Press Information

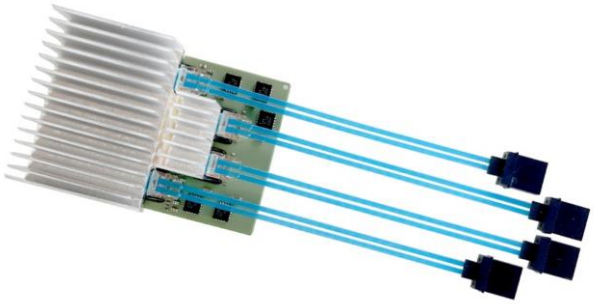
Kyocera's New "On-Board Optics Module" Achieves World-Record Bandwidth, Reduces Power Consumption for Data Centers

Prototype in development sets world-record 512 Gbps bandwidth[1].

Kyoto/London, 10. November 2022. KYOCERA Corporation has developed an *On-Board Optics Module* that achieves world-record bandwidth of 512 Gbps. The module is expected to support high-speed network applications, such as data centers. Additionally, by converting electrical signals into optical signals, the module uses much less power than conventional alternatives and will also help decrease power consumption and promote sustainability.

Kyocera's prototype module is miniaturized for installation on a printed circuit board near the processor, allowing electronic data to be converted into optical signals instantaneously. In addition, the product is designed to create unprecedented improvements in signal-to-noise ratio, virtually eliminating the signal loss caused by conventional electrical conductors. As a result of these technological advances, Kyocera's On-Board Optics Module has achieved world-record bandwidth of 512 gigabits per second (Gbps) and is expected to help data centers and supercomputers save power while increasing bandwidth and data transfer rates.

Video: Introducing Kyocera's New On-Board Optics Module
https://www.youtube.com/watch?v=BxofLof8Rmc



Kyocera's New On-Board Optics Module

[1] 512Gbps bandwidth is currently the world record using the Peripheral Component Interconnect Express 5.0 (PCIe gen5) extended interface standard (Kyocera research, September 2022).

Development Background

AI, IoT, and expanding 5G communication services are creating a rapid increase in internet traffic worldwide and unprecedented demand for high-speed, large-bandwidth data centers. However, the data center industry is fast becoming a leading consumer of electricity, so reducing their power consumption is also a major issue for society.

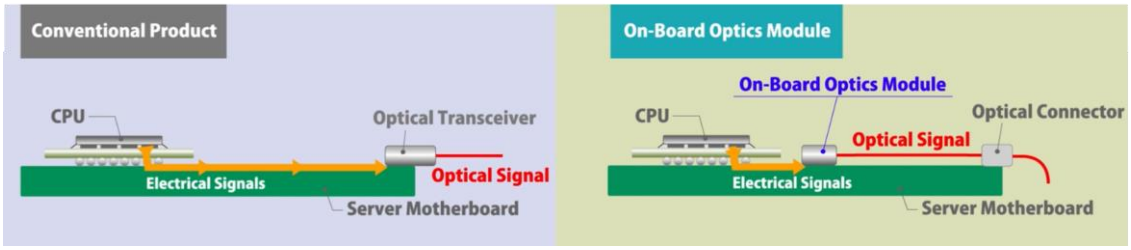
Kyocera's new on-board optics module features a miniaturized form factor that can be board-mounted inside the server near the processor, enabling power-saving signal transmission by converting electronic data into optical signals instantaneously. In addition, the prototype's transmission bandwidth of 512 Gbps will substantially improve data center speed and capacity.

In the future, to support innovations like autonomous driving and the metaverse, more data centers will need to be built to reduce latency and shorten the distance to end-users. This module contributes to miniaturization by achieving high speed and large capacity in a small form factor, allowing data centers to be built in urban and other higher-population-density areas.

Prototype Product Features

1. Power Savings

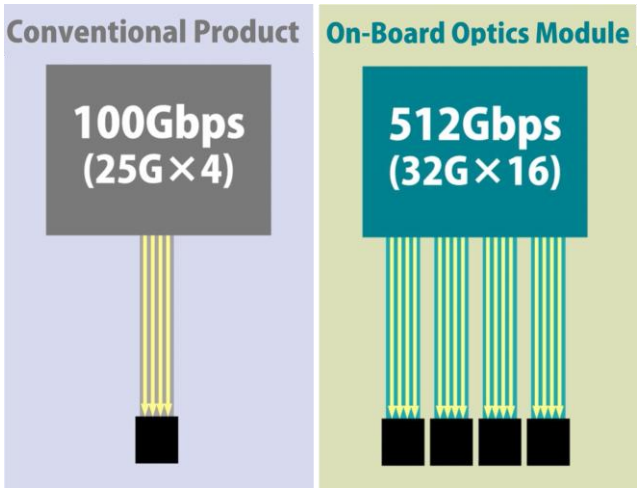
Copper conductors are usually needed to send and receive electrical signals; however, even the best copper conductors introduce electrical resistance that results in signal loss. Kyocera's new on-board optics module converts the electrical signal from the processor into a low-loss optical signal on the circuit board. In addition, data can be received as optical signals until just before reaching the processor, further reducing signal loss and power consumption.



Power Savings

2. World-Record Bandwidth, Larger Capacity

The largest bandwidth among on-board optics on the market today is 100 Gbps; Kyocera's module achieves a world-record 512 Gbps bandwidth, over 5x greater than conventional products. Such large bandwidth is possible because the module uses a Low-Temperature Co-fired Ceramic (LTCC) mounting substrate developed by Kyocera, which offers exceptional material characteristics, such as fine wiring, low dielectric constant, multilayering, and thermal conductivity.



On-Board Optics Module

3. Space Savings

Kyocera's module measures just 43.5 x 30 x 8.1 mm, allowing world-record 512 Gbps bandwidth for high-capacity data transmission even in a limited space. This will help customers build faster, more space-efficient data centers.

Overview of Kyocera's On-Board Optical Module

Bandwidth	16 channels of 32 Gbps/channel, 512 Gbps total optical transmission and reception
Size	43.5 x 30.0 x 8.1 (mm) (except 4 pairs of fiber-optic arrays)
Electrical Interface	High-speed, high-density connector plugs for connecting power and signal wires are mounted on the back.
Optical Interface	Four sets of 8-channel multimode optical fibers, each 4-channel optical transmission, and reception
Power Consumption	9W, equivalent to 18 mW/Gbps
Reliability Assurance	Telcordia GR -468 - CORE compliant

Future Development

Kyocera will continue to test our On-Board Optics Module technology with partner companies to achieve commercialization as early as possible. In addition, we will continue to engage in R&D to develop new products that contribute to solving the challenges of today's ever-evolving digital society.

For more information on Kyocera: www.kyocera.co.uk

About Kyocera

Headquartered in Kyoto, Japan, KYOCERA Corporation is one of the world's leading manufacturers of fine ceramic components for the technology industry. The strategically important divisions in the KYOCERA Group, which is comprised of 298 subsidiaries (as of March 31, 2022), are information and communications technologies, products which increase quality of life, and environmentally friendly products. The technology group is also one of the most experienced producers of smart energy systems worldwide, with more than 45 years of know-how in the industry. The company is ranked #665 on Forbes magazine's 2022 "Global 2000" listing of the world's largest publicly traded companies.

With a global workforce of over 83,000 employees, Kyocera posted sales revenue of approximately €13,42 billion in fiscal year 2021/2022. The products marketed by the company in Europe include printers, digital copying systems, semiconductor-, fine ceramic-, automotive- and electronic components as well as printing devices and ceramic kitchen products. The KYOCERA Group has two independent companies in the United Kingdom: KYOCERA Fineceramics Ltd. and KYOCERA Document Solutions Ltd.

The company also takes an active interest in cultural affairs. The Kyoto Prize, a prominent international award, is presented each year by the Inamori Foundation — established by Kyocera founder Dr. Kazuo Inamori — to individuals worldwide who have contributed significantly to the scientific, cultural, and spiritual betterment of humankind (approximately €710,000* per prize category).

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