

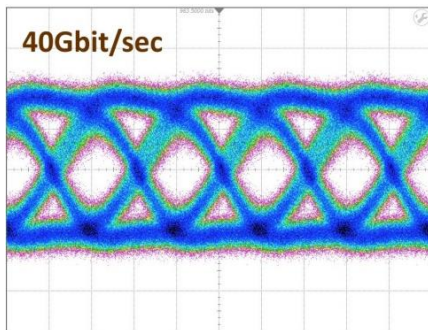
SG25H5EPIC – Demonstrators



Monolithic integrated 32 Gbps silicon modulator with driver in 0.25 μ m SiGe BiCMOS



Monolithic integrated 28 Gbaud QPSK photonic receiver



40 Gbps eye diagram, measured with $2^{31}-1$ PRBS for a Ge pin photodiode



innovations
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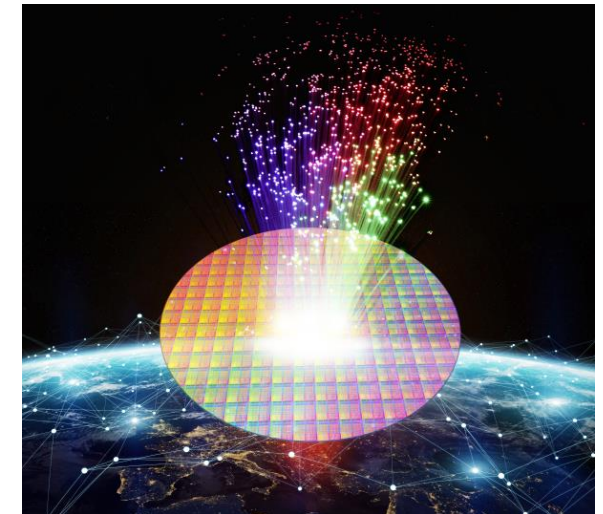
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IHP Photonic Technologies

Take advantage of IHP's innovative photonic technologies



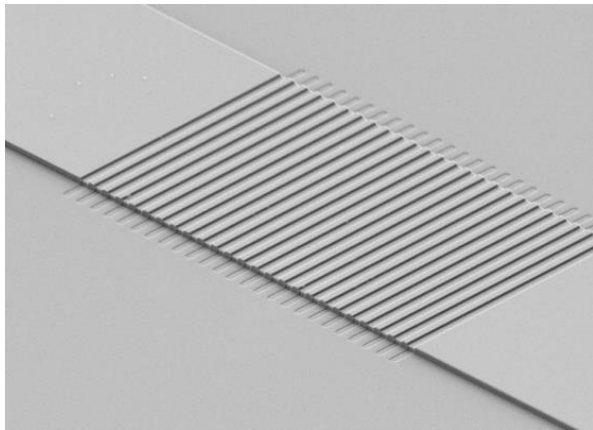
Photonic Integrated Circuit Technology – SG25PIC

IHP develops photonic integrated circuit (PIC) technology offering passive photonic components, modulators and photodetectors to provide early opportunities for realizing photonic integrated designs.

The technology is compatible with fully integrated photonic BiCMOS allowing the re-use of SG25PIC designs in IHP electronic-photonic integrated circuits in SG25H5EPIC.

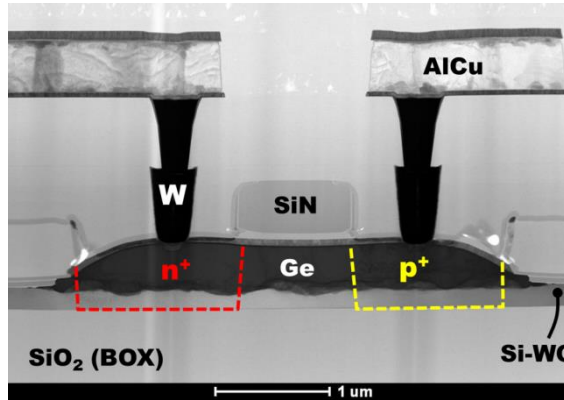
Passive Waveguide Features

- Dual-etch passive nano-waveguide technology
- 220 nm SOI
- Oxide cladding



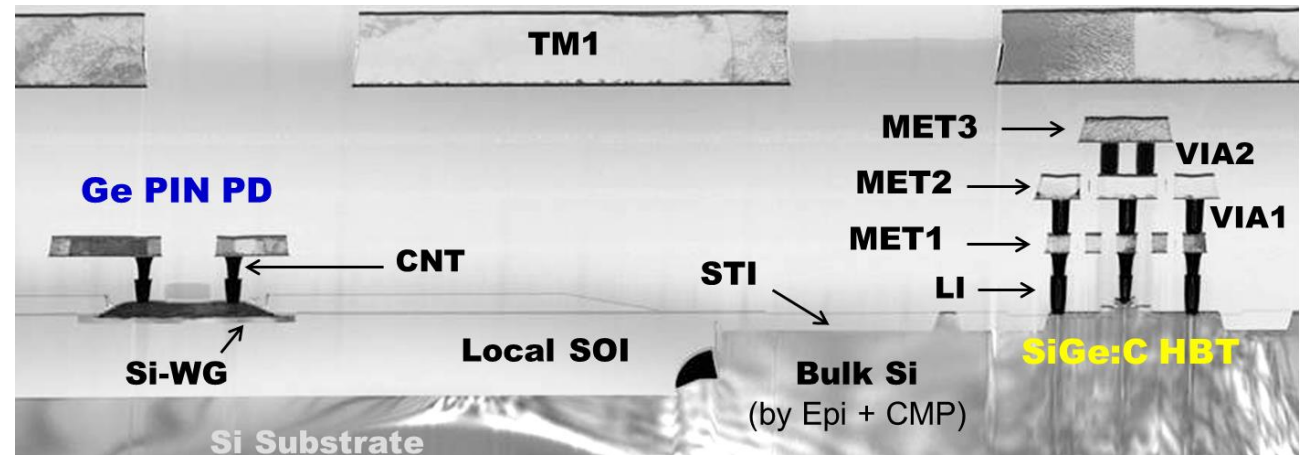
SEM image of a grating coupler

Electronic Photonic IC Technology – SG25H5EPIC



Waveguide-coupled 1st generation Ge PIN photodiode

The monolithic integration of photonic devices, such as detectors and modulators in the frontend of a Si-based integrated circuit technology, allows shortest possible interconnects between photonics and electronics from which high-speed performance of electronic-photonic integrated circuits (EPIC) greatly benefit.



TEM X-section of the photonic BiCMOS process: WG-coupled Ge-PIN diode (1st generation) on SOI and SiGe HBT fabricated in an adjacent bulk region.

SG25H5EPIC Photonic BiCMOS process features:

- High performance silicon photonics
- High performance BiCMOS electronics

| 0.25μm BiCMOS core | | | |
|--|--------------------------|------------------------------|----------------------|
| SiGe HBT | f_{max} | f_T | BV_{CEO} |
| SG25H5 | 290 GHz | 240 GHz | 1.9 V |
| Photonic components | | | |
| Ge-PIN-PD | $I_{dark} (@-2V)$ | Responsivity (@-2V, 1550 nm) | 3dB Bandwidth (@-2V) |
| | <200 nA | >0.8 A/W | >60 GHz |
| p-n phase shifter | $V_{πL} (@-1V)$ | Loss (@-1V) | |
| | 2.7 V·cm | 1.2 dB/mm | |
| Grating Coupler | Optical Loss (@ 1550 nm) | | |
| | 4 dB | | |
| Waveguides | Nano-WG: | | Rib-WG: |
| | 3.0 dB/cm | | < 0.9 dB/cm |
| Back-End-Of-Line: 5 layers AICu with 2 and 3μm thick top level metal | | | |

Process Design Kit features:

- Luceda IPKISS support for photonic designs (including simulation using Caphe)
- Cadence support for electronic-photonic circuit design (DRC, LVS, QRC)