

Photonic Solutions

Features at a Glance

- Design and optimize PIC functionality with OptSim Circuit
- Synthesize PIC layouts for fabrication in OptoDesigner, supported by foundry-specific PDKs
- Develop components with RSoft device tools, industry's largest portfolio of photonic device simulators
- Co-design of photonics and electronics with Synopsys HSPICE® and Sentaurus™ TCAD tools
- Simulate photonic and electronic circuits using OptSim Circuit and HSPICE
- Design electro-optic devices with seamless integration of the RSoft device tools and Sentaurus TCAD
- Improve quality and turnaround time of design iterations with Schematic Driven Layout with OptSim Circuit and OptoDesigner

Overview

The PIC Design Suite, including OptSim Circuit and OptoDesigner, can be used to design photonic integrated circuits (PICs) for any manufacturing process technology, for a range of applications in optical datacom, 5G, radio-over-fiber networks, microwave photonics, and leading-edge applications ranging from AR/VR, quantum computing, LiDAR, and biophotonics.

With Synopsys' solutions, photonic IC design teams have access to widely used, high-quality electronic and photonic design solutions from a single provider with a single support channel.

The PIC Design Suite Accelerates Innovation

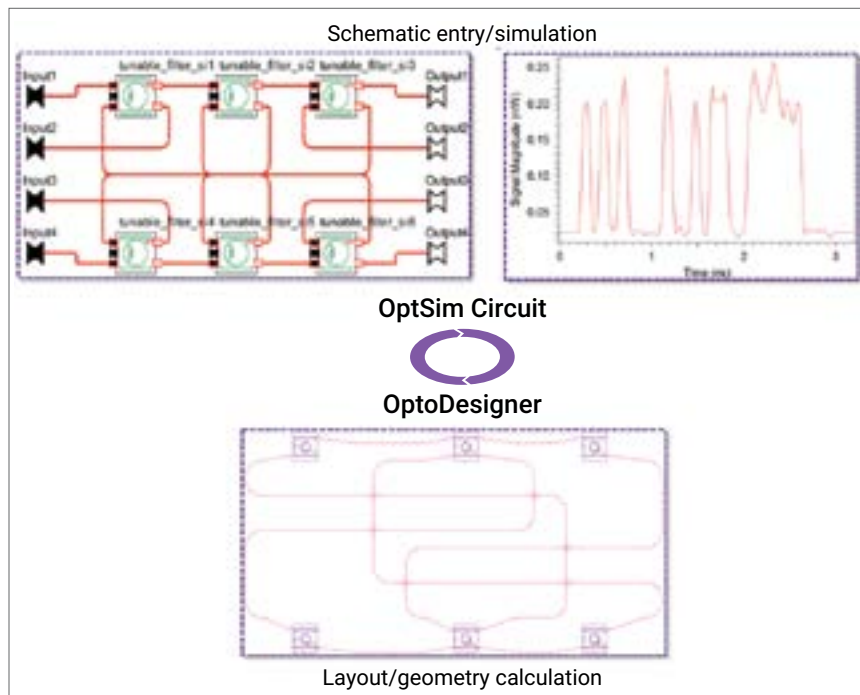
Synopsys is the only provider to offer an integrated suite of PIC design tools that spans design of photonic processes, devices, circuits and systems, and a strong tie-in to IC tools. Synopsys continues to work towards expanding integration of our PIC tools with our electronic IC design tools (Sentaurus, HSPICE, IC Validator, Custom Compiler, Proteus and CATS).

PIC Design Suite Highlights

- A comprehensive design platform with reliable and mature solutions used in hundreds of tape-outs
- The PIC Design Suite is a unified platform to evaluate optimize the impact of PIC performance on the overall system when used with the OptSim tool
- Fewer errors using an efficient circuit-driven PIC design environment
- Unlimited levels of hierarchy, simplifying design reuse for improved design productivity
- Infrastructure for organizations to capture and reuse knowledge
- Access to all major photonic technologies
- Define custom PDKs or use one of the many supported foundry PDKs

Markets, Applications and Technologies

- Communication Systems
- Photonic Components: Passive and Active
- LIDAR
- Chemical Sensing
- Spectroscopy
- Silicon photonics, InP, SiN, PLC, Polymers and more
- Transceivers for coherent and non-coherent fiber optic communication systems
- Photonic systems with multipath interference (MPI), reflections and resonances
- Ring resonators, ring modulators, traveling-wave Mach-Zehnder modulators (TWMZM), optical filters
- Biophotonics sensors



PIC Design Suite

- Seamless flow from design intent to manufacturable design
- Design reuse and scalability
- Complete library of PIC components
- Foundry PDKs, custom PDK utility, and IP creation

Photonic Device Simulation—RSoft Component Design

The industry's largest portfolio of device simulators to design bi-directional waveguides and couplers, light sources, modulators, photo diodes, nanostructures, and other components for your PICs.

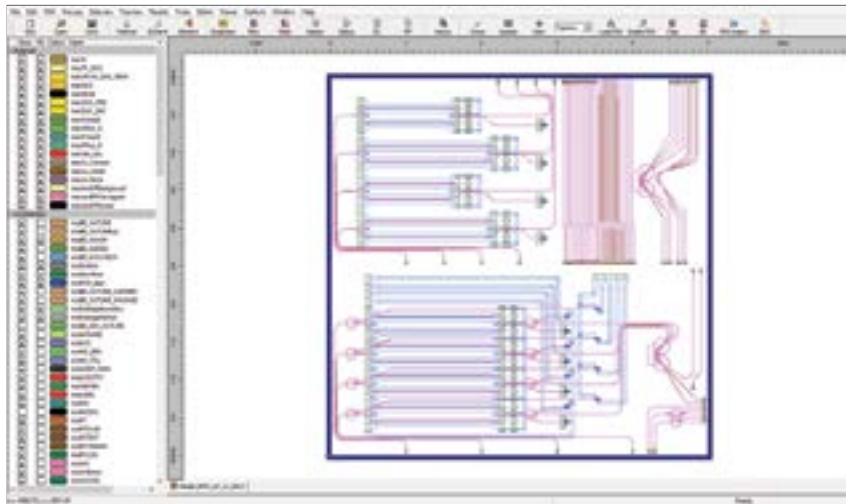
PIC Circuit Design—OptSim Circuit

Model and optimize PICs at the system level, including coupling and feedback of optical and electrical signal paths within an intuitive

graphical user interface.

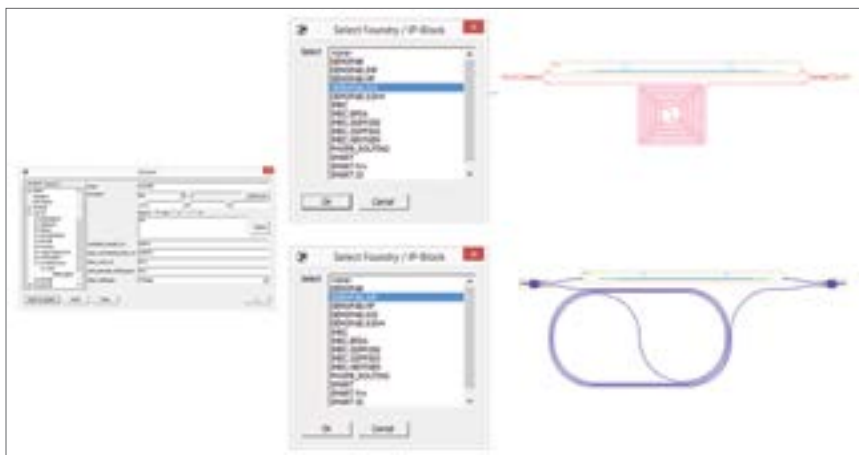
PIC Layout Implementation and Verification—OptoDesigner

Photonic-aware physical layout capabilities to synthesize PIC layouts for fabrication, enabled by support for foundry-specific process design kits and extensive libraries with many primitives and components.



Add-on Modules

- Design Rule Checking Module
- Advanced Connectors Module
- Autorouting Module
- Lattice Filter Design Module



Key Features

OptoDesigner

- Parametric and photonic-aware layout
- Technology-agnostic components and waveguides for synthesizing layout to foundry-specific PDK processes, import and export to formats such as GDSII, and CIF, and define GDS libraries using extensive caching capabilities
- Scripted layout with analytic curve engine for programmatic creation and optimization of photonic designs
- Design Intent feature to simplify mask data generation, ensures that users can design in a single layer (the design intent layer) and that the software generates all the different mask layers needed for actual production

- Advanced connectors and autorouting
- Phase-aware waveguide generation using computed optical lengths from foundry-specified data
- Automatic phase-insensitive waveguide and metal routing for assembling complex circuits
- Photonic design verification
- Design rule checking enables verification of design and manufacturing rules for photonic curvilinear layouts
- Visualization of the fabrication process flow

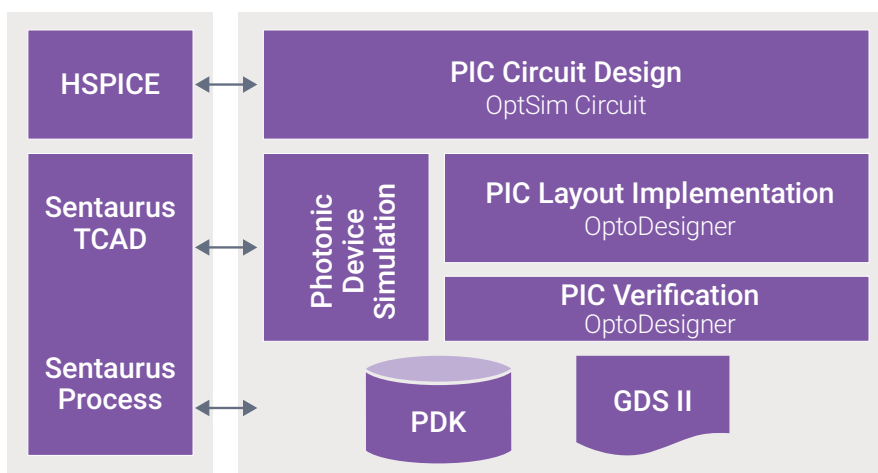
OptSim Circuit

- Extends OptSim's system modeling capabilities to include PICs
- Models forward and backward propagating reflections and resonance
- Models single- and multi-stage bidirectional PICs
- Models multipath Interference (MPI) from network and PIC elements
- Includes a library of PDK elements for the commercial IMEC foundry
- Supports reusable user-defined components and compound components
- Offers flexibility to create custom models using MATLAB co-simulations
- Provides a number of options for exporting data and for co-simulation with external tools

Excellence in Design Automation

Synopsys' 30 years of leadership in EDA, combined with OptoDesigner and the RSoft products' 25 years of leadership in photonic design automation (PDA), positions Synopsys to provide a best-in-class PIC design flow, and a single support channel. We lower access barriers to PIC technology and facilitate first-time-right PIC manufacturing.

- Unique capabilities of Synopsys Photonic Solutions
- Integrated design flow: seamless flow from design to manufacture
- Design cycles reduced in length from months to weeks
- Support for the majority of accessible PIC foundries
- State-of-the-art Custom PDK utility
- Physical verification capabilities to design for manufacture
- Co-simulation with Synopsys EDA tools: HSPICE and Sentaurus
- Support for all material technologies including silicon photonics, InP/III-V, TriPleX, SiO2/SiN technologies, including polymers, silica and more



Foundry and Packaging Partnerships

- AIM Photonics at SUNYPoly
- AMF
- CEA-Leti
- Chiral Photonics
- Cordon Electronics
- Fraunhofer HHI (Heinrich Hertz Institute)
- Imec
- IMECAS
- Infinera
- Ligentec
- LioniX International
- PHIX
- Sandia National Laboratories
- SMART Photonics
- Technobis ipss
- TowerJazz Semiconductors
- VTT

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