

SPECIAL ISSUE
Silicon Photonics

Edited by C. R. Doerr and R. Baets

2101 The Emergence of Silicon Photonics as a Flexible Technology Platform

By X. Chen, M. M. Milosevic, S. Stanković, S. Reynolds, T. D. Bucio, K. Li, D. J. Thomson, F. Gardes, and G. T. Reed

| INVITED PAPER | This paper presents a brief history of the field of silicon photonics, encompassing a discussion of the key devices, with a focus on the key performance milestones that were instrumental in demonstrating the potential of silicon photonics.

2117 Advanced Passive Silicon Photonic Devices With Asymmetric Waveguide Structures

By D. Dai

| INVITED PAPER | This paper reviews advanced passive devices in silicon photonics, such as on-chip polarization-handling devices, mode converters/(de)multiplexers, microring-resonator optical filters/switches, all taking advantage of the high index contrast and asymmetric silicon-based waveguide structures.

2144 Subwavelength-Grating Metamaterial Structures for Silicon Photonic Devices

By R. Halir, A. Ortega-Moñux, D. Benedikovic, G. Z. Mashanovich, J. G. Wangüemert-Pérez, J. H. Schmid, Í. Molina-Fernández, and P. Cheben

| INVITED PAPER | Building on the improvements in high-resolution lithography for silicon, one can create artificial dielectrics, periodic structures in silicon photonics with periods substantially smaller than a wavelength of light in the material. This paper discusses the theory and applications of these subwavelength structures.

2158 High-Speed Silicon Photonics Modulators

By J. Witzens

| INVITED PAPER | This paper reviews optical modulators in silicon, which has become a very rich topic, including Mach-Zehnder modulators and ring modulators. The tradeoffs in design to achieve high speed with minimal drive voltage and insertion loss are studied.

2183 Photonic Crystal Devices in Silicon Photonics

By T. Asano and S. Noda

| INVITED PAPER | This paper reviews the history of 2-D photonic crystal slabs based on silicon photonics, focusing on ultrasmall cavities with ultrahigh-quality factor, and their applications as add/drop filters and Raman lasers. Ways to establish strong coupling between distant nanocavities are also discussed.

2196 Parametric Nonlinear Silicon-Based Photonics

By K. Li and A. C. Foster

| INVITED PAPER | This paper discusses nonlinear optics in silicon photonics. Because of the tight optical confinement, very compact nonlinear devices can be made in silicon photonics. Applications include the generation of octave-spanning optical frequency combs for making precise clocks.

2209 Silicon Nitride in Silicon Photonics

By D. J. Blumenthal, R. Heideman, D. Geuzebroek, A. Leinse, and C. Roeloffzen

| INVITED PAPER | This paper reviews the state of the art of silicon nitride waveguide platforms, with their capabilities complimentary to those of silicon-insulator platforms, among others, with respect to the loss levels and the power handling properties.

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2095 POINT OF VIEW

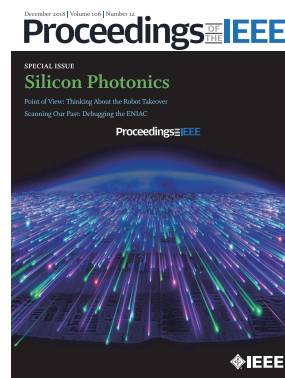
 Robot Revolution:
Myth or Reality
By H. J. Trussell

2098 SCANNING THE ISSUE

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 Debugging the ENIAC
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On the Cover:
Inspired by topic of “Silicon Photonics,” our cover image this month combines wafer chip technology with bursts of light.

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2232 Monolithically Integrated Multilayer Silicon Nitride-on-Silicon Waveguide Platforms for 3-D Photonic Circuits and Devices

By W. D. Sacher, J. C. Mikkelsen, Y. Huang, J. C. C. Mak, Z. Yong, X. Luo, Y. Li, P. Dumais, J. Jiang, D. Goodwill, E. Bernier, P. G.-Q. Lo, and J. K. S. Poon

| INVITED PAPER | This paper discusses multilayer platforms using silicon nitride and silicon waveguides. This technology allows 3-D photonic circuits to be created.

2246 Photonic Integrated Circuits Using Heterogeneous Integration on Silicon

By T. Komljenovic, D. Huang, P. Pintus, M. A. Tran, M. L. Davenport, and J. E. Bowers

| INVITED PAPER | This paper focuses on oxide bonding of III-V semiconductors and magneto-optic materials.

2258 Heterogeneous Integration on Silicon Photonics

By O. Marshall, M. Hsu, Z. Wang, B. Kunert, C. Koos, and D. Van Thourhout

| INVITED PAPER | This paper focuses on other material combinations (a.o. PZT, BTO, and graphene) as well as hetero-epitaxial growth of III-V semiconductors.

2270 Optical Interfaces for Silicon Photonic Circuits

By D. Vermeulen and C. V. Poulton

| INVITED PAPER | One of the biggest challenges in silicon photonics is coupling the very small optical mode in silicon wire waveguides to the much larger optical mode of single-mode fibers in an efficient manner. This paper discusses in detail the various approaches reported and deployed in industry today.

2281 High-Volume Manufacturing Platform for Silicon Photonics

By T. Pinguet, S. Denton, S. Gloeckner, M. Mack, G. Masini, A. Mekis, S. Pang, M. Peterson, S. Sahni, and P. De Dobbelaere

| INVITED PAPER | This paper discusses the factors that are at stake to bring a low-cost, low-power, high-performance, and high-volume optical transceiver to the market. Also, the pros and cons of monolithic and hybrid electronics/photronics integration are discussed.

2291 Silicon Photonics in Optical Coherent Systems

By C. Doerr and L. Chen

| INVITED PAPER | Silicon photonics is especially suited for advanced modulation format transmitters and coherent reception, because of the large number of required integrated optical components. This paper focuses on industry deployments of silicon photonics in optical coherent communications today and tomorrow.

2302 Mid-Infrared (Mid-IR) Silicon-Based Photonics

By J.-M. Fedeli and S. Nicoletti

| INVITED PAPER | This paper reviews the state of the art in silicon-based mid-IR integrated photonics and discusses the waveguide platforms as well as the options to integrate mid-IR light sources in such platforms. The route toward applications in the field of chemical sensing, IR spectroscopy and imaging, free-space communications, etc., is also covered.

2313 Open-Access Silicon Photonics: Current Status and Emerging Initiatives

By A. Rahim, T. Spuesens, R. Baets, and W. Bogaerts

| INVITED PAPER | Silicon photonic devices are usually fabricated in large foundries that serve multiple customers. Silicon photonics takes advantage of these open-access silicon electronics foundries. This paper discusses this ecosystem and its evolution.

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