Aries PCIe® Smart Optical TIA

Portfolio Brief

Astera Labs (NASDAQ: ALAB) provides rack-scale AI infrastructure through purpose-built connectivity solutions. By collaborating with hyperscalers and ecosystem partners, Astera Labs enables organizations to unlock the full potential of modern AI. Astera Labs' Intelligent Connectivity Platform integrates CXL®, Ethernet, NVLink Fusion, PCIe®, and UALink™ semiconductor-based technologies with the company's COSMOS software suite to unify diverse components into cohesive, flexible systems that deliver end-to-end scale-up, and scale-out connectivity. The company's custom connectivity solutions business complements its standards-based portfolio, enabling customers to deploy tailored architectures to meet their unique infrastructure requirements. Discover more at **www.asteralabs.com**

Benefits and Features

- Up to 128 Gb/s per RX channel
- 4-channel bare-die architecture optimized for high-density LPO and NPO optical engines
- Low-power, low latency, low noise, and excellent linearity for PCIe 7 links
- Analog receive circuitry with output amplitude and gain control mode to accommodate link variation
- Digital channel monitoring for link-health visibility and optimization
- Designed for resilient optical connectivity beyond 50 meters across multi-rack AI systems

Applications

- Near-packaged optics for high-radix AI switches and GPUs
- Pluggable optics for multi-rack GPU connectivity
- Disaggregated PCIe 7 scale-up architectures
- Optical engines for switches, XPUs, and other AI accelerators

Description

The Aries Smart Optical TIA is a high-density, low-power solution for PCIe 7 optical connectivity in next-generation AI scale-up systems. When paired with high-speed photodiodes, it converts incoming optical signals into electrical data for reliable transmission across extended-reach AI scale-up links. Its high-channel-count bare-die architecture enables integration into high-density optical engines such as LPO and NPO that are needed for high-radix switch or accelerator implementations.

Digital channel monitoring, combined with configurable gain, output amplitude, and gain control mode, enables channel tuning to optimize end-to-end link performance across variations in temperature, aging, optical loss, and operating conditions. Integrated with Astera Labs' COSMOS Link Intelligence, it provides device-level visibility, diagnostics, and intelligent link optimization for reliable deployment and management of optical connectivity at scale.

Product Family Information

Aries Smart Optical TIAs are part of Astera Labs' PCIe 7 optical connectivity portfolio, alongside Smart Optical Drivers, Smart Cable Modules, Retimers, Redrivers, and Gearboxes. The Aries Smart Optical TIA is the receive-side component of the optical link.

Part #	Max Line Rate	Form Factor	Max Data Rate	Function
PA7041L	128 Gbps PAM4	4-Channel Uni-Directional	0.51T	Smart Optical TIA

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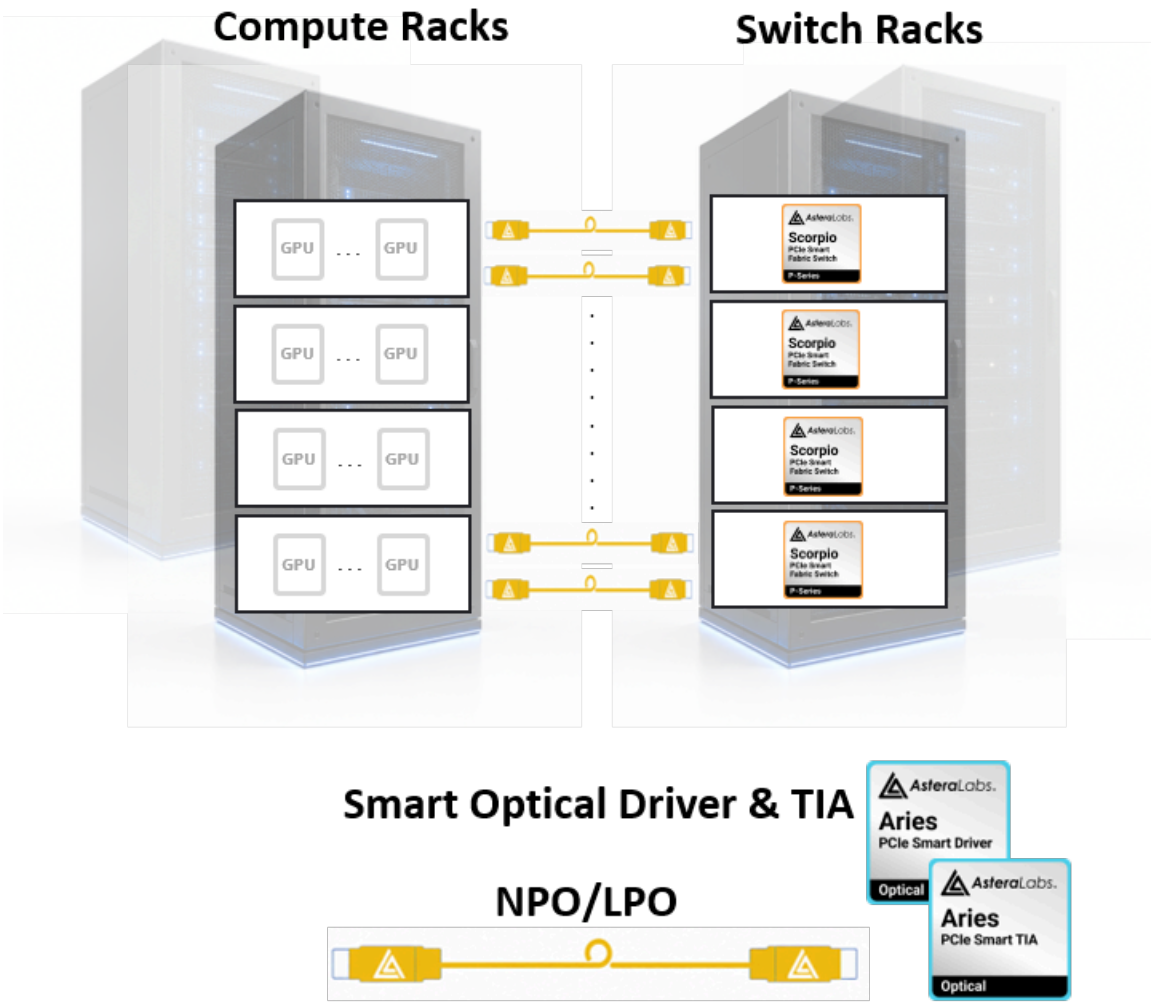
AI Server Platform Applications

The Aries PCIe® Smart Optical TIA portfolio enables high-density, low-power, low-latency connectivity for LPO and NPO in AI server platforms with disaggregated, multi-rack architectures, extended link distances, and increasing bandwidth demands across complex scale-up topologies.

- Multi-rack GPU and accelerator scale-up
- High-radix PCIe fabric switches
- Disaggregated compute and memory architectures
- AI training and inference platforms requiring long-reach, high-density optical connectivity



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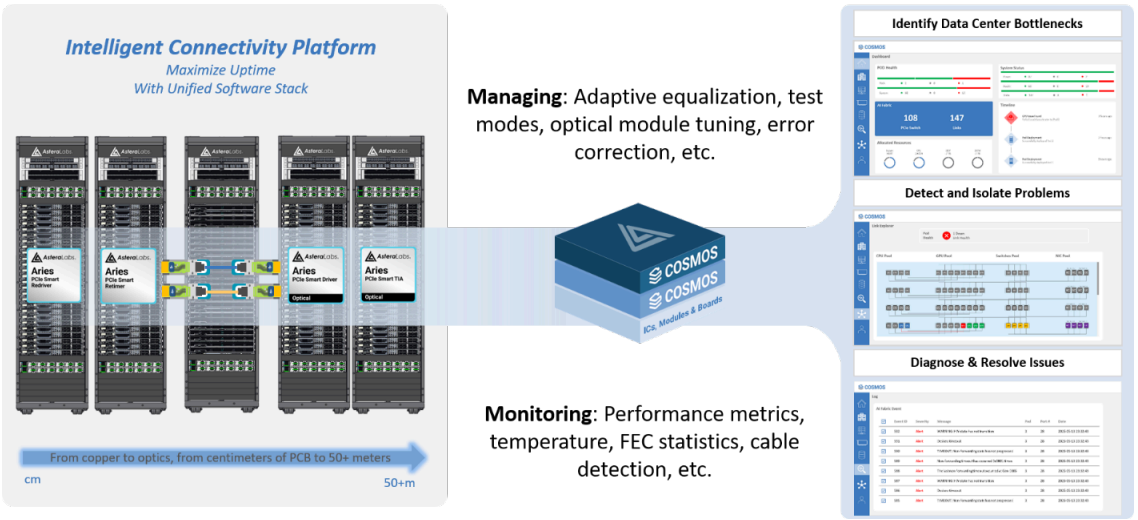
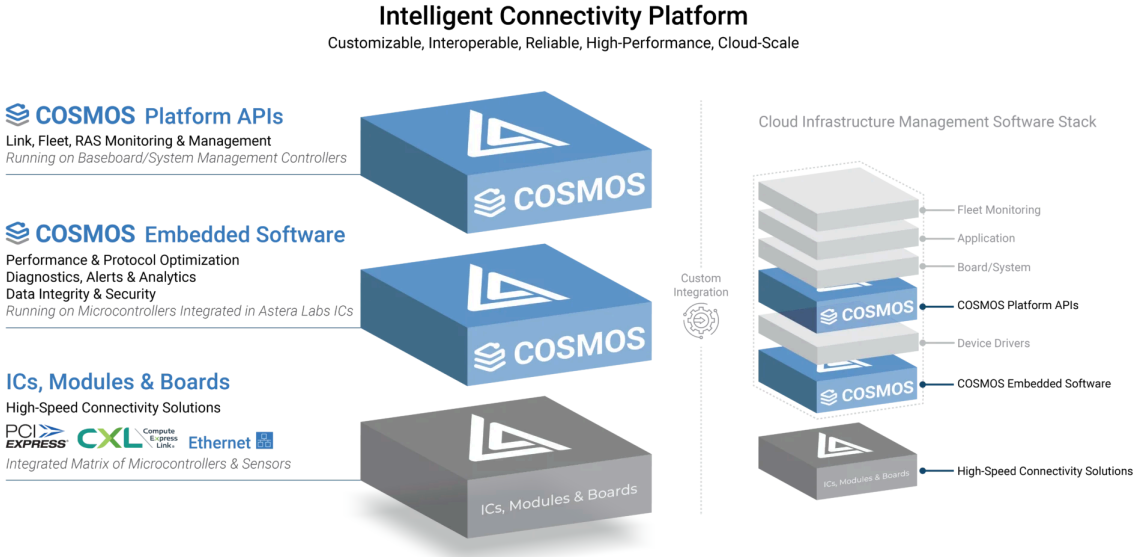
Astera Labs Intelligent Connectivity Platform

The Aries PCIe® Smart Optical TIA is an integral part of Astera Labs' Intelligent Connectivity Platform and enables device configuration, channel monitoring, diagnostics, and dynamic end-to-end link tuning. In addition to Aries, there are multiple PCIe, CXL and Ethernet ICs, Modules and Boards that are at the foundation of the platform. Astera Labs' COnnectivity System Management and Optimization Software (COSMOS) suite provides extensive Link, Fleet and RAS Management features and diagnostics. Through the combination of software and hardware, the Intelligent Connectivity Platform enables a smart connectivity backbone that is both scalable and customizable for AI and cloud infrastructure.





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