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Marvell Extends Connectivity Leadership for Accelerated Computing With Two Cloud-Optimized PAM4 Optical DSPs

- *Perseus is the industry's first 400/800 Gbps 5nm PAM4 optical DSP integrating both a TIA and VCSEL driver for optimal short-reach connection performance.*
- *Spica Gen2, an 800 Gbps PAM4 optical DSP engineered for connections ranging up to 10km in length, is now in volume production.*
- *The two optical DSPs expand Marvell's industry-leading portfolio of optical connectivity for efficiently scaling cloud data centers in the accelerated computing era.*

SANTA CLARA, Calif., Dec. 6, 2023 /PRNewswire/ -- Marvell Technology, Inc. (NASDAQ: MRVL), a leader in data infrastructure semiconductor solutions, has delivered two optical PAM4 digital signal processors (optical DSPs) to enable cloud operators to serve the exploding demand for AI, accelerated computing and cloud services by optimizing the performance, bandwidth and efficiency of the optical links connecting data infrastructure.

Sampling to select customers now, Perseus is the industry's first 400/800 Gbps 5nm device that monolithically integrates the primary electrical components of a short-reach pluggable optical module — an optical DSP, a transimpedance amplifier (TIA) and a vertical-cavity surface-emitting laser (VCSEL) driver — into a single die to reduce power, space and cost. Monolithically integrating components also reduces manufacturing complexity for module manufacturers to enable them to scale faster. Perseus is also available with an integrated silicon photonics driver.

Perseus is optimized for both active optical cables (AOCs), which replace passive copper cables for connecting equipment within racks, and short-reach single mode and multi-mode optical interconnects for distances of five to 500 meters.

Meanwhile, the Marvell® Spica Gen2, which began sampling in late 2022 and is now in volume production, is an 800 Gbps 5nm optical DSP optimized for longer-reach connections such as the high-bandwidth optical connections linking servers within an AI cluster or the optical connections between racks in a hyperscale data center. Spica Gen2 enables pluggable optical module manufacturers to reduce the power consumption of products to below 12 watts, a 25% savings over the previous generation of devices.[1]

Both chips are the latest products in a growing portfolio of optical and copper connectivity chips from Marvell optimized for specific use cases to help cloud operators maximize the utilization and performance of their infrastructures while reducing overall cost and power per bit. Both Perseus and Spica Gen2 are based on the Marvell industry-leading PAM4 optical DSP architecture, the most widely deployed optical DSP in cloud data centers and AI clusters.

"AI is impossible without optical," said Vlad Kozlov, CEO and founder of LightCounting, which forecasts that shipments of 800 Gbps and faster optical modules to the cloud will grow from 3 Exabits/second to 19 Exabits/second by 2027, a 78% CAGR. "Marvell has long been at the forefront of expanding the applications and use cases for optical inside data centers. Perseus and Spica Gen2 represent the latest steps in that voyage."

Connecting the Cloud

Optical DSP modules convert electrical signals from switches or other devices so data traffic can move to faster, more efficient and higher bandwidth optical networks. A mainstay in data centers since the early 2000s, optical modules have achieved a 1000x increase in data rate and a 100x reduction in energy per bit.[2] The majority of connections within data centers over five meters today are made with optical DSP modules.[2]

Doubling in bandwidth approximately every two years, optical DSP-based modules are growing at approximately 54% per year in terms of bits shipped,[3] enabling the 40-50% annual growth of bandwidth traffic at cloud service providers.[3]

The rise of accelerated computing will further fuel innovation in optical DSP technology as cloud service providers seek to scale their infrastructure to meet surging customer demand as well as the escalating performance requirements of these new, complex workloads. Some AI training clusters, for example, can contain up to 32,000 processors, 2,000 switches, 70,000 optical DSP modules and consume up to 45 megawatts of power.[4]

To help cloud operators and others increase their return on investment, Marvell produces connectivity products fine-tuned for different connectivity applications and use cases. Perseus, for example, supports both full retimer use cases for modules requiring both transmit and receiver capabilities as well as transmit-only or receiver-only half retimer use cases such as linear pluggable optics (LPO). Other specialized products include Nova (the industry's first 1.6T optical DSP for medium- to long-reach connections inside data centers), Porrima (100-400G), coherent DSPs and modules for long-range connections (2-2,000km), and copper-based active electrical cable devices for server-to-server links.

"The optimized approach Marvell takes to silicon design gives us a platform for developing a broader portfolio of products," said Osa Mok, chief marketing officer at InnoLight. "In the AI era, customers will obsessively seek performance and power gains in every part of their infrastructure. Specialized optical modules and technologies will allow them to achieve their goals in a scalable, economical manner."

"Accelerated computing requires accelerated infrastructure," said Xi Wang, vice president of product marketing for Optical Connectivity at Marvell. "Perseus and Spica Gen2 are the latest examples of our strategy to enable our partners and end users to continuously improve the efficiency, performance and resiliency of their critical assets while creating a platform for new services."

Select features of Perseus include:

- Quad / Octal 100 Gbps/channel optical PAM4 DSP
- Support for both 400G and 800G optical module applications
- Low power
- Integrated TIA

- Integrated linear driver (VCSEL and SiPho PIC)
- CMIS compliant with advanced diagnostic features
- Supports independent lane operation
- Compatible with 800 Gbps QSFP-DD and OSFP optical modules for 800 Gbps applications and QSFP112 modules for 400 Gbps AOC/single-mode/multi-mode deployments

Select features of Spica Gen2 include:

- Qualified and proven 800G Spica DSP architecture for data center connectivity
- Support for 1x800G, 2x400G, 8x100G connectivity for 51.2T, 25.6T switches, and advanced AI/ML clusters
- Supports 100m SR8 and 500m DR8, 2Km 2xFR4 and 10Km LR8 optical modules
- IEEE, MSA and CMIS compliant DSP that supports all 200G/400G/800G based data center optical connectivity applications
- Low power DSP with integrated drivers supporting EML and Sipho
- Advanced diagnostic features that provide insights into the health of the network
- Support for bare die design for cost sensitive applications and small BGA package designs, for faster time to market
- Compatible with 800 Gbps QSFP-DD and OSFP modules

Availability

Perseus is sampling to select customers now. Spica Gen2 is commercially available.

About Marvell
To deliver the data infrastructure technology that connects the world, we're building solutions on the most powerful foundation: our partnerships with our customers. Trusted by the world's leading technology companies for over 25 years, we move, store, process and secure the world's data with semiconductor solutions designed for our customers' current needs and future ambitions. Through a process of deep collaboration and transparency, we're ultimately changing the way tomorrow's enterprise, cloud, automotive, and carrier architectures transform—for the better.

1. Marvell, Dec 8, 2022.
2. Marvell, IEEE Journal of Selected Topics in Quantum Electronics, May/June 2023.
3. Light Counting, Optical Vendor Landscape, June 2023.
4. Marvell; 2023 OCP Global Summit.

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