

Silicon Photonics High-Precision Coupling Technology



Overview

Abstract: High-throughput functional testing of silicon photonics is a key challenge for scalable manufacturing. We present a technique for wafer-scale testing using high-density edge couplers that add excess loss of <2 dB without requiring additional footprint. Silicon photonics has drawn increasing attention in the past few decades and is a promising key technology for future daily applications due to its various merits including ultra-low cost, high integration density owing to the high refractive index of silicon, and compatibility with current. At FormFactor, our engineers have collaborated with IHP Microelectronics to develop the industry's first fully automated wafer-level edge coupling measurement system designed specifically for silicon photonic integrated circuits (PICs). OCIS codes: . This study introduces low-loss coupling strategies and their implementation for a silicon nitride integrated platform. This system integrates state-of-the-art technologies, including optical probes, advanced alignment algorithms, and.



Article Content

May 18, 2026

Sample manuscript showing specifications and style

While silicon photonics possesses key economic advantages over classical photonic platforms, it has yet to become a commercial success because these advantages can be fully realized only when high ...

May 29, 2026

Design of a tunable vernier ring filter for NIR

Silicon photonics is emerging as a major technology in optical communication and sensing, providing efficient and compact solutions for high-speed signal processing. For next

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Integrating silicon photonics with complementary metal-oxide ...

Complementary metal-oxide-semiconductor-integrated silicon photonics offers a practical path forward by combining high-volume manufacturing with mature photonic building blocks.

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Self-imaging grating couplers for silicon photonics

Fiber-to-chip coupling often limits the practical performance of photonic integrated devices. In selecting a coupling strategy, designers balance coupling efficiency, optical bandwidth, fiber-array

Feb 15, 2026

Self-imaging grating couplers for silicon photonics

In this work, we designed a fiber-to-chip grating coupler whose spot size and coupling position are tailored to maximize coupling efficiency and to match a Gaussian beam by utilizing the

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Fully Automated Wafer-Level Edge Coupling Measurement System for ...

Our solution offers full wafer-scale edge coupling with exceptional coupling efficiency, rapid throughput, and robust optical measurement repeatability and stability. Our solution demonstrates...

Sep 05, 2025

Roadmapping the next generation of silicon photonics

We chart the generational trends in silicon photonics technology, drawing parallels from the generational definitions of CMOS technology. We

Dec 17, 2025

Grating Couplers on Silicon Photonics: Design

Silicon photonics is an enabling technology that provides integrated photonic devices and systems with low-cost mass manufacturing capability. It has

Apr 03, 2026

Designing an Efficient Silicon Photonics System: Direct Integrating ...

PCSELS, known for their high power, coherent vertical emission, and superior beam quality, are optimized here for integration with silicon photonics. This study employs an adjoint shape

Jan 08, 2026

Silicon Photonics

Silicon photonics is defined as an optical technology that integrates photonics and electronics to enhance high-speed communications and is considered a strategically important systems technology

Sep 26, 2025

Edge Couplers in Silicon Photonic Integrated Circuits: A

In this paper, we mainly focus on edge couplers in silicon photonic integrated circuits. We deliver an introduction to the research background,

Jan 01, 2026

Modeling Dual-SiOxN Thin-Film Edge Coupler with Ultra

High-performance facet couplers are essential components in the field of silicon nitride integrated photonic chips. In this work, a novel end-face coupling

Apr 10, 2026

Edge Couplers in Silicon Photonic Integrated Circuits: A

Silicon photonics has drawn increasing attention in the past few decades and is a promising key technology for future daily applications due to its

Nov 04, 2025

Hybrid integration of silicon photonics circuits and InP lasers by ...

Abstract: Efficient coupling of III-V light sources to silicon photonic circuits is one of the key challenges of integrated optics. Important requirements are low coupling losses, as well as small footprint and high

Jan 09, 2026

Silicon Photonics Devices and Integrated Circuits

High-extinction photonic filters based on cascaded Mach-Zehnder interferometer-coupled resonators address the increasing demand for precise

Sep 23, 2025

Highly-efficient fiber to Si-waveguide free-form coupler for foundry ...

Introduction Driven by inherent advantages in highly scalable manufacturing [1,2], silicon photonics is a disruptive technology that has influenced multiple application spheres such as quantum optics ,

Jan 12, 2026

Photonic Integrated Circuits (PICs) for Next Generation Space ...

Silicon photonics (SOI) is CMOS-compatible. CMOS infrastructure provides well controlled and rapidly scalable fab environment (higher yield than InP). Enables 3D-integration with driving CMOS

Apr 12, 2026

Silicon Photonics: The Future of High-Speed Optical

Discover how silicon photonics enables high-speed, energy-efficient optical communication by integrating photonics and silicon

Jul 21, 2025

Tutorial on Silicon Photonics Integrated Platform Fiber Edge Coupling

Here we present an overview of coupling technologies, optimized designs, and a tutorial on manufacturing techniques for inverted tapers, which enable effective coupling for both transverse

Feb 14, 2026

Redefining Wafer Test, Fully Automated Edge Coupling

Discover how FormFactor's automated wafer-level edge coupling system enhances silicon photonics testing with unmatched precision,

Dec 30, 2025

Fully Automated Wafer-Level Edge Coupling Measurement System for ...

This system integrates state-of-the-art technologies, including optical probes, advanced alignment algorithms, and precision calibration processes, to ensure high coupling efficiency, rapid throughput,

Feb 23, 2026

Tutorial on Silicon Photonics Integrated Platform Fiber Edge Coupling

This study introduces low-loss coupling strategies and their implementation for a silicon nitride integrated platform. Here we present an overview of coupling technologies, optimized designs, and a tutorial on

Apr 07, 2026

Silicon photonics

Silicon photonics is the study and application of photonic systems which use silicon as an optical medium. The silicon is usually patterned with sub

Apr 19, 2026

High Coupling Efficiency Grating Couplers for Silicon Photonics

We present techniques for optimizing the coupling efficiency between silicon photonic and optical fibre systems based on the adoption of back-end-of-line CMOS-compatible waveguide grating couplers.

May 13, 2026

TSMC's Silicon Photonics Architecture: Why Couplers

Silicon photonics has emerged as a key solution for next-generation optical interconnects, offering high speed, low power consumption, and seamless

May 24, 2026

TSMC's Silicon Photonics Architecture: Why Couplers

Along this trajectory, NVIDIA is also on the verge of realizing its Photonic Interconnect vision, and TSMC's robust silicon photonics modules and

Apr 18, 2026

Roadmapping the next generation of silicon photonics

In order to complete the transition to the era of large-scale integration, silicon photonics will have to overcome several challenges. Here, the authors

May 17, 2026

High efficiency and compact vertical interlayer coupler for silicon ...

In this paper, a high efficiency and compact vertical interlayer coupler with nonlinear tapers for silicon nitride-on-silicon photonic platform was designed and discussed.

Aug 23, 2025

Coupling strategies for silicon photonics integrated chips

Abstract Over the last 20 years, silicon photonics has revolutionized the field of integrated optics, providing a novel and powerful platform to build

Feb 17, 2026

Wafer-scale high-density edge coupling for high throughput testing of ...

In this paper, we present a new technique that facilitates the coupling and testing of edge couplers on a wafer scale; an approach that combines the low-loss characteristics of edge couplers with the

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