

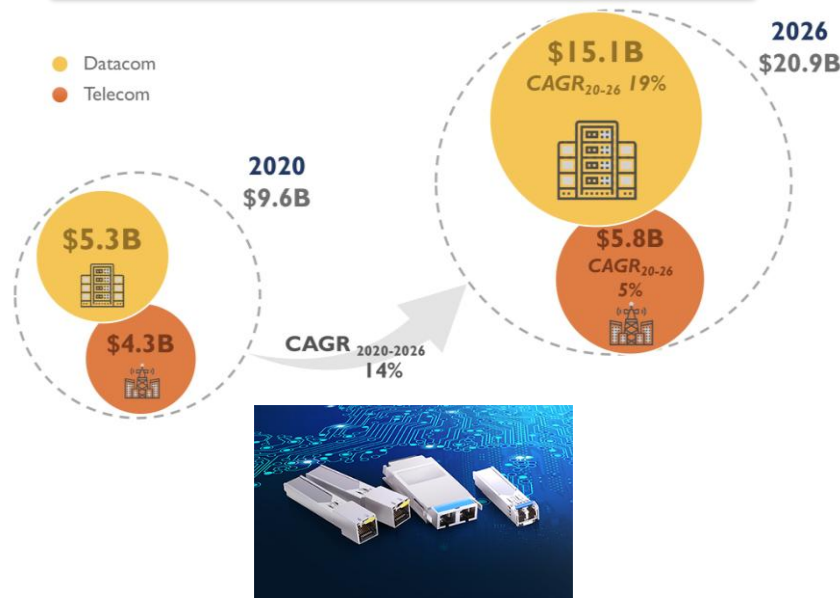
Optical Transceiver Market

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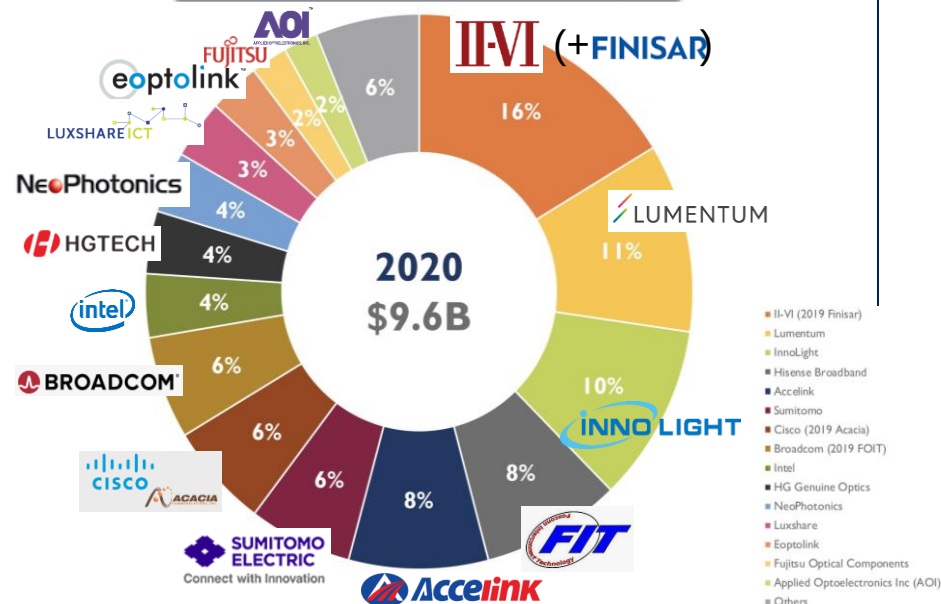
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- ◆ Optical transceiver market growth will accelerate (CAGR14%, '20-'26).
- ◆ This growth is driven by big cloud service and telecom operators.

Optical Transceiver Market Size



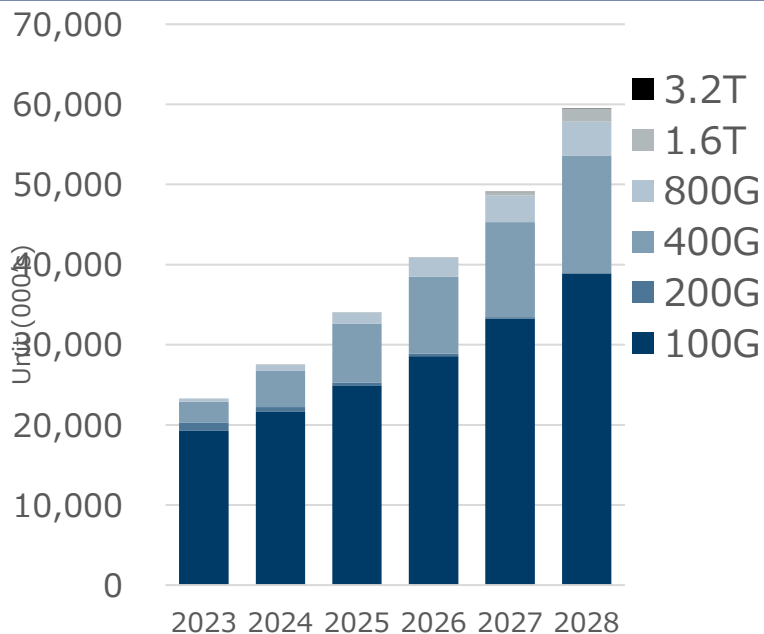
Market Shares ('20)



Source : Optical Transceivers for Datacom & Telecom Market 2021 report, Yole Development, 2021
http://www.yole.fr/Optical_Transceivers_Datacom_And_Telecom_Update_2021.aspx

- ◆ The 100GE optical transceiver market will grow by CAGR 15%('23-'28).
- ◆ The 400GE optical transceiver market will a rapid growth at CAGR 41% ('23-'28).

Optical Transceiver Forecast



Growth Rate

CAGR ('23-'28)	
100G	15%
200G	-37%
400G	41%
800G	63%
1.6T	256% ('24-'28)
3.2T	200% ('27-'28)

2023 Ranking

Ranking of Top 10 Transceiver Suppliers

Company	
1	Innolight
2	Coherent
3	Huawei (HiSilicon)
4	Cisco (Acacia)
5	Accelink
6	Hisense
7	Eoptolink
8	HG Genuine
9	Source Photonics
10	Marvell

Source: 富士キメラ2024 Co-Package・光電融合のキーデバイスと新材料市場総調査

Source :
LightCounting

Optical Transceiver Market

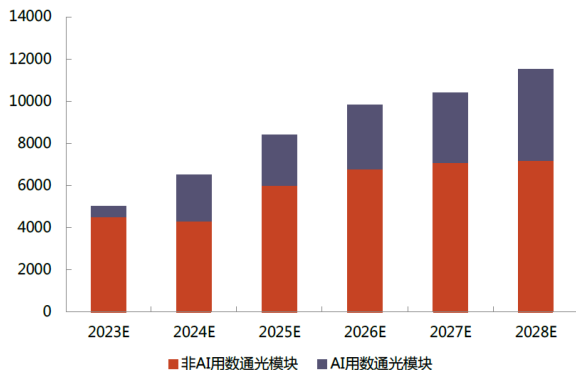
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- ◆ 800G demand is increasing rapidly in CY-2024, due to AI server marketing
- ◆ Estimate that 1.6T will come from CY-2026. Technical reserve is ready

北美四大云厂商资本开支（单位：亿美元）

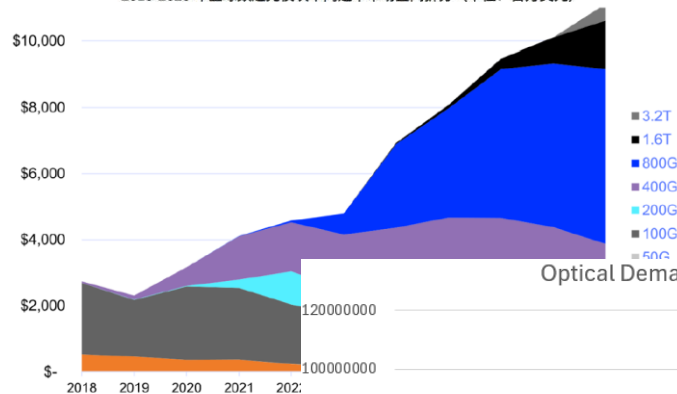
亿美元	2020	2021	2022	2023	2024E	2025E
微软	154.41	206.22	238.86	281.07	523.83	583.12
meta	151.63	186.90	314.31	272.66	373.90	415.05
亚马逊	401.40	610.53	636.45	527.29	626.30	674.87
谷歌	222.81	246.40	314.85	322.51	479.47	486.09

2023-2028 年全球数通光模块市场空间（单位：百万美元）



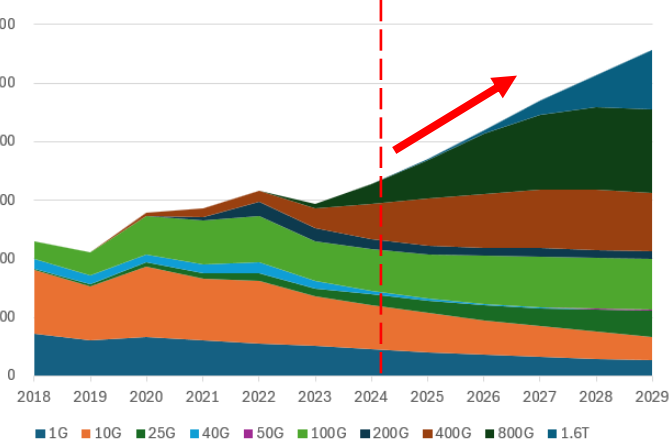
资料来源：Lightcounting, Coherent 预测，光大证券研究所整理

2018-2028 年全球数通光模块不同速率市场空间拆分（单位：百万美元）



资料来源：Lightcounting, Coherent 预测

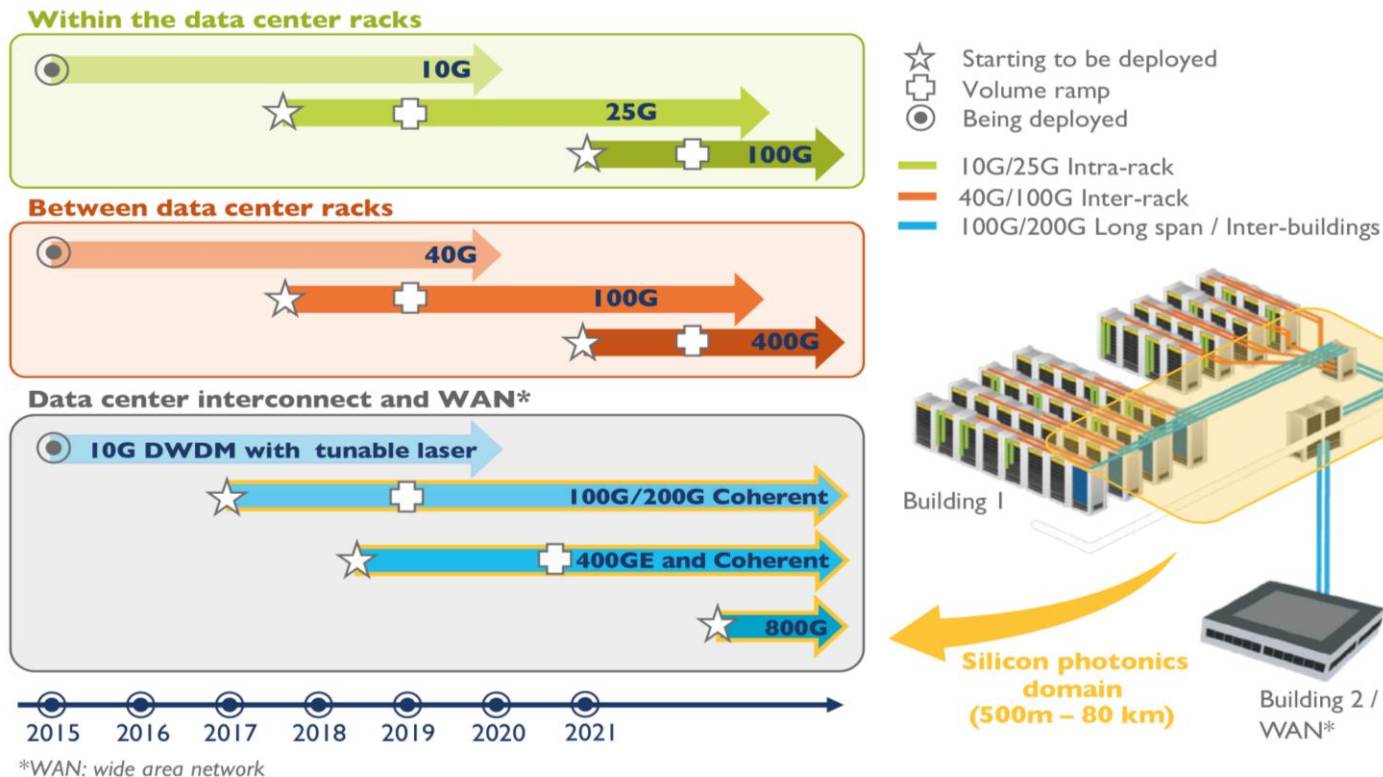
Optical Demand Forecast



Status of Optical Transceiver in Datacenter

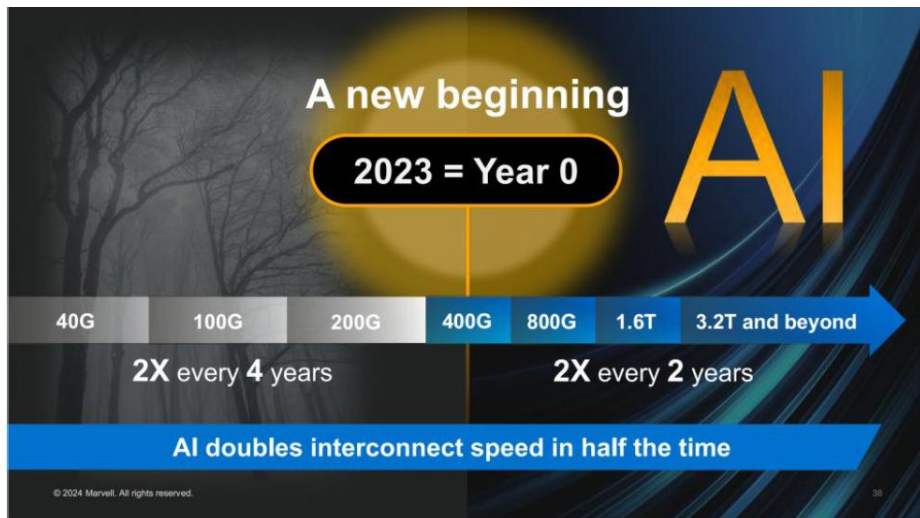
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◆ Datacenter Market request shifts to high speed Transceiver.



Status of Optical Transceiver in Datacenter

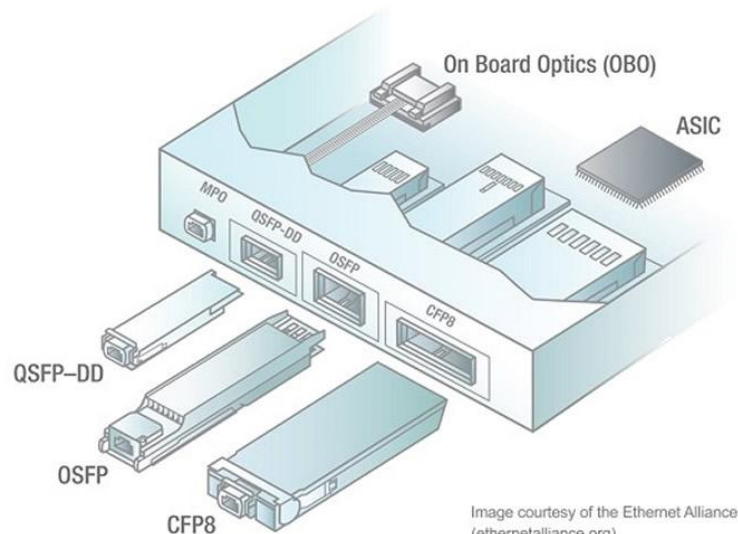
- Optical module develop cycle



Developing cycles is becoming shorter (4years → 2years), due to AI's huge demand for data transmission

- ◆ There are many kinds of optical transceiver form factor.
- ◆ Challenges; Reduce size, Decrease power consumption while increasing data throughput.

400G Optical Transceiver Form Factor

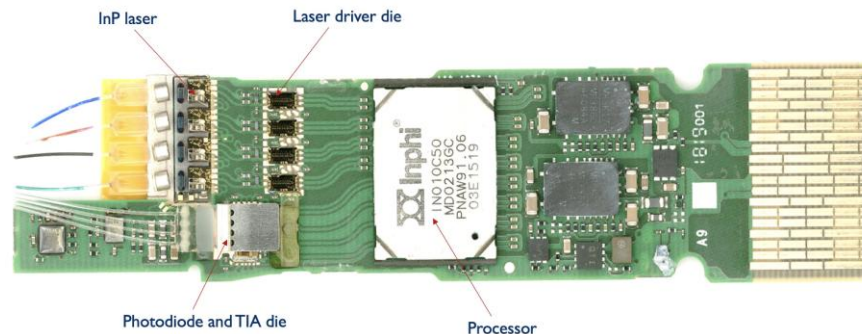


<https://www.accton.com/Technology-Brief/the-new-world-of-400-gbps-ethernet/>

Optical Transceiver Structure

Innolight 400G optical transceiver electronic board

(Source: Innolight's 400G QSFP-DD Optical Transceiver report, System Plus Consulting, 2021)



© 2021 | www.systemplus.fr - www.reverse-casting.com

Source : Optical Transceivers for Datacom & Telecom Market 2021 report, Yole Development, 2021
http://www.yole.fr/Optical_Transceivers_Datacom_And_Telecom_Update_2021.aspx

Optical Transceiver Type

[PCB condition]

- Size/Layer: 72*20*1.0mm / 4+2+4 (100G)
75*20*1.0mm / 5+2+5 (200G)
78*20*1.0mm / 5+2+5 (400G)

100G/200G

QSFP

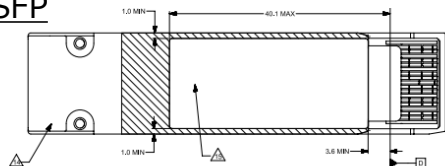
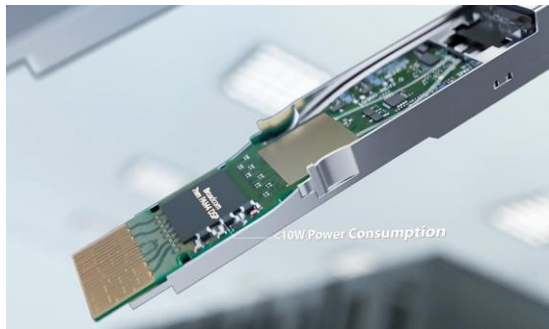
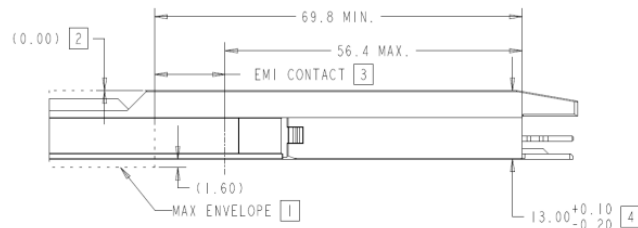
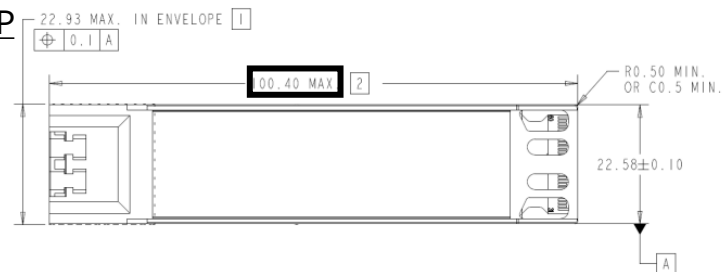


Figure 42: Drawing of the QSFP-DD module



400G

QSFP

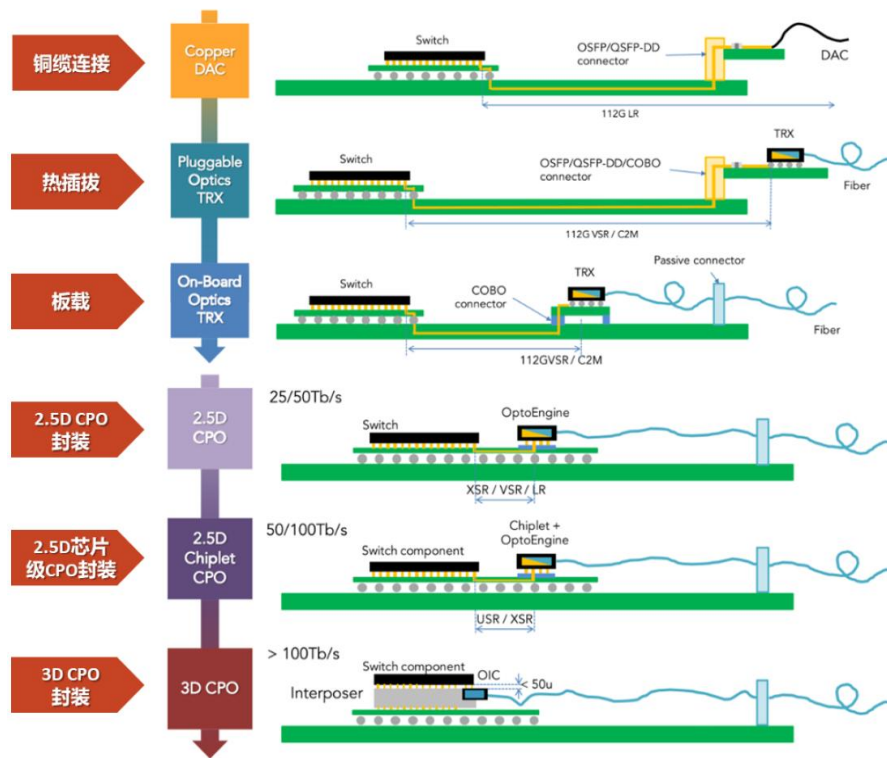


NOTES:

(1) FRONT OF THE MODULE, PULL TAB AND OTHER COMPONENTS CAN EXTEND 1.6MM MAX FROM THE BOTTOM OF THE MODULE AND CAN HAVE UP TO 22.93mm WIDTH IN THE MAX ENVELOPE SHOWN.

Optical module tech. trend

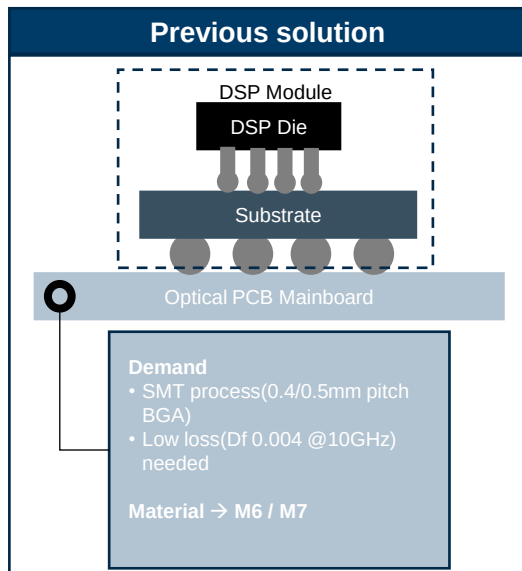
- Optical module packaging trend



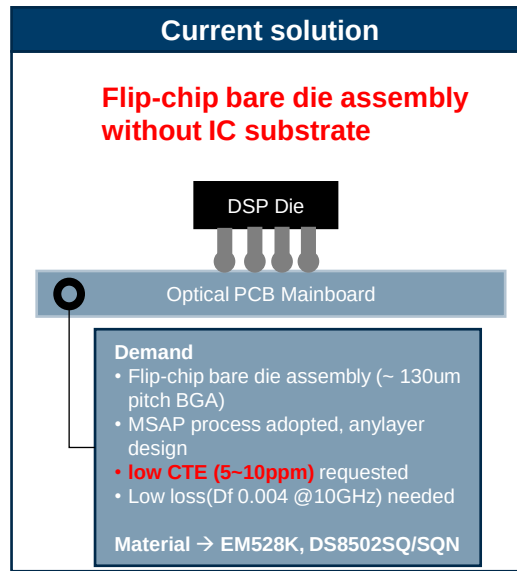
Optical module tech. trend



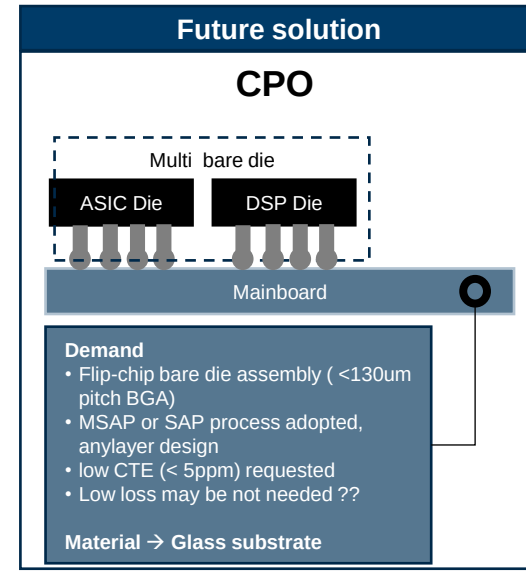
- **Advantages of bare die assembly**
 - 30% total cost down compare with PKG assembly.
 - Better signal loss performance due to without IC substrate trace.
- **“Flip-chip bare die assembly” is the main method for high-end optical module, which request low CTE optical PCB to ensure the reliability of solder bump.**



- 100G, 200G, 400G
- 800G (20%)



- 800G (80%)
- 1.6T



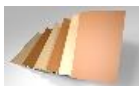
- 3.2T
- 6.4T ?

Optical module tech. trend

ITEM	2020	2021	2022	2023	2024	2025	2026	2027	2028
Speed	25.6 Tb/s 56Gbps 51.2T b/s 112Gbps 102.4 Tb/s 224Gbps 204.8T ? 448Gbps?								
Switch Chip	Tomahawk 4		Tomahawk 5			Tomahawk 6?			Tomahawk7 ?
Optical Module	QSFP56 200G								
	QSFP-DD		QSFP112 400G						
	OSFP		OSFP 800G						
						OSFP-XD 1.6T			
						OSFP-XD			OSFP-XD 3.2T

Panasonic
INDUSTRY

PCB Material



MEGTRON6

Halogen-free
MEGTRON6

MEGTRON7

Under Development
R-5393

MEGTRON8

Under Development
NEXT R-5393

Panasonic Low Loss Material for Optical Transceiver

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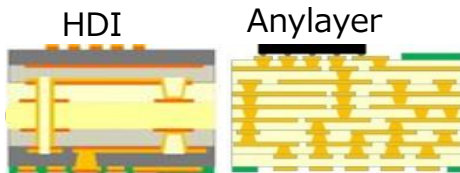
100GE 28Gbps(12.89GHz)	200GE 56Gbps(14GHz)	400GE 56Gbps(14GHz)	800GE 112Gbps(28GHz)
L/S 50/50um Via Φ100um	L/S 50/50um Via Φ100um	L/S 50/50~40/40um Via Φ80~100um	L/S 30/30 um Via Φ60~65 um

MEGTRON6



Halogen-free
MEGTRON6 (E)

PCB Construction



- PTH, HDI, Anylayer
- 8~16L

MEGTRON7 (GE)

 **R-5393**

MEGTRON7 (N),(GN)

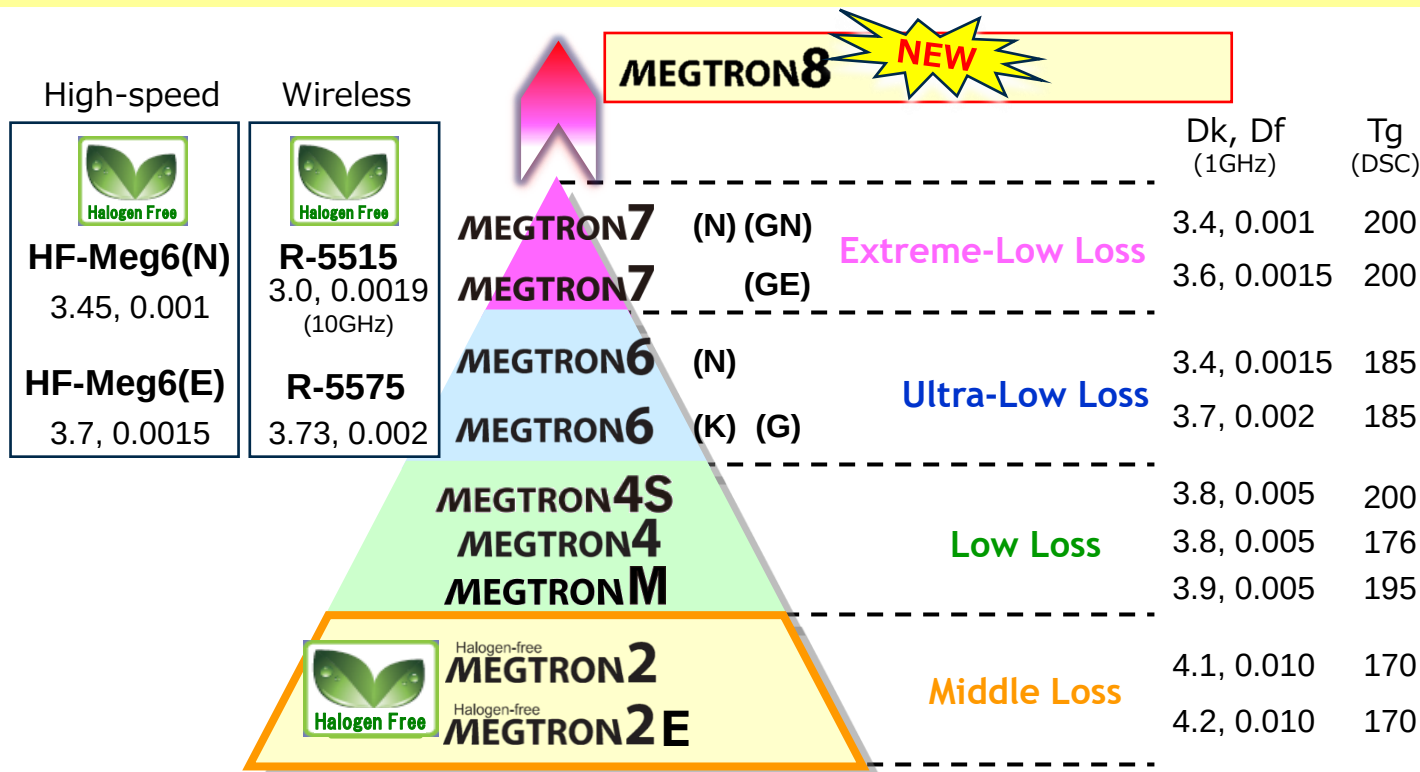


Halogen-free
MEGTRON6 (N)

Low Loss Material Line-up

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- ◆ Panasonic productions low Dk,Df multi-layer materials for high speed and wireless applications.
- ◆ New ultra-low loss material MEGTRON 8 will be released.



The above data is actual values and not guaranteed values.

Panasonic
INDUSTRY