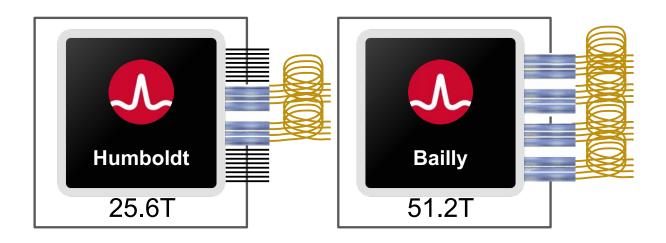


# SILICON PHOTONICS AND CO-PACKAGED OPTICS

8<sup>TH</sup> EDITION | MAY 2022



Source: Broadcom



# **Table of Contents**

Α	bstract	4
E	xecutive Summary	5
	Market forecast for co-packaged optics	7
С	hapter 1: Photonic Integrated Circuits and Co-Packaged Optics	9
	Optical transceivers	9
	Optical cables and interconnects	. 11
	Defining integration	. 14
	Market size for discrete and integrated optical transceivers	. 15
	Monolithic integration of optics with electronics	. 17
	Monolithic integration in other materials	. 19
	Hybrid integration and co-packaging	. 19
	Optics Co-packaged with switching ASICs	. 20
	Near Packaged Optics (NPO)	. 22
	Co-Packaged Optics for Al Clusters and HPCs	. 24
	Market forecast for co-packaged optics by application	. 27
С	hapter 2: Indium Phosphide-Based Technology, Products, and Markets	. 29
	Main applications and market segments	. 29
	Technology and manufacturing	. 31
	Integrated DWDM products	. 34
	Integrated Ethernet products	. 38
	Integrated FTTx products	. 40
	Market forecast for discrete and integrated InP products	. 42
С	hapter 3: Gallium Arsenide-Based Technology, Products and Markets	. 47
	Main applications and market segments	. 47
	Technology and manufacturing	. 49
	Integrated VCSEL products	. 50
	Market Forecast for discrete and integrated GaAs products	. 52
С	hapter 4: Silicon Photonics Technology, Products and Markets	. 56
	SiP technology	. 57
	Integration of lasers on Silicon	. 60



## SILICON PHOTONICS AND CO-PACKAGED OPTICS | MAY 2022

	Examples of Hybrid Integration (Flip Chip Bonding)	. 62
	Examples of heterogeneous INtegration (wafer bonding)	. 64
	SiP products for Ethernet and AOC/EOM applications	. 68
	Market data and Forecast	. 70
	SiP-based DWDM products	. 71
	The bottom line	. 73
С	hapter 5: Lithium Niobate (LiNbO <sub>3</sub> ) based technology and products	. 75
	Why is Thin Film LiNbO3 different?	. 77
С	hapter 6: Silicon Photonics Supply Chain	. 79
	The foundry model emerges	. 79
	Laser INtegration at Foundries	. 80
	AIM Photonics	. 82
	AMF	. 84
	CEA-Leti	. 85
	Global Foundries	. 86
	iMEC	. 89
	Intel	. 90
	Tower Semiconductor	. 91
	TSMC	. 92
	VTT	. 93
	Other foundries	. 93



### **Abstract**

This report provides an in-depth analysis of the impact of silicon photonics (SiP) on the market for optical transceivers and related components in 2016-2021. It also presents a forecast for shipments and sales of discrete and integrated products based on InP, GaAs, SiP and LiNbO<sub>3</sub> technologies for 2022–2027. The forecast is segmented by main applications, including Ethernet, WDM, Wireless Fronthaul/Backhaul, Fibre Channel, FTTx, Active Optical Cables (AOCs), Embedded Optical Modules (EOMs) and Co-Packaged Optics (CPO). Products are sorted by data rate, reach, and form factor into more than 150 categories. The report also discusses the supply chain for SiP products, including profiles of the leading foundries.

Adoption of CPO is discussed in detail, including use cases in datacenters, Al Clusters and HPCs.

**LightCounting** is a market research company focused on the in-depth study of high-speed interconnects for the datacom, telecom, and consumer communications markets. Our research covers the whole supply chain from optical and semiconductor components, to modules, subsystems and their applications in telecom and datacom systems.

This LightCounting market report contains material that is a confidential, privileged, company product for the sole use of the intended recipients being LightCounting clients and subscribers. Any review, reliance on or redistribution by others or forwarding without LightCounting's expressed permission is strictly prohibited.

#### **LightCounting Market Research**

7726 Gunston Plaza, Unit 1480, Lorton, VA 22199 www.lightcounting.com | 408-962-4851