



cea

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# Silicon Photonics

Design, process development, testing,  
and packaging solutions

## Silicon photonics benefits

Thanks to its unparalleled miniaturization stage and optimal CMOS process compatibility, Silicon Photonics is a core-integrated technology addressing a wide range of high-volume markets.

Silicon Photonics is becoming a key material platform enabling technology for high-speed connectivity in data centers. In the near future, Photonic Integrated Circuits (PIC) will be bringing significant changes to high-performance computers and unlocking the full potential of AI by resolving the transmission bottleneck limits of electronics.

Silicon Photonics is also spreading to many new applications, from quantum photonics for communication and computing to advanced sensors for medical, environmental, and food manufacturing applications.

## Applications

CEA-Leti's versatile PIC platforms address visible to mid-infrared applications, such as:

- communication,
- computing,
- automotive,
- medical,
- and industrial markets.

Work performed in the frame  
of the IRT Nanoelec consortium.



**Pioneering silicon photonics for more than 20 years, CEA-Leti has designed a technology toolbox featuring state-of-the-art performance for communication, computing and optical sensors.**

## Device library

CEA-Leti's process design kit (PDK) includes active and passive silicon photonic devices featuring state-of-the-art performance: routing and WDM devices, modulators, photodetectors and III-V/Si lasers, as well as silicon nitride-based components for O-band, C-band and other on-demand wavelengths. CEA-Leti's PDK is compatible with standard electronic design automation (EDA) tools, including those from Siemens EDA and Luceda.

## Circuit design

CEA-Leti highly experienced teams design innovative devices and circuits taking into account partner-specific requirements. Circuits can either be designed with CEA-Leti's standard device-library PDK or with custom building blocks.

## Fabrication platform

CEA-Leti's versatile photonics platform offers a broad range of 200 mm and 300 mm CMOS-compatible processes that leverage top of the line pre-industrialization equipment. In addition to silicon, CEA-Leti has mastered the integration and stacking of amorphous Si, SiGe, Ge and SiN layers. Consequently, CEA-Leti now offers several PIC platforms:

- Photonics SOI
- Ultra-Low Loss Si<sub>3</sub>N<sub>4</sub>
- SiGe / Si for 3-8 μm wavelengths
- Ge / SiGe low loss for 8-12 μm wavelengths

CEA-Leti has not only demonstrated the integration of III-V-bonded epi-layers, but new materials such as LNOI, BTO, polymer, PCM and superconducting materials for a new generation of performant lasers, modulators and detectors.

## Testing

CEA-Leti's world-class testing facilities include several automated on-wafer measurement probers, with high-frequency and temperature test equipment—tests directly performed at wafer level or on packaged devices.

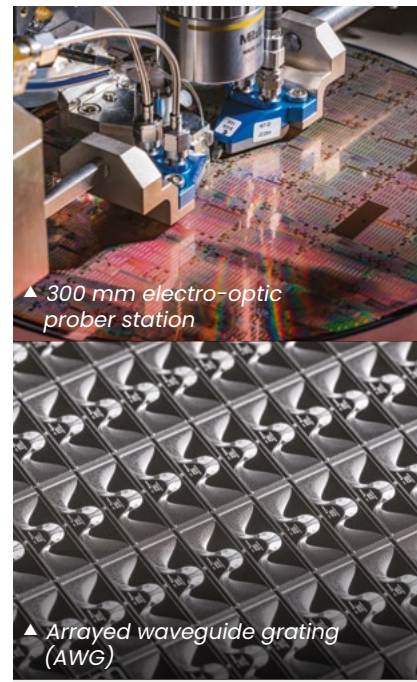
## Packaging

CEA-Leti's packaging capabilities rely on 3D-integration building blocks for a variety of uses, e.g. hybridization of photonic and electronic ICs using micro-pillars, flip-chip bonding and photonic TSVs, as well as co-packaged optics.

## CEA-Leti, technology research institute

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## Interested in this technology?

Get in touch to find solutions to your next design, integration, testing, and/or packaging challenge:

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