

## Generic Platform for Silicon Photonics Based on MEMS Reconfigurable Photonic Integrated Circuits

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**Abstract**— In the European project MORPHIC (MEMS-based zero-power Reconfigurable Photonic ICs), we are extending a silicon photonics platform with optical MEMS functionality for low-power phase shifting and coupling. This functionality is critical to establish generic photonic circuits that can be reconfigured in software to perform a variety of optical functions for different applications. This also addresses today's bottleneck of the long and costly path from idea towards realization for full-custom PIC designers and manufacturers. With programmable photonic circuits, we expect the lead time to reduce from an almost a year to a few weeks from the user side with great reduction in cost and effort.

Today, the research, development and industrial implementation of photonic integrated circuits (PICs) have reached a level of maturity that turned them into a major investment in high-tech industrial market. However, the rather long and expensive development of an idea from the initial design to prototyping has become an obstacle in progress path of this field. At this stage, the silicon photonic designers and developers go through a process of full-custom chip design similar to electronic application specific integrated circuits (ASICs). The new concept of field-programmable PICs (FPPIC), in contrast to application-specific PIC (ASPIC) technology, is similar to field programmable gate arrays (FPGAs) in electronics. Our goal in MORPHIC is to elaborate a generic platform based on a network of electrically tunable optical waveguide couplers and phase-shifters that can be configured for different applications from optical communication to microwave optics and quantum optical processors. The tunability in such devices is provided through incorporation of integrated optical MEMS components with almost zero electric power consumption and high reliability. The fabrication of this platform will be based on IMEC's standard iSiPP50G process, which makes it ready for industrialization. As shown in Fig. 1, the MORPHIC ecosystem extends to include also the packaging and programming functionality to interface the large volume manufacturing with the mass customization needed by the end user. Large manufacturing of standard chips will drop the cost of the device significantly, and provide off-the-shelf access to the user.

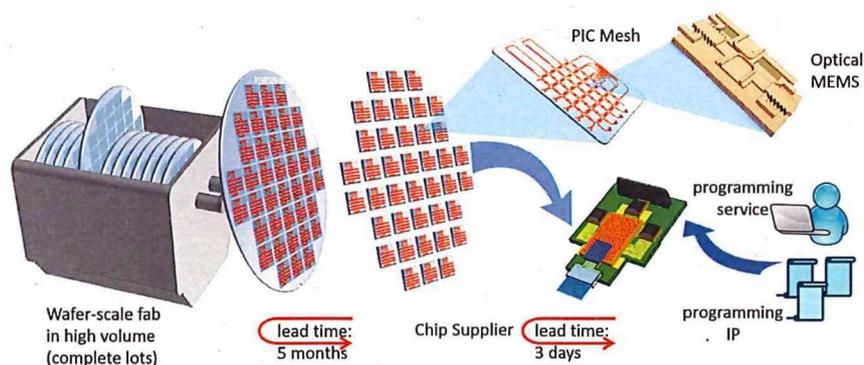


Figure 1: MORPHIC's building blocks and ecosystem: from large volume manufacturing to the end user.

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