

# WHITE PAPER

## Silicon Photonics: A New Technology Platform at TeraXion

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### Introduction

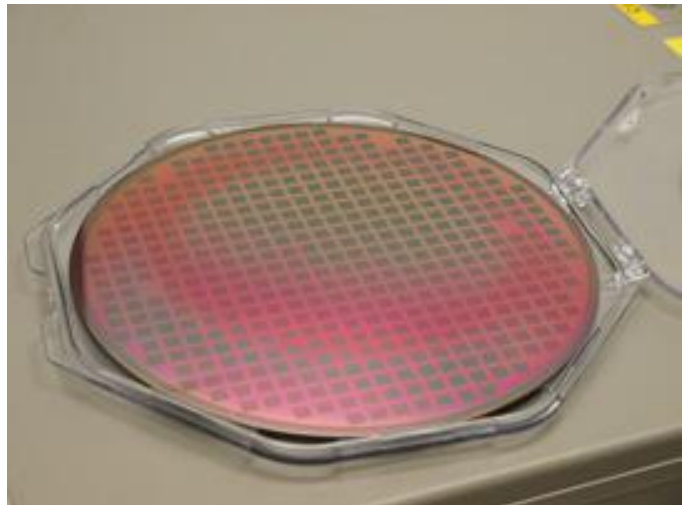
TeraXion is a company that is well known for its products—such as dispersion compensators based on Fiber Bragg Gratings (FBG)—and its expertise in ultra-narrow linewidth lasers. For over 10 years now, we've been offering high-end solutions for a wide variety of customers. In the constantly evolving telecom market landscape, TeraXion is now adding a new technology platform to its toolkit. Driven by the rapid surge in telecommunications traffic, highly integrated photonics components are becoming increasingly needed, making possible high-functionality, low-power and low-cost telecommunications modules. This new photonic integration effort is well underway at TeraXion, as we focus on the development of new telecom products based on silicon photonics.

### Silicon Photonics Benefits

Over the past decade, the silicon photonics community has made fantastic progress in implementing a wide variety of optical and electro-optical devices in silicon. Recently, photonic integration has been intensively pursued by applying silicon photonics technology, thanks to its ultra-small size, low cost and convergence with electronic devices. Many different types of functions have been demonstrated by a large number of groups in silicon photonics: waveguides, modulators, filters, integrated photodiodes, etc. Integrating some of these functionalities on a miniature chip, using either a monolithic or hybrid integration approach, is highly desirable for the photonics industry.

Silicon photonics, and more specifically SOI (silicon-on-insulator), offers numerous benefits. First, silicon has the characteristic of being transparent to wavelengths

in the optical transmission range of interest in the telecom market. Silicon photonics also exhibits an extraordinarily-high contrast between the refractive index of the core and the surrounding cladding. This high refractive index contrast enables optical modes to be confined and guided by devices with sub-wavelength dimensions and low propagation loss. In fact, radius of curvatures as low as 5  $\mu\text{m}$  are common in silicon photonics designs, which greatly enables chip densities.



### Silicon Photonics Wafer

Still skeptical? Another key property of silicon photonics is that the materials are compatible with standard CMOS fabrication equipment. Therefore, reusing the huge technology base for submicron mass-fabrication, which produces a high volume and high yield of low cost chips, will be possible. The eventual integration of electronics next to the photonic layer will also be a key advantage in reducing cost and power consumption in silicon photonics devices.

# Silicon Photonics: A new Technology Platform at TeraXion

Clearly, the unprecedented maturity of silicon materials, processing, device and circuit design technologies, stemming from worldwide R&D investments, offers an extraordinary leveraging opportunity in photonics applications and markets.

## Product Development

Worldwide research activities have demonstrated that silicon photonics chips can generate, modulate, process and detect light signals. All of the constituent components of a photonic data transmission system built on electronics-compatible silicon wafers — including laser sources, modulators, detectors, waveguides and filters — have already been demonstrated. For example, Intel has developed, fabricated and demonstrated the first end-to-end silicon photonics integrated link, with integrated hybrid silicon lasers operating at 50 Gb/s over a single fiber.

Capitalizing on its unique photonic expertise to cope with new market challenges, TeraXion started investing significantly in silicon photonics technology a few years back. Numerous silicon photonics products are now under development at TeraXion and are being fabricated with the help of outside fabs. The first product to the market will be a small-form-factor integrated coherent receiver that will be used for 40 and 100 Gb/s applications. Other telecom and non-telecom products will follow in the coming years thanks to partnerships with different companies and universities. Our photonics design know-how has been demonstrated over more than 10 years, while our ability to package and deliver high-volumes of telecom-grade modules has been experienced by our broad customer base.

## Conclusion

TeraXion strongly believes that the field of silicon photonics is poised for rapid expansion, driven by the unique possibilities it brings to build high-performance electronic and photonic components on the same silicon chip, leading to highly integrated small form factor devices. We are committed to remain at the forefront of this new trend that will leverage the photonics industry.

To learn more about our development activities on silicon photonics, please contact Carl Paquet ([cpaquet@teraxion.com](mailto:cpaquet@teraxion.com)).

## About TeraXion

TeraXion is a leading-edge photonic solutions provider for high-end applications of the optical communications, industrial lasers and optical sensing markets. Its line of OEM chromatic dispersion management solutions includes Telcordia-qualified low-loss static and tunable dispersion compensators for terrestrial and submarine networks. TeraXion offers customized filtering solutions based on advanced FBG technology and narrow linewidth semiconductor laser sources for RF photonic and coherent detection systems.

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