Photonic Solutions

Seamless Design Flow from Concept to Manufacture

- With RSoft™ Photonic Device Tools, use the industry's widest portfolio of simulators and optimizers to design passive and active devices

- Perform multi-domain co-simulations with the RSoft Photonic Device Tools, CODE V®, LightTools®, and Sentaurus™ TCAD

- Design and optimize PIC functionality with OptSim™ Circuit

- Simulate photonic and electronic circuits using OptSim Circuit and HSPICE®

- Improve quality and turnaround time of design iterations with Schematic Driven Layout in OptSim Circuit and OptoDesigner™

- Synthesize PIC layouts for fabrication in OptoDesigner, supported by foundry-specific PDKs

- Design and deploy high-speed, fiber-optic data communications systems with OptSim™ and ModeSYS™

Overview

Photonics, or the manipulation and movement of light waves, represents a growing opportunity for designing and manufacturing devices, systems and integrated circuits for applications in high-speed data communications, advanced sensing, and imaging. Photonic technologies promise orders-of-magnitude speed improvements with reduced power consumption for data transmission and ultra-sensitive sensing capabilities in multiple domains.

Synopsys is accelerating the adoption of photonic and photonic integrated circuit (PIC) technologies with software to design and manufacture energy efficient, high-performance photonic devices, systems, and integrated circuits. The Photonic Solutions portfolio offers a seamless design flow from concept to manufacturable design, supported by photonics experts. With Synopsys software, design teams have access to widely used, high-quality electronic and photonic design solutions from a single provider with a single support channel.

Markets, Applications, and Technologies

- Communication Systems
- 5G
- Radio-over-fiber networks
- Microwave photonics
- AR/VR
- Quantum computing
- Photonic components: passive and active
- LiDAR
- Chemical sensing
- Metamaterials and metalenses

- Spectroscopy
- Integrated Photonics: Silicon photonics, III-V like InP and GaAs, 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
- Biophotonic sensors

Bio sensors

LiDAR

AR/VR
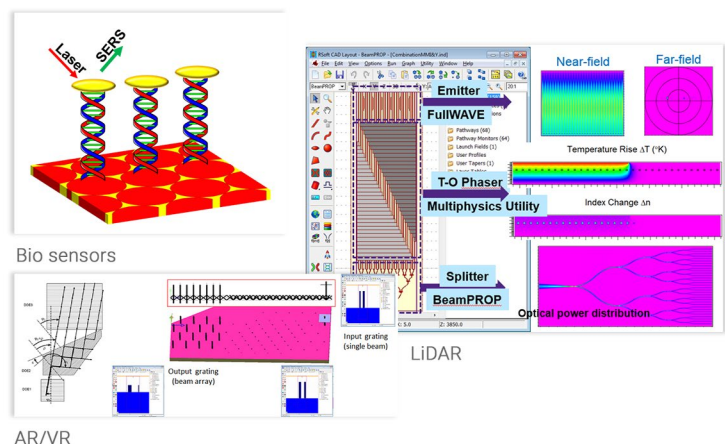
Access a Complete Portfolio of Photonic Device Simulators and Optimizers

The RSoft Photonic Device Tools comprise the industry's widest portfolio of simulators and optimizers to design passive and active photonic and optoelectronic devices. You can design any type of photonic device, including lasers, VCSELs, integrated photonic devices like MMI's, gratings, splitters and couplers, modulators, photo diodes, and nanostructures.

The RSoft Photonic Device Tools bring together Synopsys optical and semiconductor design tools to enable streamlined, multi-domain co-simulations. Our tools are integrated with:

• Synopsys CODE V® and LightTools® products for rigorous modeling of nano-textured optical structures and diffraction analysis in imaging and illumination applications

• Synopsys Sentaurus™ TCAD products for simulations of complex optoelectronic devices
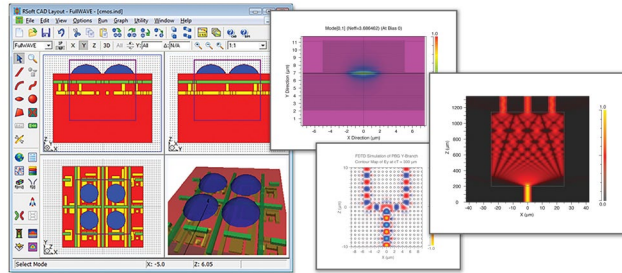
## Accelerate Photonic Integrated Circuit Design and Delivery

The PIC Design Suite, which includes the OptSim Circuit and OptoDesigner tools, offers photonic-aware physical layout capabilities enabled by support for foundry-specific PDKs, including:

• Schematic capture, simulation and optimization with OptSim Circuit

• Automated layout synthesis for fabrication with OptoDesigner

• Bidirectional interface between OptSim Circuit and OptoDesigner for an efficient PIC design workflow

• The Custom PDK Utility, which utilizes the RSoft Photonic Device Tools, providing PIC designers and PDK developers with a powerful tool to generate foundry-specific building blocks, as well as augment existing PDKs with custom components

• PDK support for PIC foundries offering multi-project wafer (MPW) services

• Full support for schematic-driven layout and photonic layout versus schematic verification using IC Validator™

• Co-design of photonics and electronics with Synopsys HSPICE®
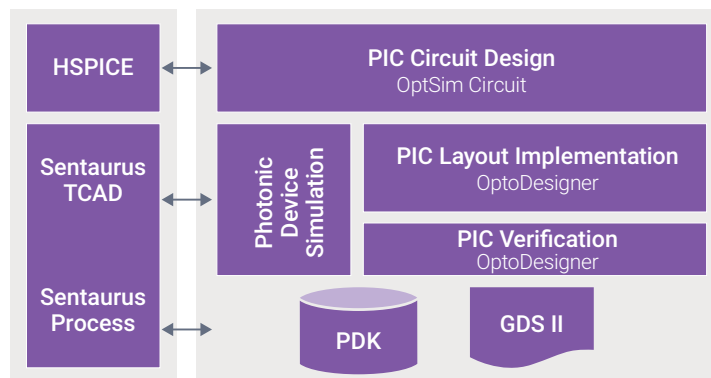
PIC Design Suite Benefits

- Comprehensive design platform with reliable and mature solutions used in hundreds of tape-outs

- Unified platform to evaluate and optimize PIC performance on the overall system when used with our system solution OptSim

- 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

- Ability to define custom PDKs or use one of the many supported foundry PDKs
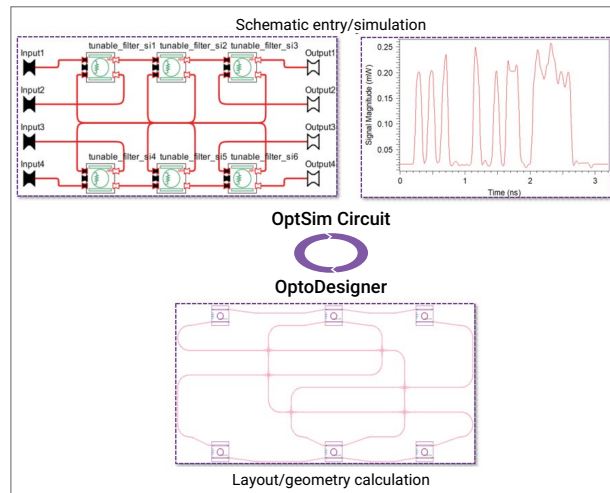
PIC Circuit Design with OptSim Circuit

Use OptSim Circuit to model and optimize PICs at the circuit level, including coupling and feedback of optical and electrical signal paths, within an intuitive graphical user interface.

PIC Layout Implementation and Verification with OptoDesigner

OptoDesigner provides 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.
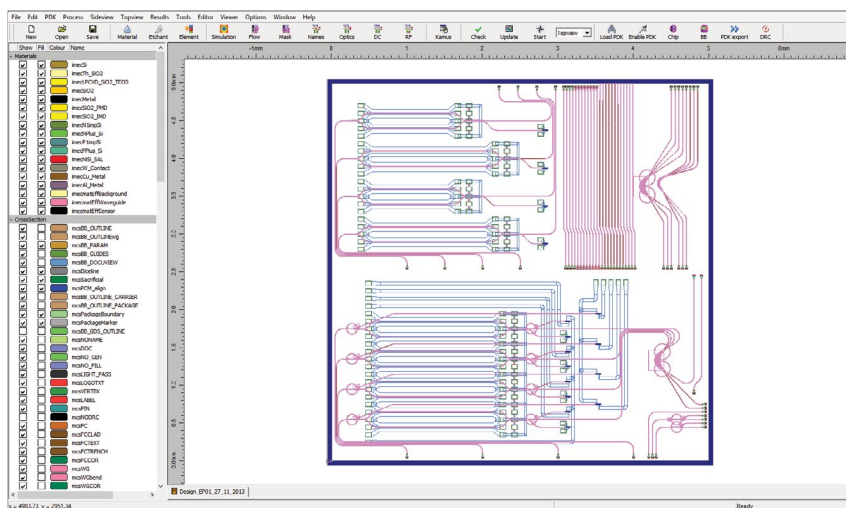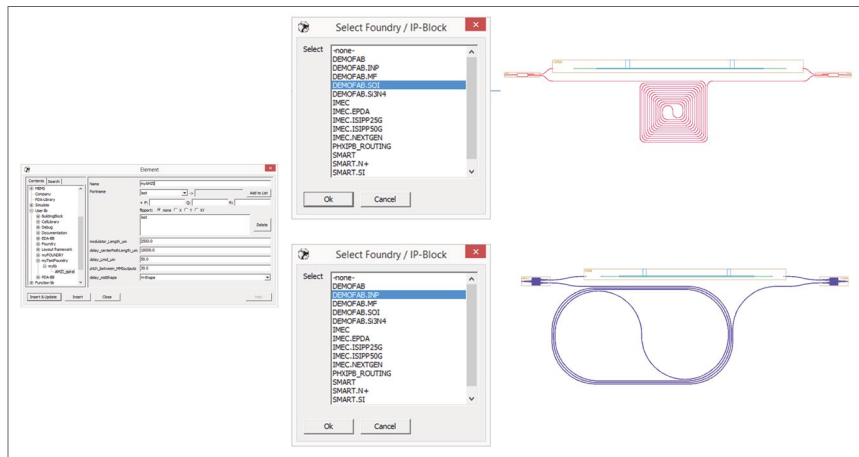
Foundry and Packaging Partners

Our foundry and packaging partners providing MPW services for chip manufacturing, packaging, and assembly of silicon photonics, silicon nitride and InP chips include:

- AIM- SUNYPoly/Analog Photonics

- AMF

- CEA-Leti

- Cordon Electronics

- Fraunhofer HHI (Heinrich Hertz Institute)

- Imec

- Infinera

- Ligentec

- LioniX International

- PHIX

- SMART Photonics

- TowerJazz Semiconductors

- VTT

Design Spectrally Efficient Fiber-Optic Communication Systems

The Photonic System Tools, which include OptSim and ModeSYS™, provide a virtual testbed where you can design single- and multi-mode, fiber-based high-speed data communication systems. The powerful time- and frequency-domain split-step simulation engines facilitate rigorous analyses of linear, non-linear, and polarization-dependent transmission impairments. The tools offer the following features and benefits:

- Optimize data communication performance to meet or exceed design goals
- Support brownfield and greenfield deployments
- Include a rich library of photonic, opto-electronic, electronic and microwave/RF components
- Include hundreds of pre-supplied designs for rapid prototyping
- Offer easy-to-use options to account for component tolerances and estimate Monte Carlo performance bounds
- Provide powerful insights into the role of electrical and optical noise in systems and their interplay with transmission impairments
- Support testing and optimization of photonic components and PICs in the context of system performance and compliance with industry standards

Applications include data center and automotive optical interconnects, aerospace and defense radio-over-fiber communication systems, long-haul and passive optical networks, sensor systems such as VCSEL-based 3D sensing, time-of-flight, LiDAR, biometric OCT, and iFoG.
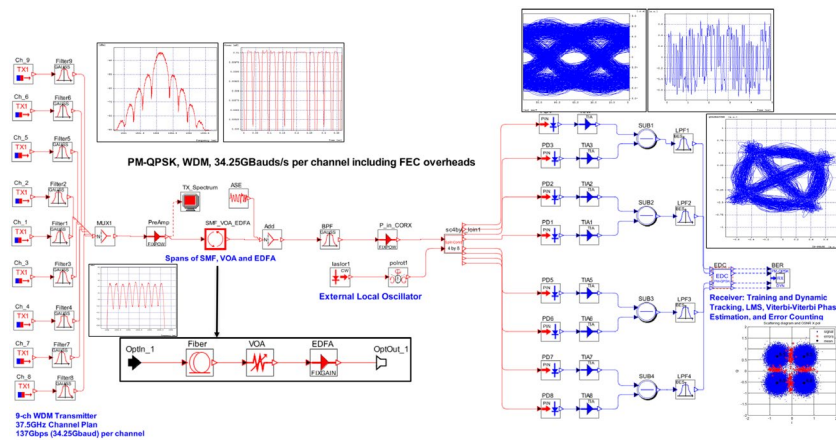
Expert Electronic and Photonic Design Automation

Synopsys has 30+ years of leadership in electronic design automation, combined with a legacy of photonic innovations for 25 years. We are uniquely positioned to provide best-in-class photonic design solutions and a scalable path towards full electric-photonic co-design. Visit us online at **synopsys.com/photonic-solutions**.

To Get Started

Contact us today at photonics@synopsys.com to request a demo and free 30-day evaluation.