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Paradigm shift in high-speed interface technology

The exponential growth in data center traffic is driving an increase in demand for cost and energy efficient interface bandwidth scaling. This creates a need for a paradigm shift in I/Otechnology that meets future connectivity requirements within data centers. Silicon Photonics (SiPh) based optical interfaces significantly improve I/O density by optimizing solutions along three vectors independently: Packaging density, speed per lane, and number of wavelengths per channel. SiPh platforms efficiently leverage the high speed interface ecosystem that is evolving towards silicon and hybrid chiplet platform integration (heterogeneous integration). Simulation, design, and packaging tools from leading EDA vendors enable electro-optical co-design. The validation of the devices and subsystems follow standard techniques on wafer level, package and PCB level and provide full correlation from device to system level. Backend semiconductor activities still need to develop to support fiber handling and die level optics testing capability. Legacy optical transceiver module platforms being unique has prevented volume scaling and high reliability. Additionally, optical modules have routinely lagged silicon availability in networking. An integrated, on-substrate optical I/O platform utilizing the tested and proven highvolume semiconductor manufacturing and packaging ecosystem can overcome the variation and uncertainty inherent in the optical I/O market today. This paper recommends a SiPh based optical I/O solution that merges mature silicon chiplet packaging and fiber connectivity to achieve the highest I/O efficiency for networking applications with highest density, lowest power and cost. A Broadcom prototype system with a 25.6Tbps optical switch is demonstrated and main performance parameters are reported.

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Biography

Karl Muth is currently Senior Principal Systems Architect at Broadcom San Jose, CA. He is a member of the silicon photonics founding team at Broadcom and is leading the architecture and design of integrated terabit optics. During his career he has worked with industry leading companies on the design of wireless and optical transceivers and numerous chipsets for RF and high speed optical communications. He received the 2021 Charles Kao Award for Best Optical and Networking Paper. Mr. Muth is a member of the Optical Society of America, a member of the IEEE and the IEEE-SA.