

# Scalable Integrated Graphene Photonics (IGP™), a new photonics platform.

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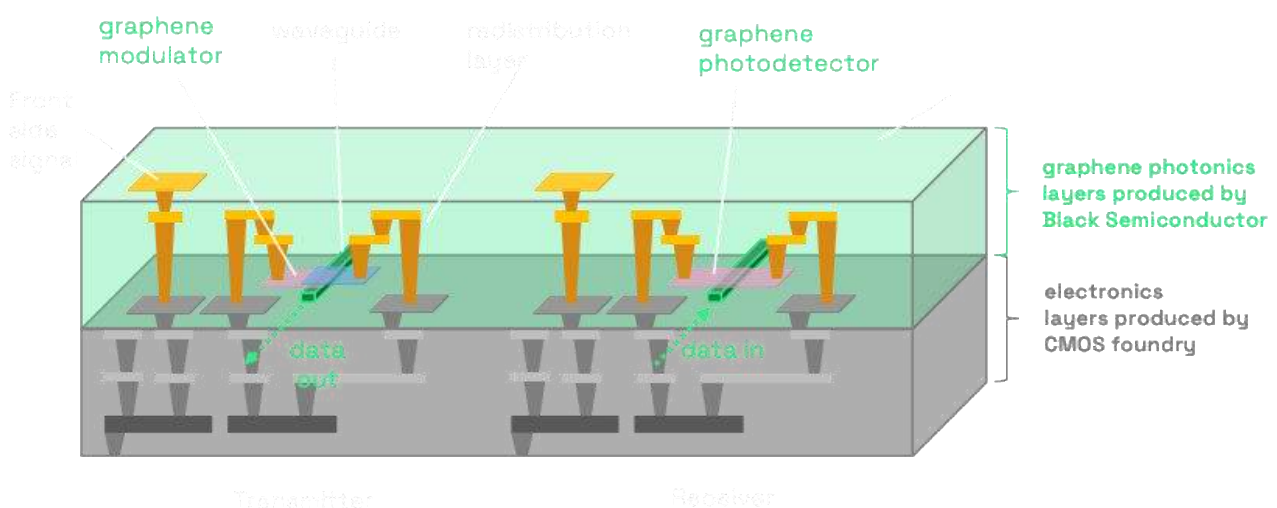
Abstract

**Photonic interconnects** are rapidly becoming essential for AI computing, directly addressing the bandwidth, latency, and power bottlenecks that copper-based interconnects can no longer overcome at the scale modern workloads demand. As training clusters and inference systems grow to tens of thousands of XPU's, the economics increasingly favor photonics-not as a niche capability, but as an architectural necessity.

Silicon Photonics (SiPh) currently defines the "State of the Art" for high-volume photonics manufacturing. Yet despite its maturity, SiPh carries a fundamental constraint: it is incompatible with back-end-of-line (BEOL) integration. Temperature budget limitations, process incompatibilities and material availability all place SiPh outside the BEOL window, meaning it cannot be brought onto the chip itself, only alongside it.

**Integrated Graphene Photonics (IGP™ )** offers a different path. Graphene supports high-speed, high-efficiency modulators and detectors while remaining fully compatible with BEOL thermal and process constraints. It is one of the very few materials systems that satisfies all three requirements simultaneously: the right devices, the right temperature budget, and the right process compatibility. This opens the possibility of bringing photonics onto every chip. Not as an add-on, but as a native layer. This allows to fundamentally rethink how computing systems are architected.

The obstacle is that graphene exists today only in research environments. Until now, it is absent from every mainstream semiconductor foundry ecosystem, with no qualified process flows, no established supply chain and no path to volume production. This talks traces Black Semiconductor's journey to change that.



**Figure 1:** Cross section of an EPIC hybrid photonic-electronic chip based on IGP™ technology