# How Taiwan's research and eco-systems on silicon photonics can expedite its applications in AI/HPC and other emerging fields

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**Abstract**

After several decades of development and research, photonic integration circuit (PIC) is emerging as the real big thing for semiconductor and photonics industry. It is the disruptive technology that will alter the competitiveness of various high-tech products and enable new applications. Taiwan has been playing an important role in advanced semiconductor manufacturing. Due to the migration of well-established ecosystems into the silicon photonics field and the government's strategic plan, Taiwan has quickly captured the wave of silicon photonic based technologies for applications in AI/HPC interconnects.

The current status of silicon photonics technology development and the related eco-system in Taiwan will be addressed in this talk. The silicon-photonic eco-systems, including the design houses, Si/InP semiconductor foundries, as well as testing, packaging, and system assembly companies, are quickly established in Taiwan to cope with the demands of mass-producing the PICs for mainly AI/HPC applications. Leading by TSMC, the number-one semiconductor foundry in the world, several companies in the eco-system are currently working with the major system companies for manufacturing PIC-based pluggable and co-packaged-optics (CPO) modules for data-center optical interconnects. Some companies are developing the PIC solutions for other applications like autonomous vehicles, photonic quantum computing, and bio-medical sensing.

**San-Liang Lee**

San-Liang Lee received the Ph.D. degree in electrical and computer engineering from the University of California, Santa Barbara (UCSB), in 1995. He joined the faculty of the Department of Electronic and Computer Engineering, National Taiwan University of Science and Technology (NTUST) in 1988 and became a Full Professor in 2002 and a Chair Professor in 2019. He was the

Vice President of the university from 2011 to 2014. He served as the Dean of Academic Affairs Office, NTUST, from 2008 to 2010. He was the Chairperson of the Department of Electronic and Computer Engineering for 2005-2008. He was the Director of the program office for the National Innovative Education Program on Image Display Technology, sponsored by the Ministry of Education (MoE), Taiwan, from 2005 to 2009. He was the Director of the research program on Silicon Photonics and Integrated Circuits sponsored by the National Science and Technology Council (NSTC), Taiwan from 2018 to 2023. He was the Director of Photonic Division, Department of Engineering and Technologies, NSTC from 2021 to 2023, and the founding dean of Industry-Academia Innovation College, NTUST, from 2022 to 2024. He is currently the Director of the Heterogeneous Integrated Silicon Photonic Integration Research Center (HiSiPIC), sponsed by MoE, Chairperson of the Intenational Heterogeneously Integrated Silicon Photonics Alliance (HiSPA), and a visiting professor in the Nakano-Tanemura Lab of the Univeristy of Tokyo. He was a visiting scientist in the Research Laboratory of Electronics, Massachusetts Institute of Technology (MIT) from 2010 to 2011. He served as the Electronic Section Editor of the SCI indexed Journal, Journal of the Chinese Institute of Engineers from 2007 to 2012. He serves as the Senior Editor of IEEE ACCESS Journal. He received the 2018 Outstanding Research Award from NSTC, and 2019 MOC Contribution Award from the Microoptics Group of Japanese Society of Applied Physics.

His research interests include semiconductor optoelectronic components, photonic integrated circuits, nanophotonics, and optical networking technologies. He has published more than 250 referred papers in international journals and conferences and holds >30 patents. He is a Senior Member of IEEE and a Fellow of Taiwan Photonics Society.