

[Info-communications] Growth strategy for data center-related business

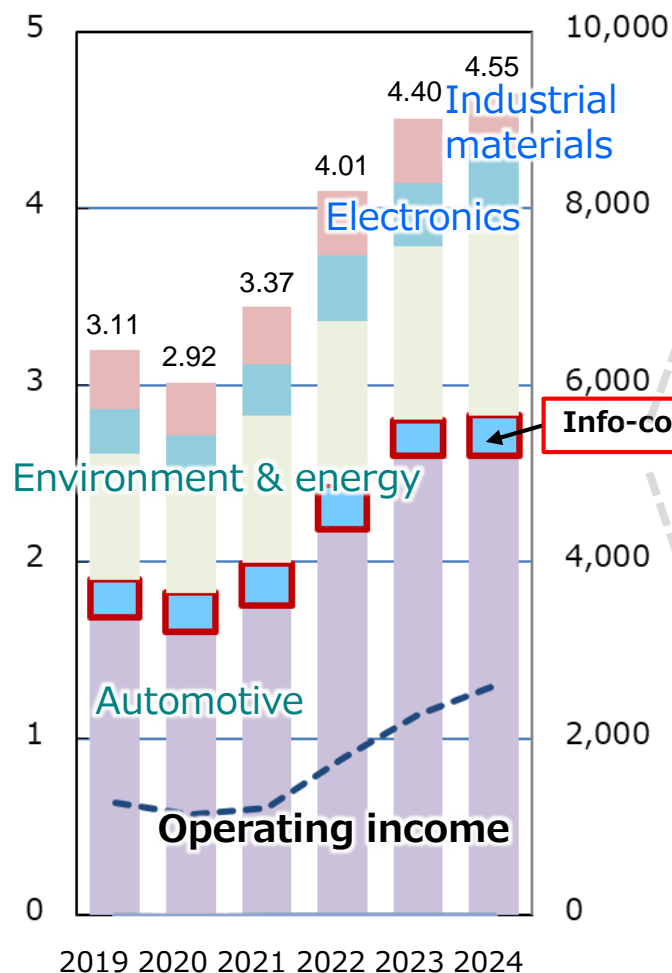
Sumitomo Electric Industries, Ltd.
November 13, 2024

Sales by Business Segment

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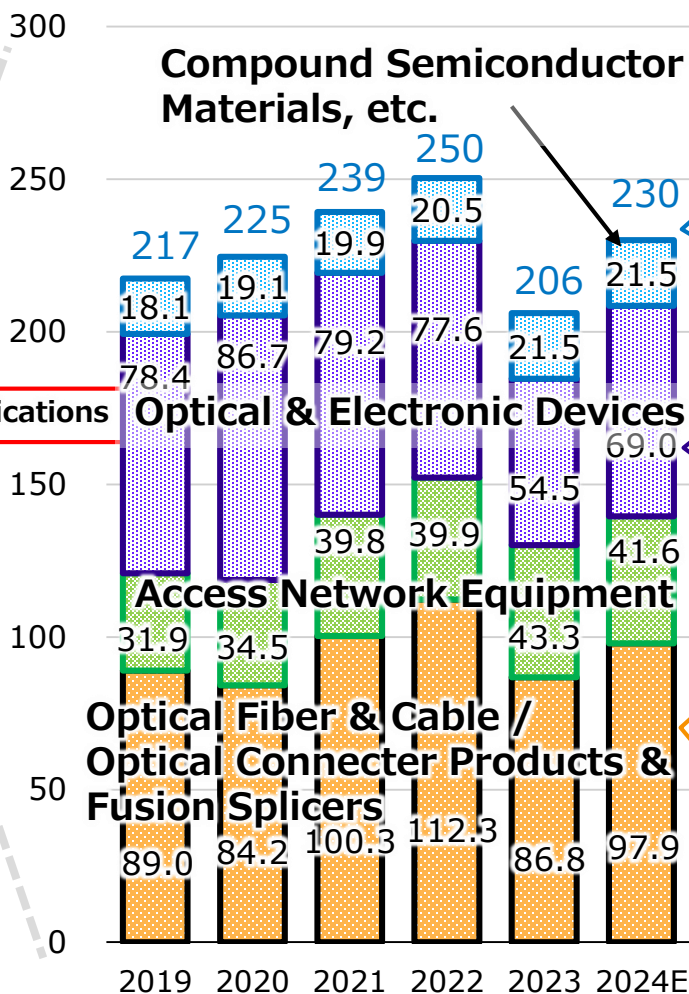
Sales
1 trillion yen/year

Operating income
100 million yen/year



(E)

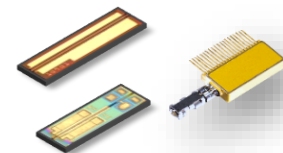
Sales
1 billion yen/year



Data Center related products



Compound semiconductor substrate (GaAs, InP)



Optical Devices

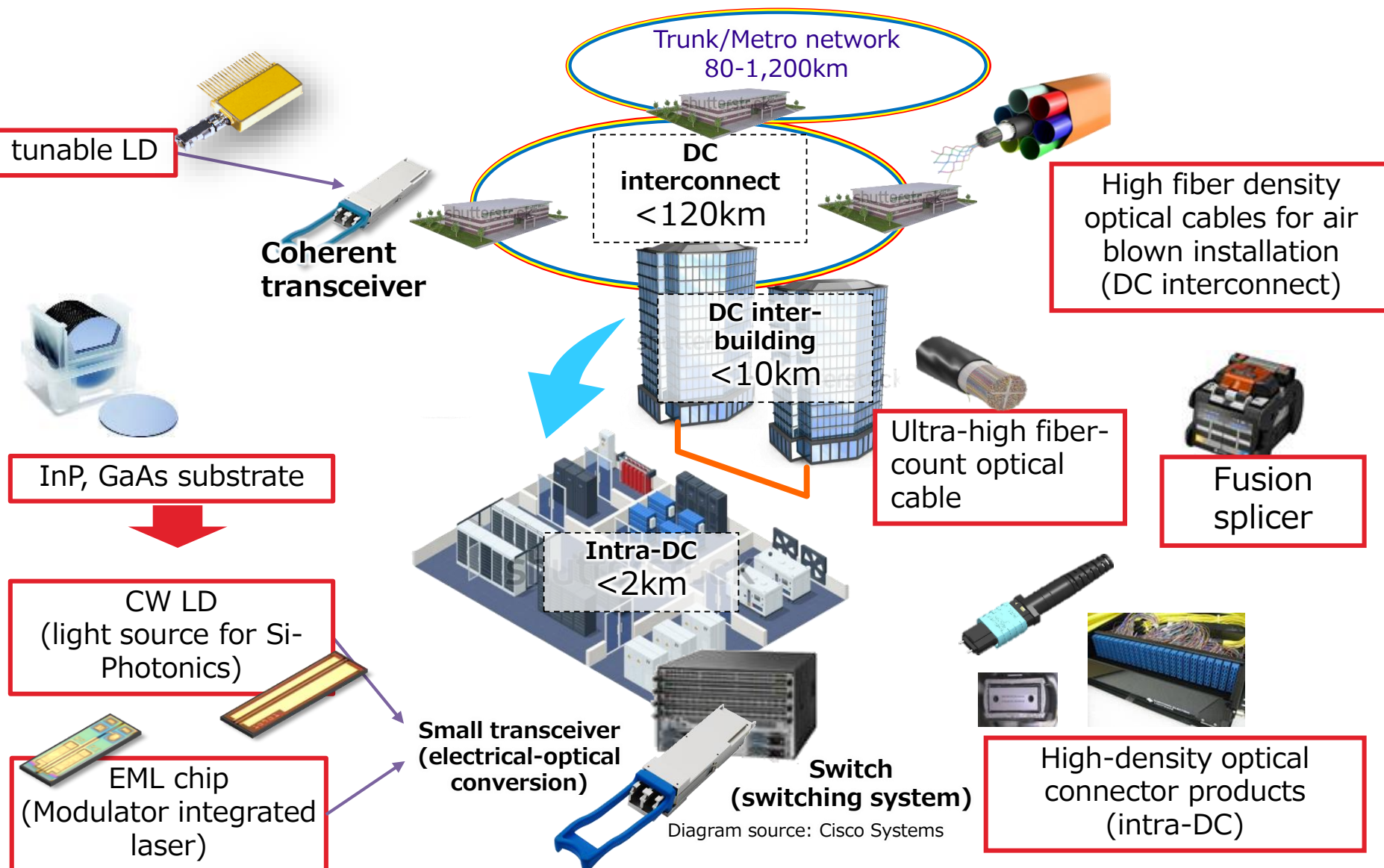


Optical fiber, cables, Optical connector, Fusion splicer

Source : FACT BOOK FY2024 1st Half Result
<https://sumitomoelectric.com/ir/library>

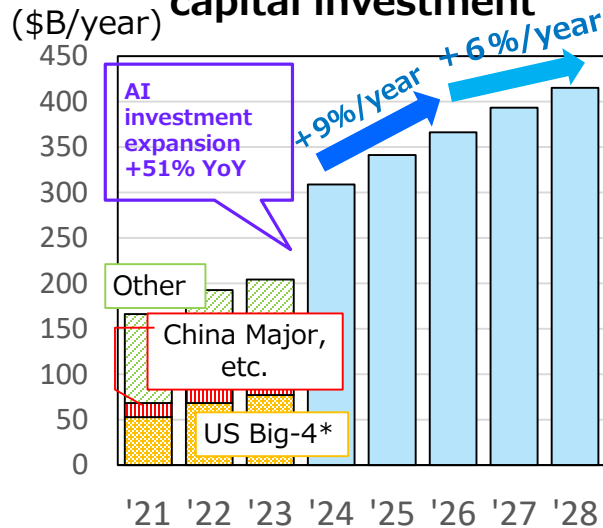
Sumitomo Electric Products in the Data Center (DC) Market

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DC operators making advanced investment in Generative AI market to secure long-term shares

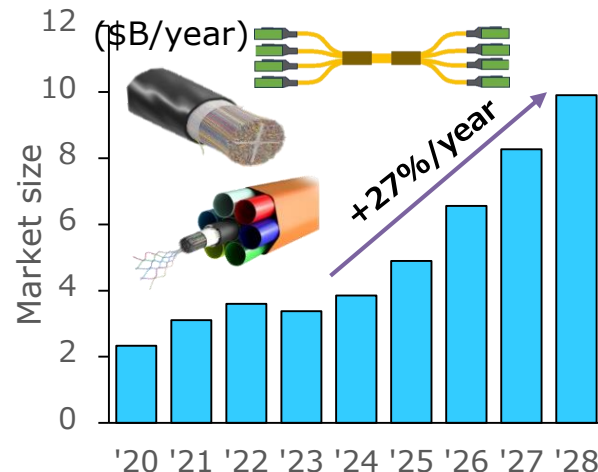
DC IT infrastructure capital investment



(US Big-4*: Google, Amazon, Meta, Microsoft)
(China Major: Baidu, ByteDance Alibaba, Tencent)

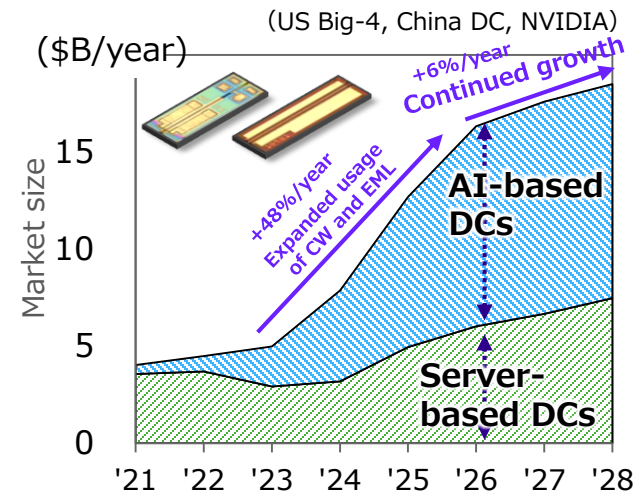
Source : Omdia

Optical connector and cable market for DCs



Source : Sumitomo Electric estimates

Optical transceiver market for large DCs



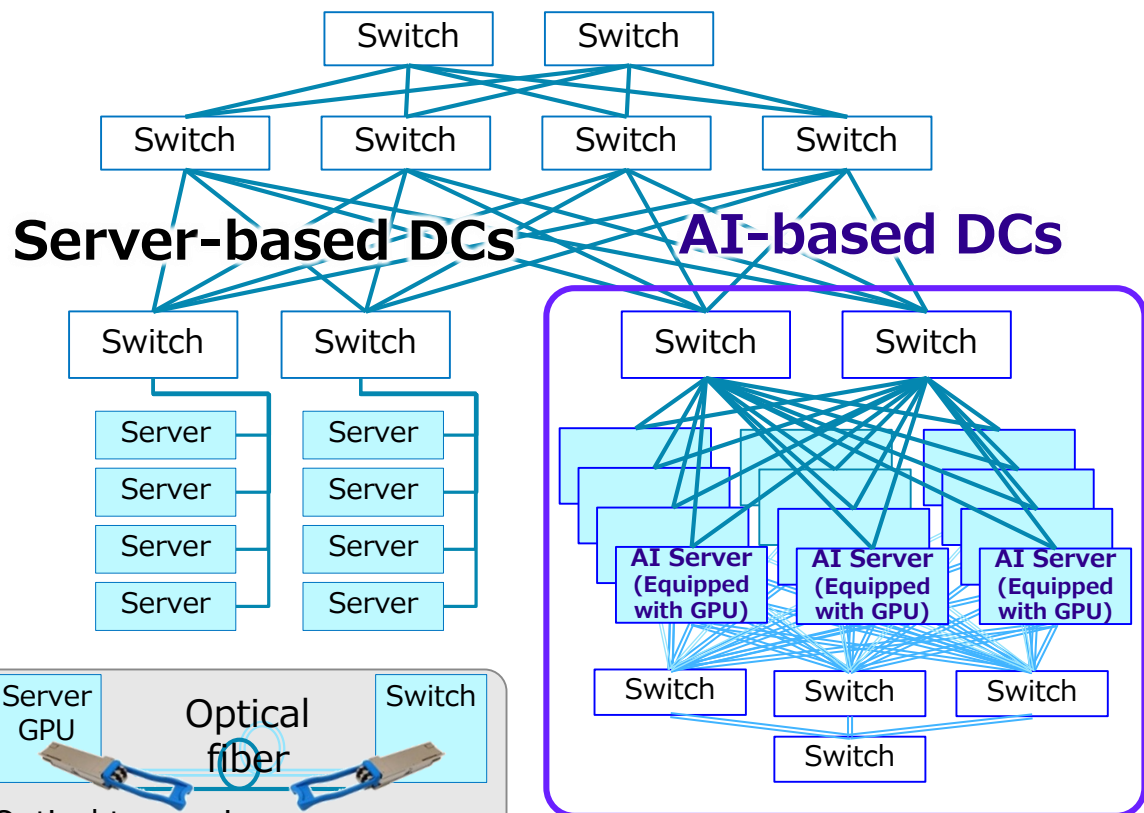
Source: Light Counting Cloud Datacenter Optics, Jul.2024

Market	North American and European DCs	Chinese DCs
Conditions	<ul style="list-style-type: none"> Increased investment in generative AI Platformers (US Big-4, etc.) vying for supremacy 	<ul style="list-style-type: none"> Increased activity in domestic GPU development and imports Increased DC construction by platformers (e.g. Chinese giants), although on a smaller scale

Architecture of DC for Generative AI and Optical Network

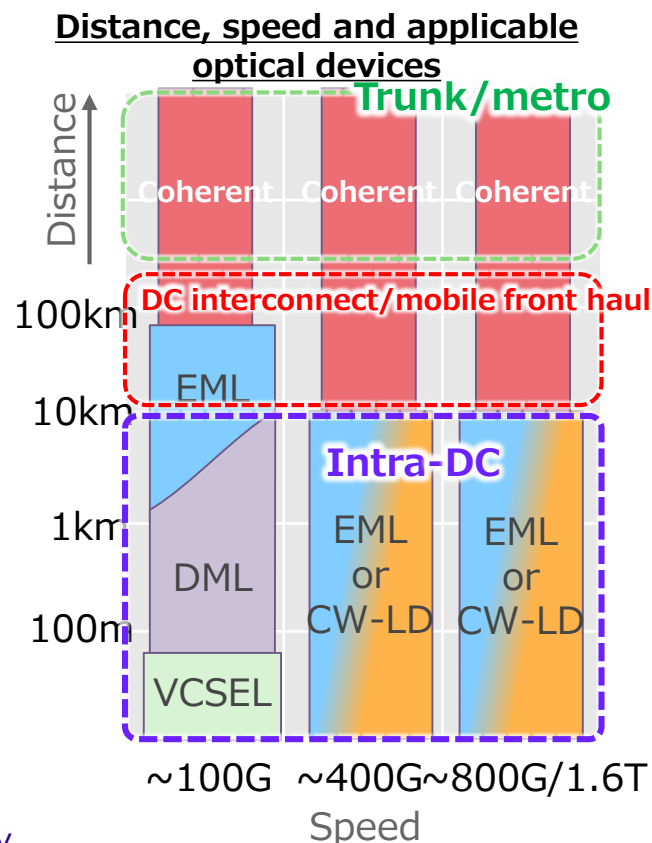
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Since the advent of generative AI, the number of AI-based DCs for machine learning with multiple GPUs has increased. Optical network demand for inter-GPU has increased. Devices for optical networks change as speeds increase.



Optical network
Convert electrical signals into light and connects using optical fiber and connectors

Tens of thousands of GPUs are connected by high-speed optical network (the DC for inference can be downsized according to the application)





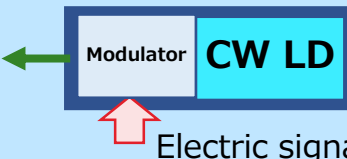
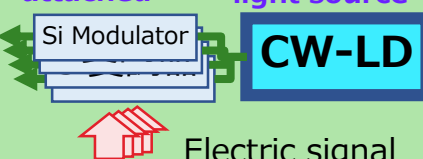
VCSEL: Vertical cavity surface emitting laser
DML: Direct modulation laser
EML: Electroabsorption-modulated laser
CW: Constant wave (used in conjunction with Si modulator)
Coherent: Long-distance transmission technology

SUMITOMO ELECTRIC GROUP

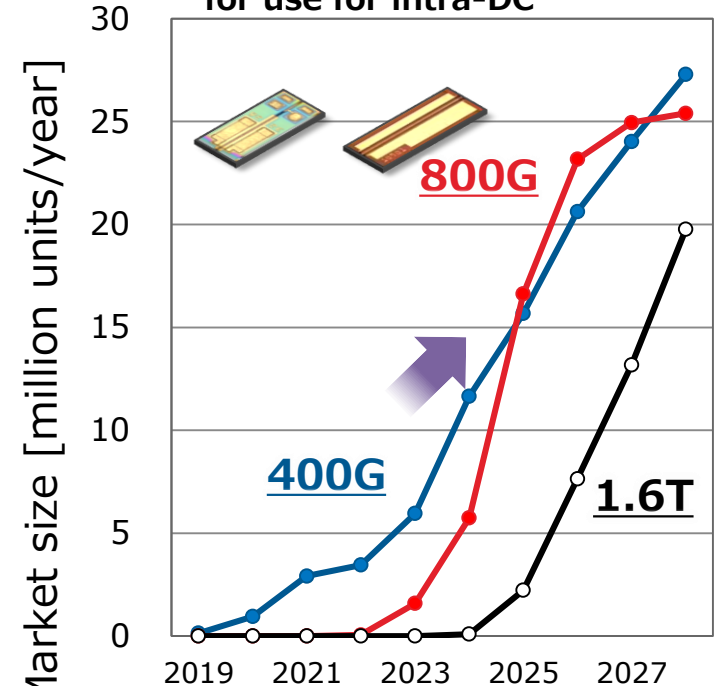
Optical Devices Used for Intra-DC

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Optical devices used for the optical network of intra-DC are mainly EML and CW-LD, which are our main products.

	EML 	CW-LD 
Composition	<p>Modulator integrated</p> 	<p>Externally attached</p> <p>High-output light source</p> 
	Operates on its own chip	Consists of a light source and a Si modulator
Conditions	Currently mainstream	Outlook for future growth
Sumitomo Electric Features	Compact design Cost-competitiveness and high production capacity with 4-inch mass production technology	Highest output in the market Cost-competitiveness and high production capacity with 4-inch mass production technology

Optical transceiver market for use for intra-DC



Source: LightCounting Cloud Datacenter Optics, Jul.2024

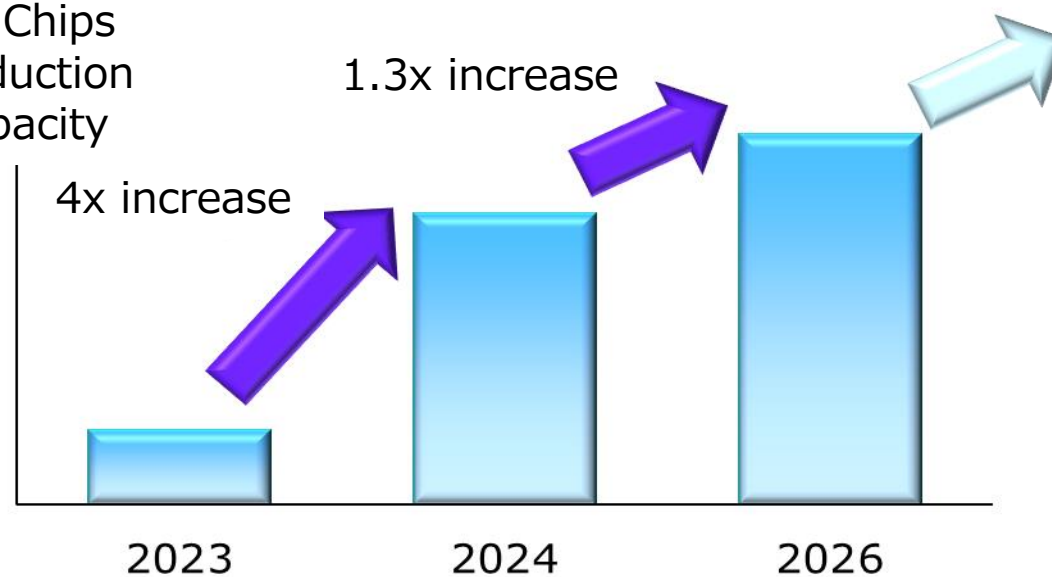
Demand ratio for chip quantity
(Sumitomo Electric estimates)

Chip	2024	2026	2028
EML	76%	55%	31%
CW-LD	24%	45%	69%

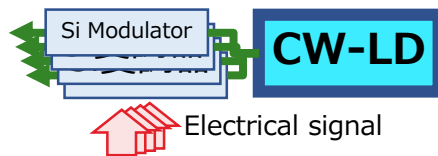
Plans of Production Capacity Expansion and New Product Launch for intra-DC optical devices

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LD Chips
production
capacity



CY	2023	2024	2025	2026	2027
EML	EML for 400G/800G (100G/1 wavelength) (4.5dBm(2.8mW))			EML for 800G/1.6T (200G/1 wavelength)	
			Market launch		
CW-LD	100mW class CW-LD			350mW class CW-LD	
			Market launch		

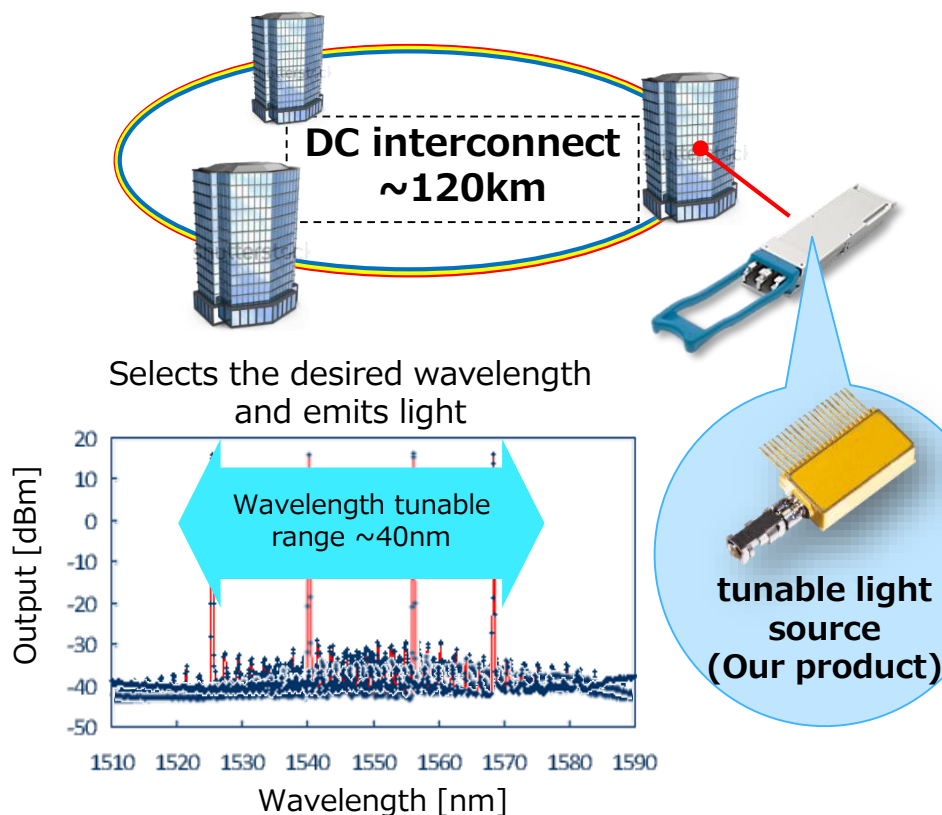


Support for high-density and parallel Si photonics modulators for 1.6T OSFP (transceiver) and CPO (Co-Packaged Optics).

Optical devices used for DC interconnect

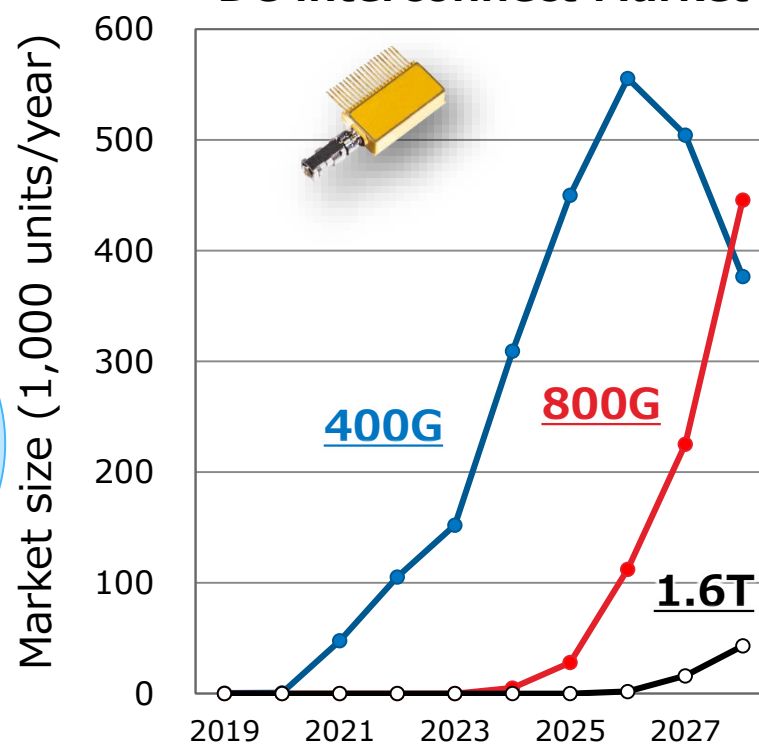
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Decentralizing DCs in terms of power procurement and site availability requires DC interconnect using wavelength-multiplexed coherent technology with wavelength-tunable LDs.



Features of Sumitomo Electric's product:
High output, low power consumption
Supports the 19dBm (90mW) required for 800G
Highest output in the industry

Optical Transceiver for DC interconnect Market



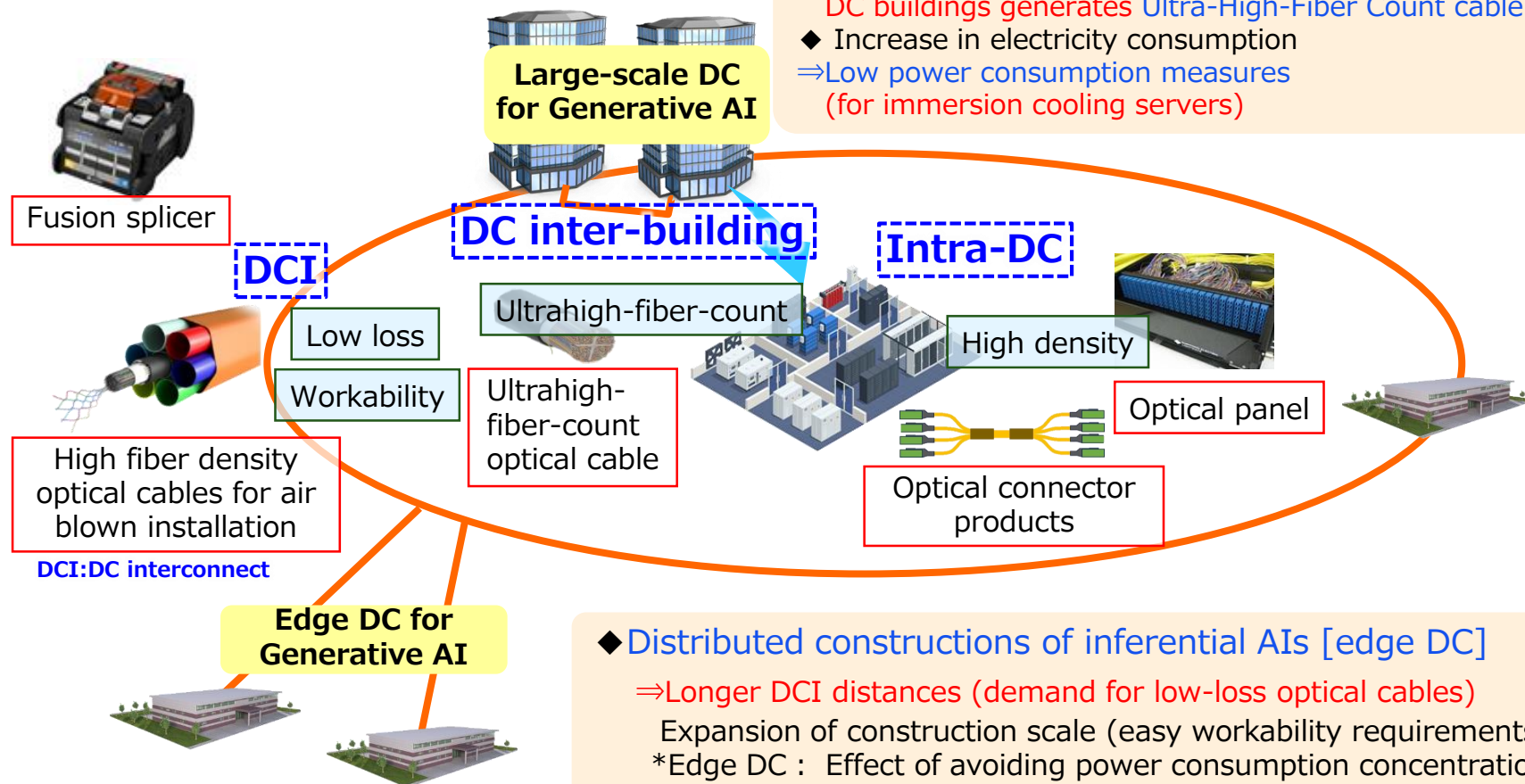
Source: LightCounting Cloud Datacenter Optics, Jul.2024

The relationship between DC for Generative AI and the demand for optical fiber-related products

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Changes in demand due to DC for Generative AI

- ◆ Massive learning
 - tens of thousands of GPUs interconnected by optical network
 - Optical connector demand is 7 to 10 times that of conventional DCs
 - ⇒ Compact, lightweight, high-density, low-loss
 - The increase needs of more optical network inside and between DC buildings generates Ultra-High-Fiber Count cable demand
- ◆ Increase in electricity consumption
 - ⇒ Low power consumption measures (for immersion cooling servers)



◆ Distributed constructions of inferential AIs [edge DC]

- ⇒ Longer DCI distances (demand for low-loss optical cables)
- Expansion of construction scale (easy workability requirements)
- *Edge DC : Effect of avoiding power consumption concentration

Our Strengths and Main Optical Fiber-related Products

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- **Vertical integration** e.g. from connector parts to assembly products
⇒ High performance, high reliability
- **Product development and customization capabilities** that bring together in-house technologies, including materials
⇒ **Rated No. 1 for four consecutive years by existing major customers**

Further growth through expansion of customer base
Our customer base growth: 4 times increase from FY23 to FY25

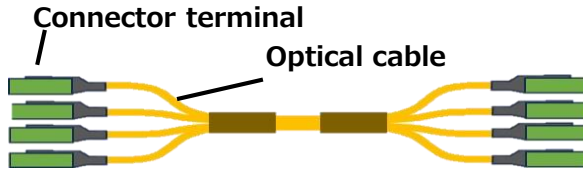


Optical connector products

- High-speed optical communication links the GPU, switches and servers inside the DC



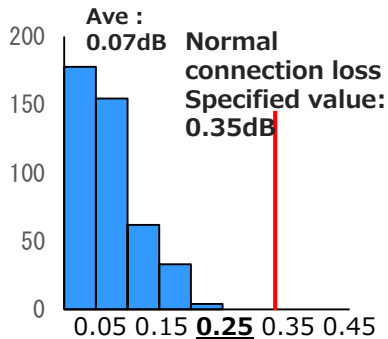
Connector terminal (ferrule) cross-section



High-precision connector terminal processing technology

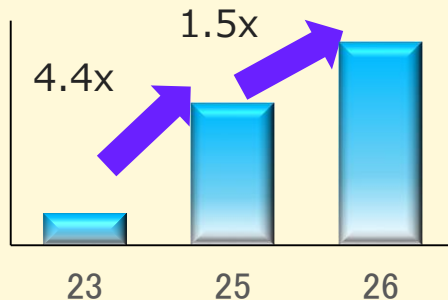
+
High-precision optical fiber, integrated manufacturing

Low loss of 0.25dB or less is achieved, compared to the usual 0.35dB loss with high-density 24-core MPO connectors



Loss measurement data for our 24-fiber MPO connector

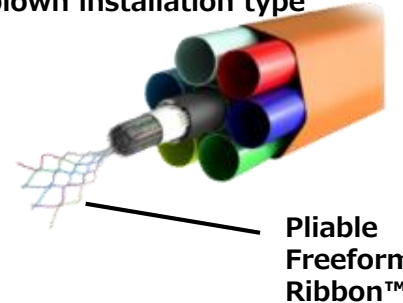
Optical connector production capacity



Optical cables

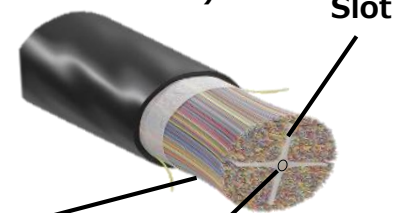
- **Pliable Freeform ribbon™ fiber with excellent fusion splicing workability, low-loss fiber application**
- Development of 3456-fiber and 6912-fiber cables **before anyone else in the world**

① High-density air blown installation type



Pliable Freeform Ribbon™

② Small diameter 6912-fiber-count robust cable (outer diameter: 32 mm)



Center tension member (TM)
⇒ **No bending directionality**

① High fiber-count / high-density cable (air blown installation, pre-terminated, high installation performance)

+ [**Customization according to needs**]

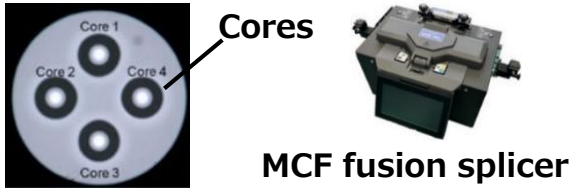
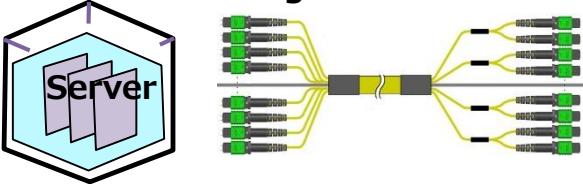
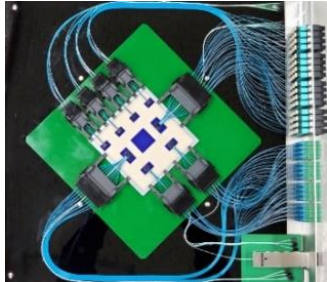
- Currently developing the world's top-performing air blown installation
- ② **Unique slot and center TM structure** => Optimal for DC conduit installation
- High-precision slot molding fiber stranding technology achieves both **flexibility and robustness, achieving no installation accident ever** (caused by the product)

Future optical fiber-related products

[Total technical strength within the company]

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In addition to optical fibers and connectors, we also offer a wide range of technologies, including optical devices and electronic wires. We are able to respond to the diversification of needs in generative AI.

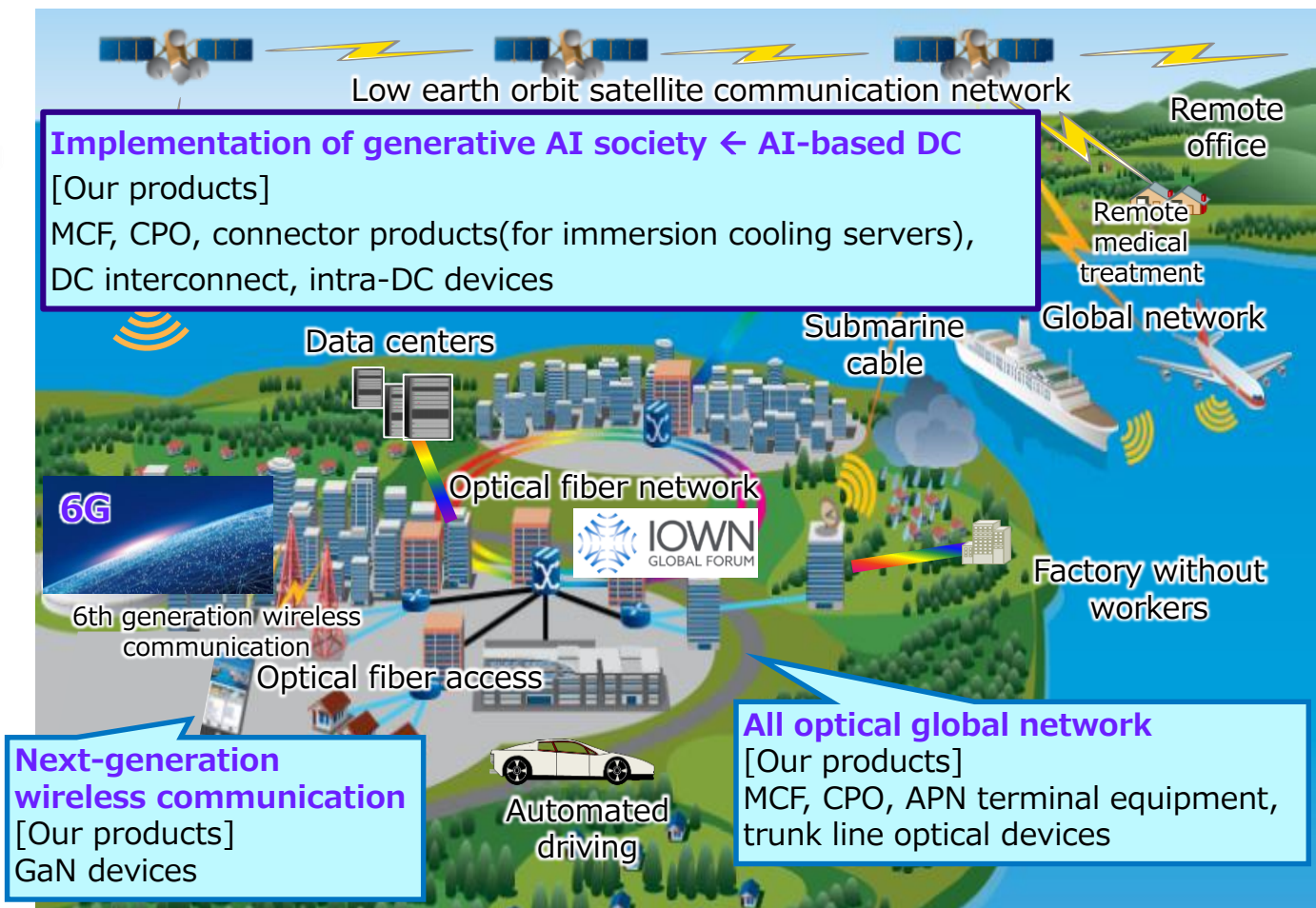
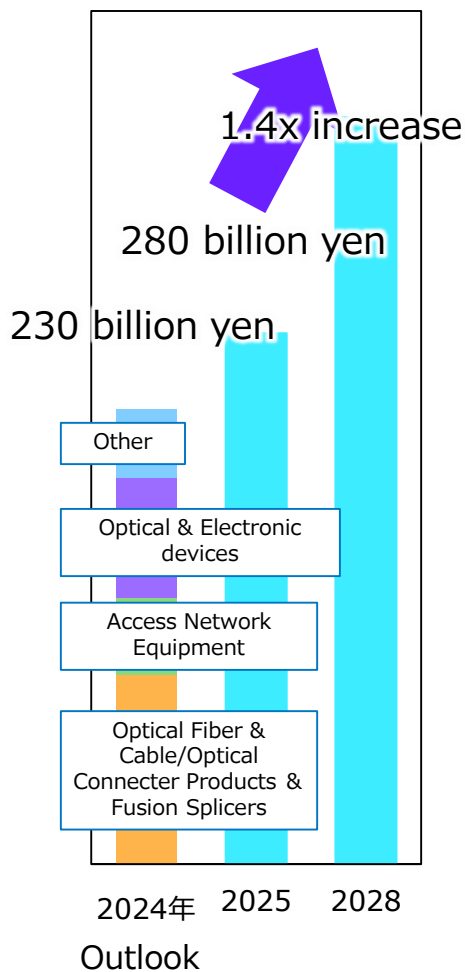
Product	Features and Strengths
Multi-core fiber (MCF) (fiber with multiple cores)  <p>MCF fusion splicer</p>	<ul style="list-style-type: none"> • Great expectations for a product that achieves higher density and more efficient construction • First in the world to be introduced commercially for use for submarine optical cable, outpacing other companies • Providing solutions in combination with specialized fusion splicers and peripheral technologies • Rapid expansion expected for DC (ultra-high density solution)
Optical connector products for immersion cooling servers  <p>Conceptual design of an immersion cooling server</p>	<ul style="list-style-type: none"> • Substantial reduction in DC power consumption with immersion cooling servers • In spite of short term requirement, our material technology successfully developed new materials for optical connector products used in special refrigerants and has already been approved by our customers
CPO (Co-Packaged Optics) 	<ul style="list-style-type: none"> • Integration of IC and optical transmission functions to solve saving power consumption and more bandwidth requirements. • Combines our optical devices, couplers and network technologies • Attracting attention from IC chip manufacturers, etc. • Will be developed into a wide range of Photonics-Electronics Convergence products in the future

Market Changes Toward 2030 and Our Efforts

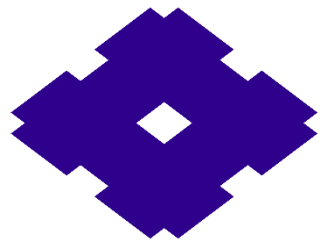
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We aim to grow by combining our comprehensive strengths with high-level technology and solutions.

Info-communications Sales Plan



IOWN: Innovative Optical and Wireless Network (ALL optical NW concept)



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