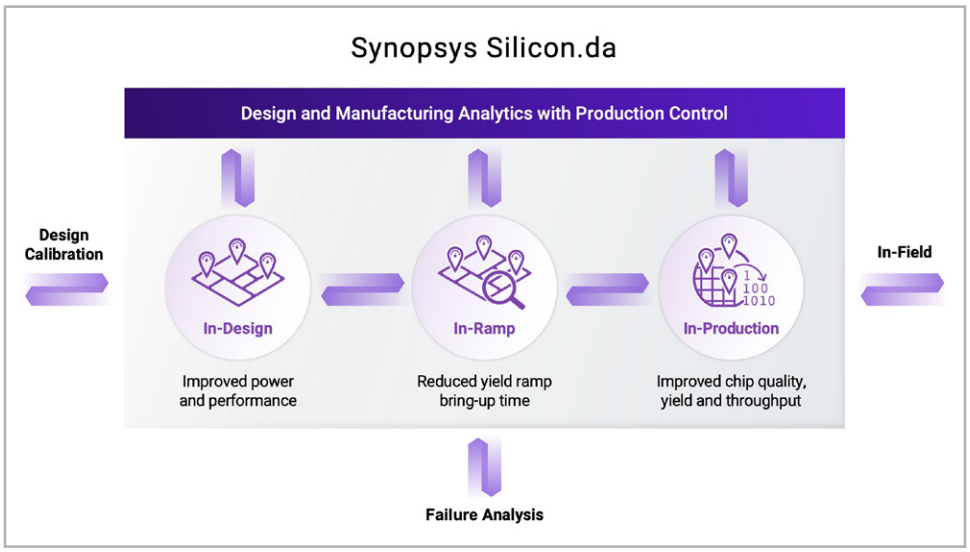
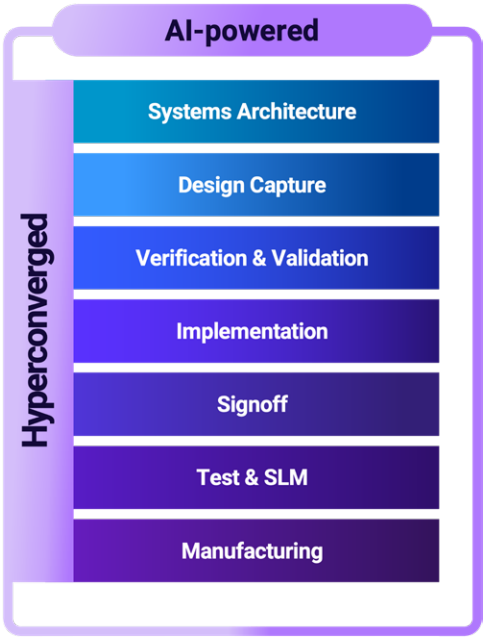


Figure 5: Actionable insights throughout the silicon life cycle with Synopsys Silicon.da analytics

Synopsys Silicon.da is a unique analytics solution spanning design and product manufacturing phases. The solution provides actionable insights through the use of powerful analytics and automatically highlights silicon data outliers to enable engineering teams to quickly identify and correct underlying issues in the semiconductor supply chain. Environmental, structural and functional monitors enable deep insights from SoC manufacturing to in-field systems. Meaningful data is gathered at every opportunity for continuous analysis and actionable feedback. Synopsys Silicon.da boosts productivity by consolidating analytics into a single environment while being able to process and analyze order of magnitude more silicon data compared to other approaches. It also enables engineering teams the ability to leverage silicon design, production and sensor data to quickly determine how to improve key chip production metrics such as yield, quality, and throughput, while also improving key silicon operational metrics such as chip power and performance.

AI-enabled EDA – Smarter Decision Making, Improved Accuracy, Faster Time-to-Market

Synopsys is a leading provider of AI-enabled solutions for every area of the development flow.



System Architecture

Tackle the complexity of modern system design with confidence using Synopsys' AI-powered solutions. System engineers are challenged to architect, integrate, and manage advanced systems that seamlessly blend hardware and software, all while meeting demanding schedules and stringent requirements for performance, security, and scalability.

Analog Design

Confidently overcome the demands of the Angstrom era—rapidly migrating IP across technology nodes, optimizing across hundreds of PVT corners, and managing massive simulation workloads with unprecedented efficiency.

Digital Design and Signoff

Unlock new levels of innovation and productivity with Synopsys' advanced Digital Design Implementation solutions, powered by AI. Our intelligent tools are designed to help you meet stringent performance, power, and area (PPA) objectives, while seamlessly aligning with manufacturing requirements and quality standards.

Verification and Validation

Accelerate SoC verification and drive exceptional quality with Synopsys' AI-powered verification solutions. Our intelligent verification platform empowers engineers to efficiently meet functional, performance, and quality targets by automating complex tasks and surfacing issues earlier in the verification process.

Test and Silicon Lifecycle Management

Maximize Silicon Quality and Reliability with Synopsys' Test & Silicon Lifecycle Management Solutions. Our suite of solutions empowers semiconductor teams to ensure product quality, optimize yield, and enhance reliability throughout the entire chip lifecycle. Our advanced tools and analytics enable efficient test automation, in-depth silicon monitoring, and actionable insights from design to in-field operation.

Manufacturing

Enhance Yield, Efficiency, and Quality with Synopsys Manufacturing Solutions. Semiconductor manufacturers can utilize Synopsys to optimize yield, improve operational efficiency, and ensure the highest levels of product quality. Our solutions leveraging advanced analytics, process automation, and real-time data insights to help you identify and resolve manufacturing challenges quickly, streamline production workflows, and maintain consistent quality from wafer fabrication to final test.

Summary

The Synopsys.ai EDA suite uses the power of AI to optimize silicon performance, accelerate chip design, and improve efficiency throughout the entire EDA flow to deliver leading PPA and yield. Its generative AI technology provides expert guidance and assistance whenever needed. Transformative agentic AI technology provides a multi-agent workflow that revolutionizes efficiency, productivity, and outcomes. The hyperconverged, AI-powered EDA stack quickly handles design complexity and takes over repetitive tasks such as design space exploration, verification coverage and regression analytics, and test program generation. Synopsys.ai's comprehensive data analytics solutions further boost productivity by harnessing untapped, actionable insights from the enormous amount of data collected throughout the development flow. With Synopsys.ai, engineering teams can focus on design innovation and spend less time getting to market. Synopsys.ai: Building Products of Tomorrow, Today.

For more information about Synopsys products, support services or training, contact your local sales representative or visit us on the web at: www.synopsys.com.