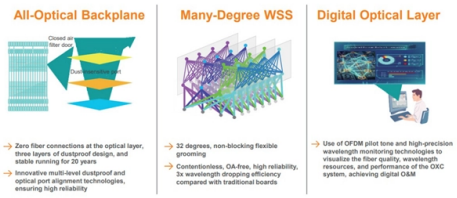
Detection Methods for Optical Coupled Integrated Modules



Article Overview

Optical coupled integrated modules are detected using waveguide-coupled photodetectors, hybrid III/V-silicon photodiodes, and coherent detection with 90° optical hybrids.

Waveguide-Coupled Photodetectors

Waveguide-coupled photodetectors separate the photon absorption path from the photocarrier transport path, which alleviates the trade-off between responsivity and bandwidth. By guiding light through an integrated waveguide into the photodetector, these devices achieve high-speed detection while maintaining efficient light absorption. Key performance metrics include responsivity, dark current, and 3 dB bandwidth, with design optimizations such as reducing intrinsic region width and minimizing junction capacitance to enhance speed without sacrificing sensitivity .

Hybrid III/V-Silicon Integration

Silicon photonic integrated circuits often require integration of III/V materials or germanium to achieve high-speed, high-efficiency detection. Hybrid III/V-silicon photodiodes are typically bonded to silicon-on-insulator (SOI) waveguides, enabling low-loss optical coupling and compatibility with standard CMOS fabrication processes. This approach allows simultaneous optimization of optical gain and photodiode bandwidth, supporting applications in microwave frequency generation, coherent receivers, and optical interconnects ....

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