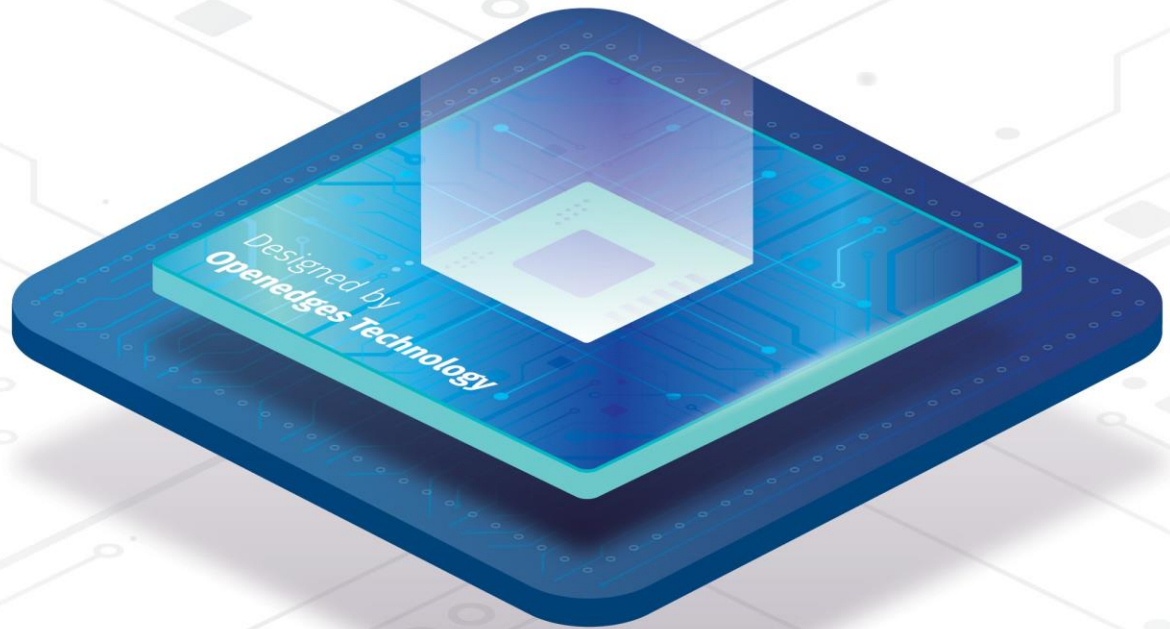


AI for Everyone, Everywhere



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The Future of AI Computing

Table of Contents

CPU, GPU, NPU 등 SoC에
세심한 연구/검증된 기능

Prologue

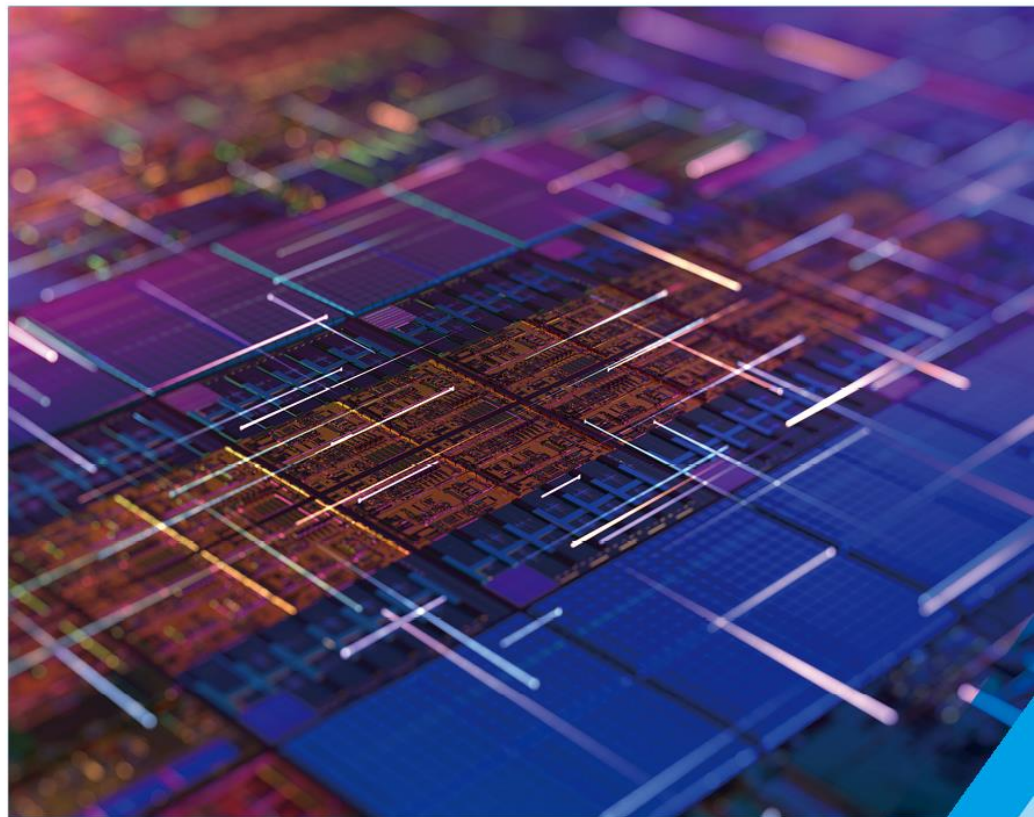
01
Structural Growth of
System Semiconductor
Market

02
OPENEDGES Technology,
as Korea's most renowned
AI semiconductor IP
design company

03
Financials

Prologue

OPENEDGES Technology's Business Areas



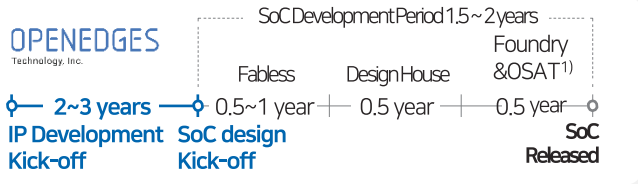
OPENEDGES Technology's Business Areas ①

Semiconductor IP is a ready-made solution requiring high-level technologies that enable faster development of SoC (System on Chip) such as AI semiconductors, reduce costs, and mitigate the risk of failure risks in development that can cost \$100 million



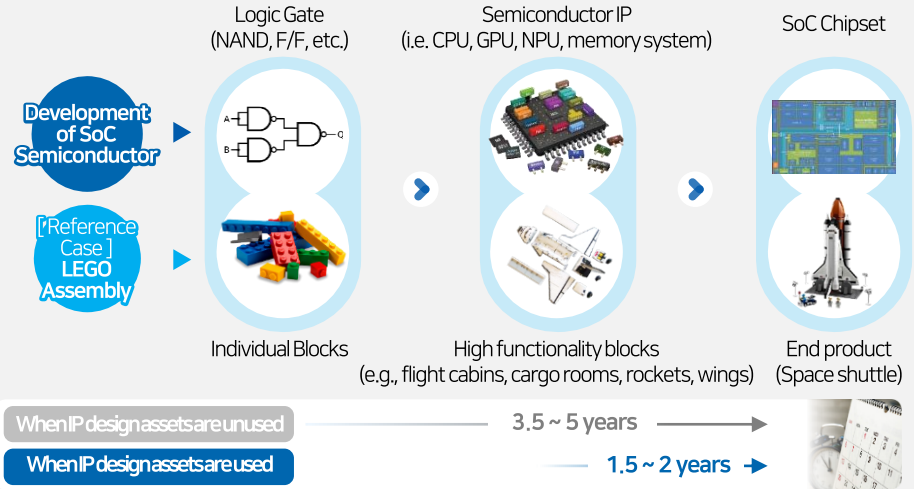
What is Semiconductor IP?

Previously designed/verified function blocks, such as CPU, GPU, and NPU, that can be embedded in SoC

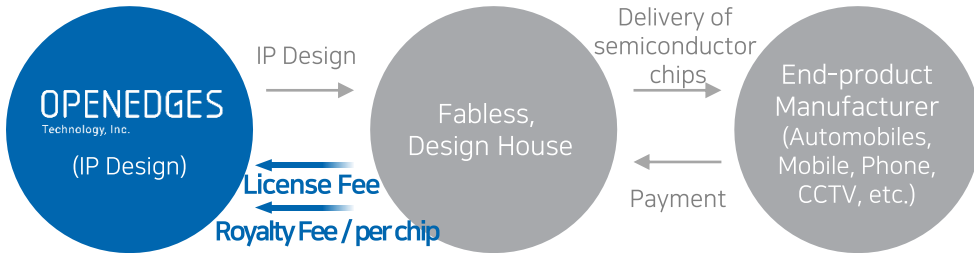


※ Note 1) Outsourced Semiconductor Assembly and Test (Packaging and backend company)

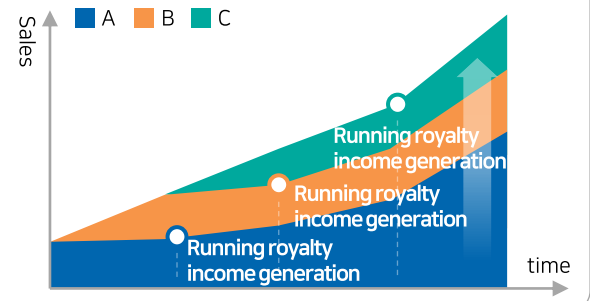
Reduction in SoC design time and cost for fabless companies



Semiconductor IP Business Profit Structure

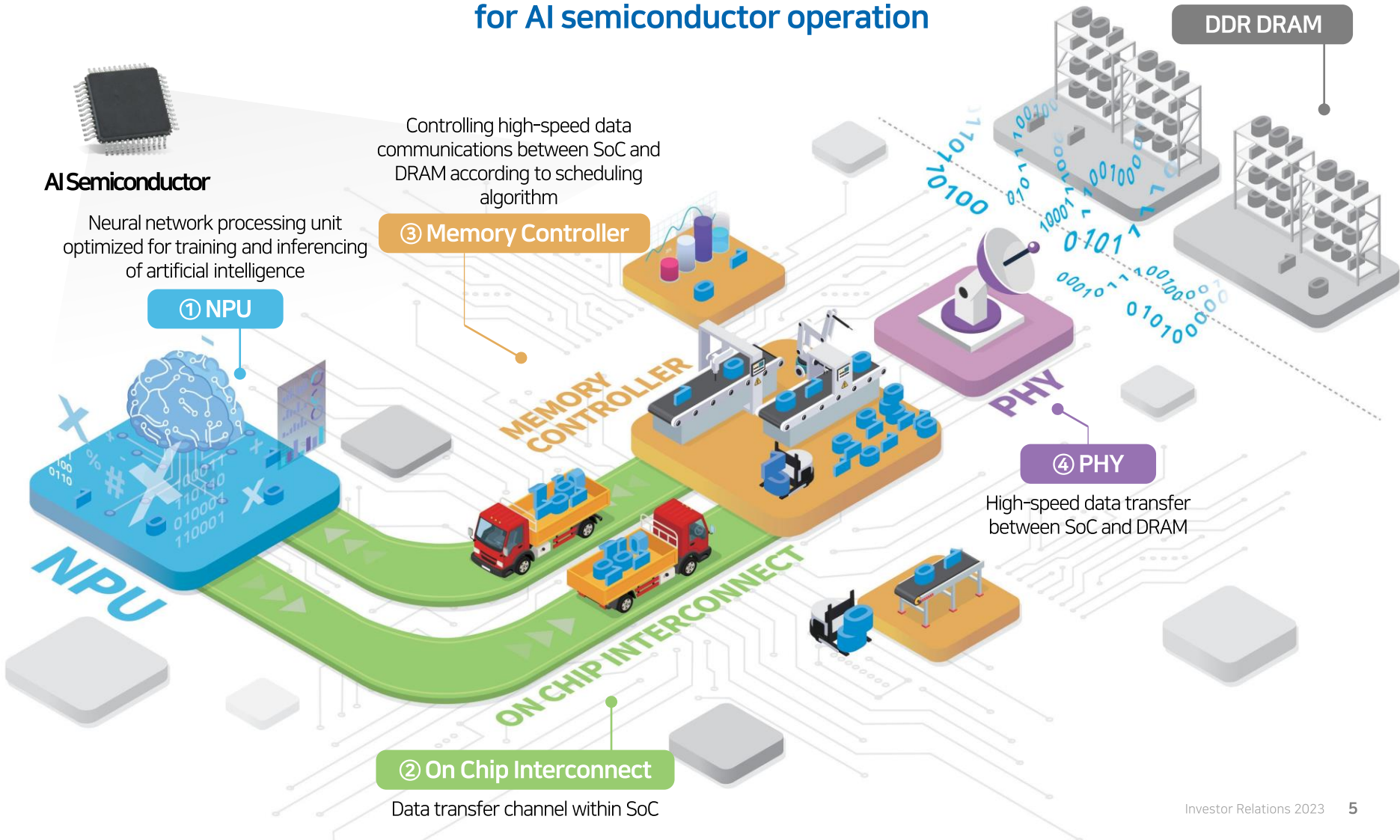


※ The semiconductor IP industry has been oligopolistic, dominated by a few market players due to high technical barriers to entry.



OPENEDGES Technology's Business Areas ②

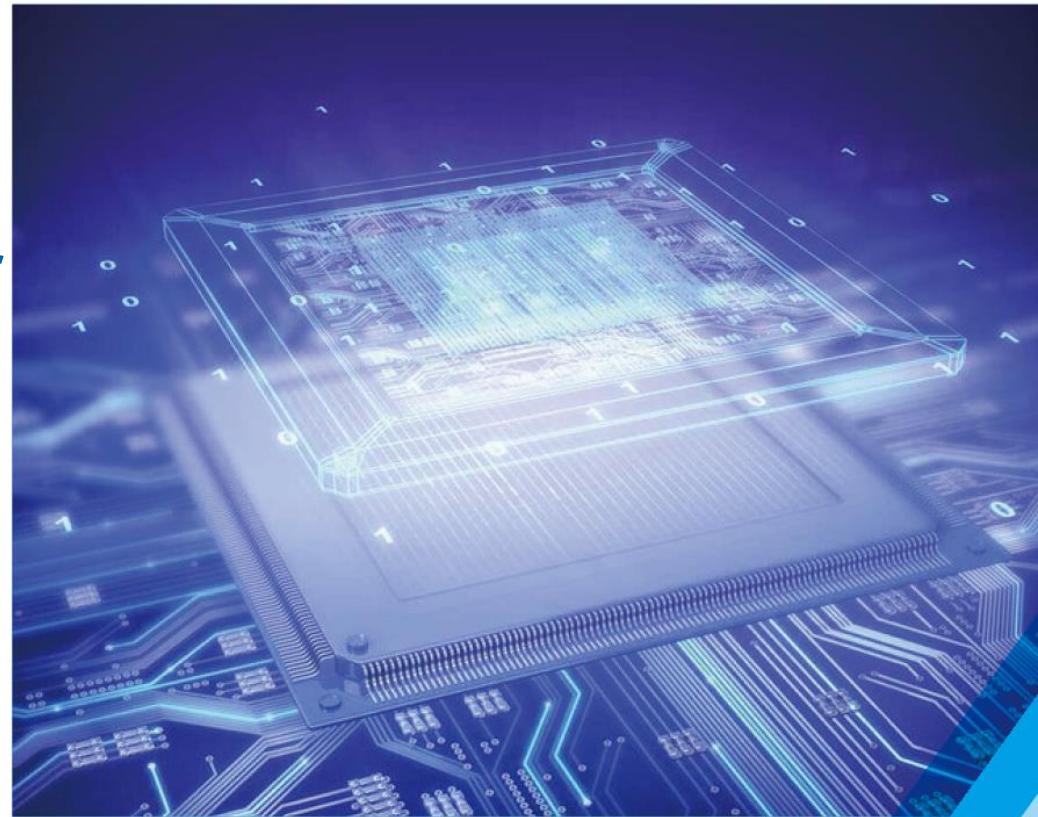
Design and provision of integrated IP solution that serves as a basis for AI semiconductor operation



01

Structural Development of System Semiconductor Market

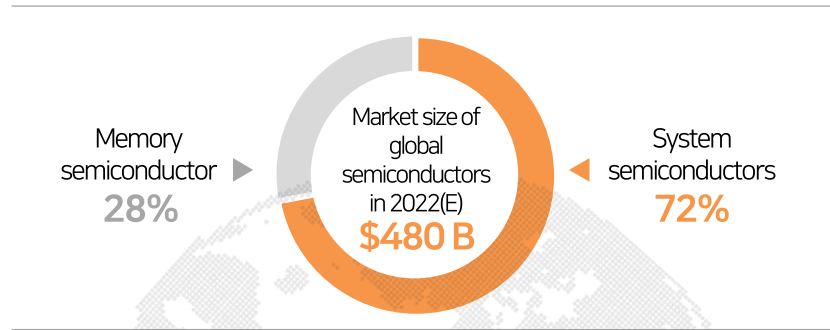
- 01. Growth of AI Semiconductor & IP Market
- 02. Roles of Semiconductor IP Design Company
- 03. Increased Significance of System Semiconductor IP Design
- 04. Korea's Full-fledged System Semiconductor Market Investment



01 | Growth of Global System Semiconductor Market

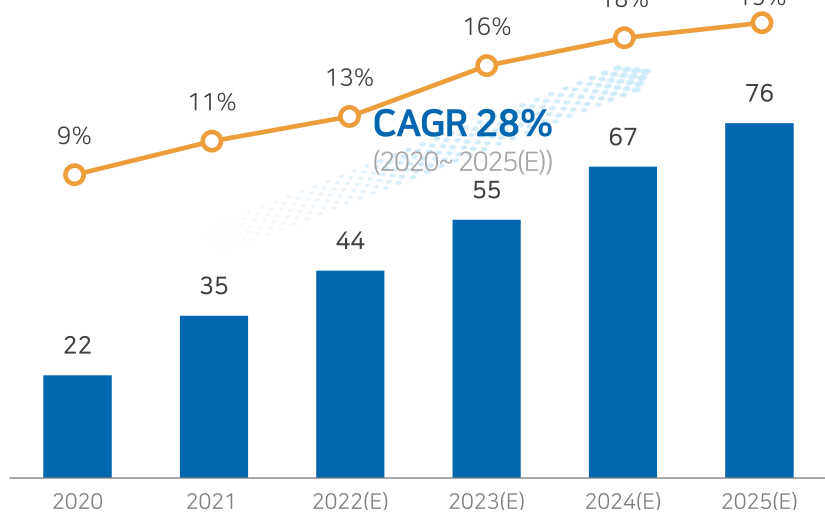
Contrary to memory semiconductors, system semiconductors are continuing their steady growth

Prospects for Global Semiconductor Market during 2018-2023



Prospects and Percentage of Global AI Semiconductor Market

Percentage of AI semiconductor market within the system semiconductor market (Unit: \$ B)
AI semiconductor market size

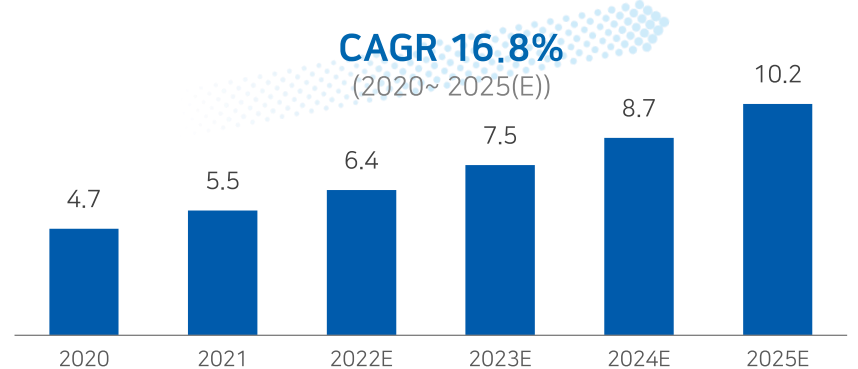


※ Source: AI Semiconductor (Gartner, May 2022)

Global Semiconductor IP market forecast

Company	2022 Sales (\$ M)	CAGR (2018-2022)
arm	2,742	9%
SYNOPTIS®	1,315	16%
cādence®	358	14%
OPENEDGES Technology, Inc.	7.7	107%
Others		11%
Total		14%

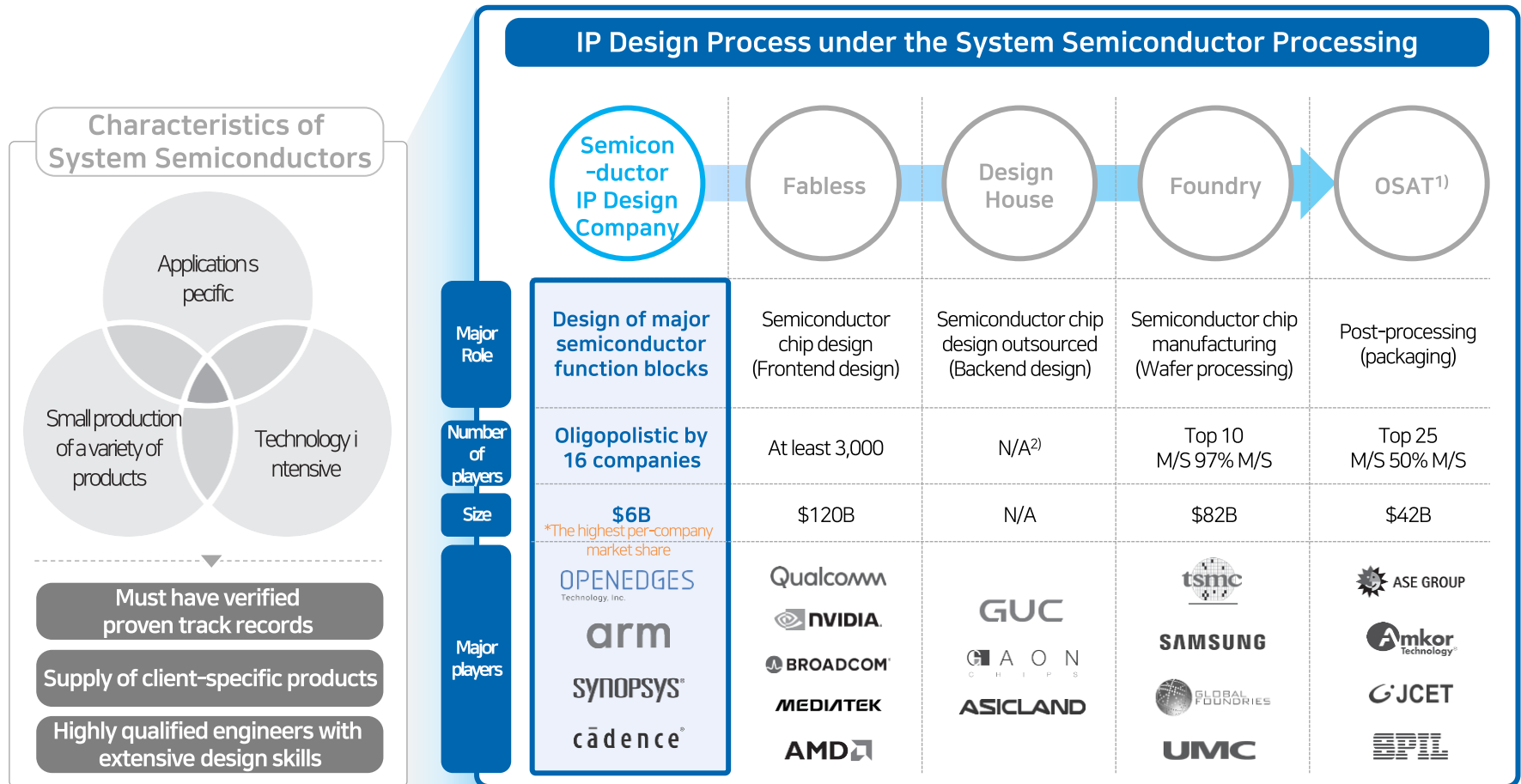
Semiconductor IP market size (Unit: \$ B)



※ Source: IPnest 2022.05, Press Clipping

03 | Roles of Semiconductor IP Design Companies

Semiconductor IP companies aim to develop and supply function blocks as needed by Fabless and Design House in a proactive manner.

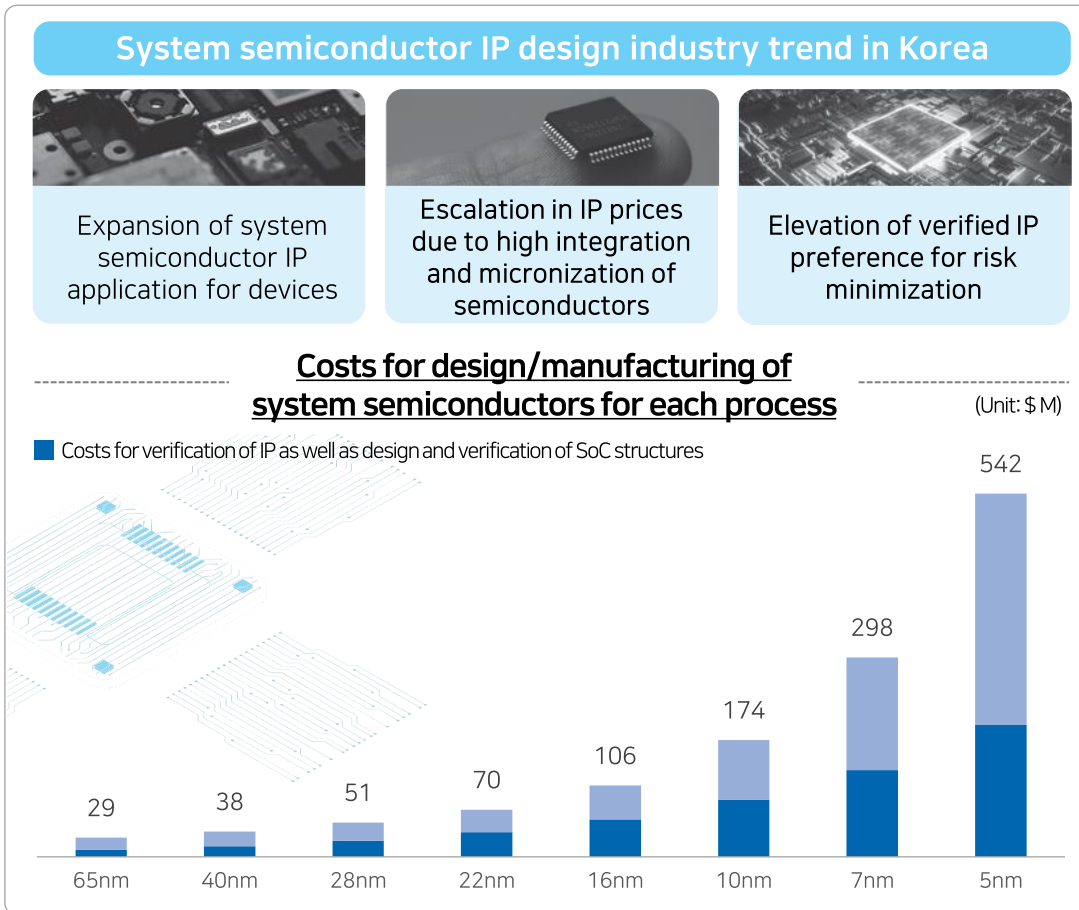


※ Note 1) (Outsourced) Semiconductor Assembly and Test: Semiconductor package assembly and test company that is responsible for performing post-processing after wafer process


Note 2) Design House market does not have a reliable market size data as it is in its initial formation stage.

04 | Increased Significance of System Semiconductor IP Design

The rapid increase of design/manufacturing costs of system semiconductors
 → **Emphasis on the importance of verified IP companies**



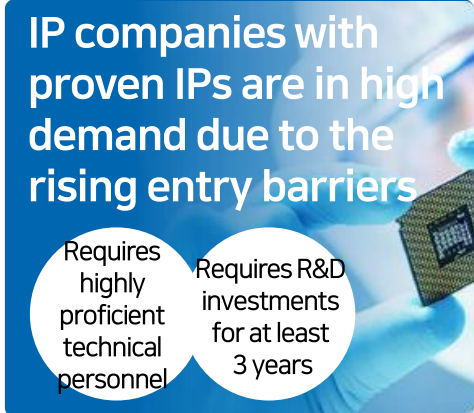
Higher demand for proven IPs



IP companies with proven IPs are in high demand due to the rising entry barriers

Requires highly proficient technical personnel

Requires R&D investments for at least 3 years



※ Source: IBS (International business strategies)

05 | Korea's Full-fledged System Semiconductor Market Investment

Activation of Korea's system semiconductor market by large-scale investment in collaboration by private and public sectors

→ Expected to benefit as the only AI semiconductor IP supplier in Korea

Korean Government's Support

Announcement of the 'strategies for becoming the super-country of semiconductors' (July 21, 2022)

Fullest corporate investment support
Achievement of investment of at least \$26 billion for 5 years

Collaborative workforce training by private and public sectors
Supply 150,000+ talents for 10 years

Procurement of advanced system semiconductor technologies
Global market share: 3% (present) → 10% (2030)

Establishment of table material/part/equipment ecosystem
Self-support rate: 30% (present) → 50% (2030)

Major investment plans (A total of \$2.8B)

Support for design and sale of fabless chip	\$1.2 billion
AI semiconductor	\$1.0 billion (2022-2029)
Semiconductors for automotives	\$0.4 billion (2024-2030)
Semiconductors for electric power	\$0.35 billion (2024-2030)

Samsung Electronics' investment in system semiconductors

Announcement of 'Samsung's future plans for dynamic and innovative growth' (May 24, 2022)

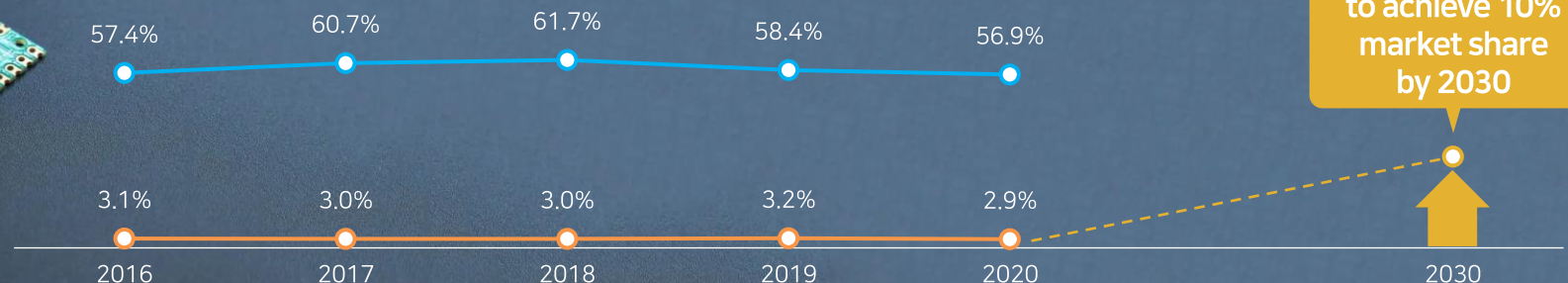
Announcement of investment plans for high-performance/low-power AP, super high-speed communication semiconductor, fabless system semiconductor, image sensor, etc.



Investment of **\$34.6 billion** for five years for the promotion of semiconductors and new projects
(Planning domestic investment of KRW 360 trillion)

Global market share by Korean semiconductors

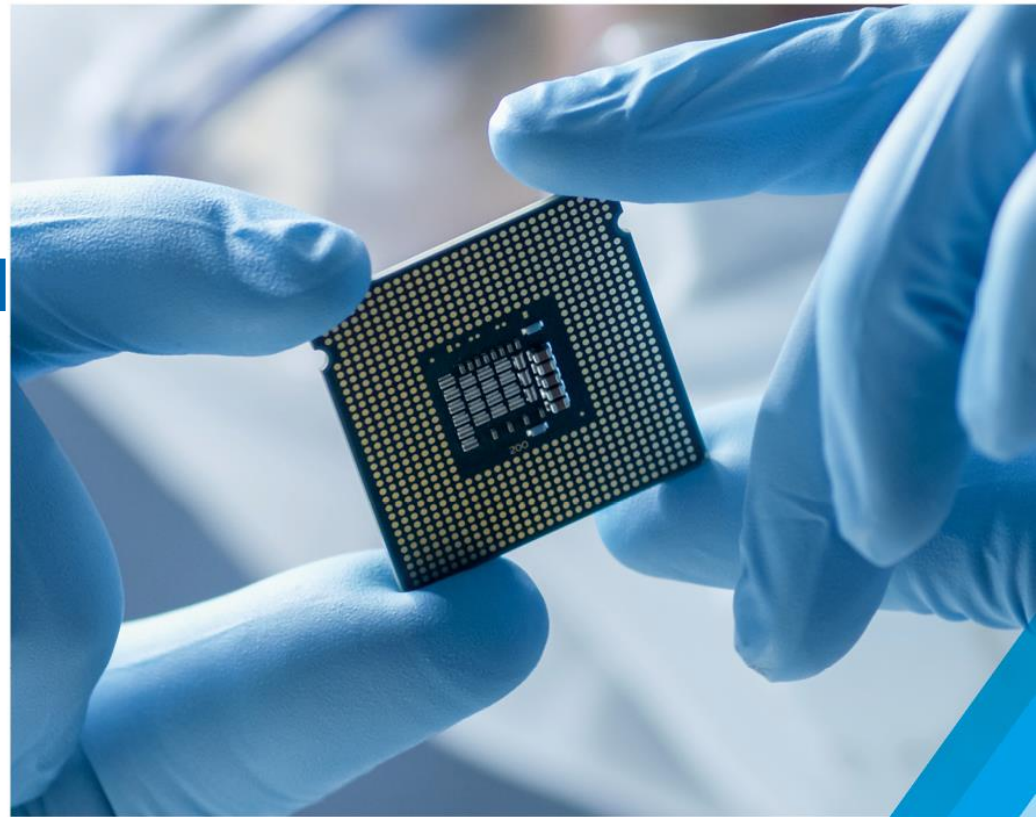
● Memory semiconductor ● System semiconductor



02

OPENEDGES Technology, as Korea's most renowned AI semiconductor IP design company

- 01. The Overview of OPENEDGES's Core Competitiveness
- 02. A Global Team of Professionals
- 03. Industry's Highest Technological Competitiveness
- 04. Verified Global Track Records
- 05. Business Partnership with Global Enterprises



01 | The Overview of OPENEDGES' Core Competitiveness

OPENEDGES hold the key success factors
to become a global leader in the AI semiconductor IP market

01



A Global team of
Professionals



02



Industry's
highest
technological
competitiveness



03



Verified global
track records



04



Strategic
partnership
with global
enterprises



02 | A Global Team of Professionals ① HQ

Leadership of industry-leading experts with over 20 years of experience from Samsung Electronics/SK Hynix, and more.



R&D personnel

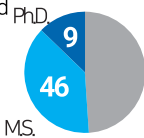
Among the total personnel (132 team members)

79%



Percentage of Ph.D. and MS. degree holders (55 members) among the R&D personnel

50%



Status of Each Country



Sean Lee
Representative Director / CEO

SAMSUNG | SAMSUNG ADVANCED INSTITUTE OF TECHNOLOGY

Ph.D. Candidate in Electrical and Computer Engineering, Seoul National University
 • 2017-Present: Representative Director, OPENEDGES Technology, Inc.
 • 2008-2015: Principal Researcher, Samsung Electronics (Exynos Development)
 • 2007-2008: Samsung Advanced Institute of Technology



Cody Hwang
R&D Center Head / CTO / Co-founder

Codeholics/ codeholics | 대우전자 | Chips&Media

M.S.in Electrical Engineering, Seoul National University
 • 2017-Present: CTO, OPENEDGES Technology, Inc.
 • 2010-2015: CTO, CodeHolics
 • 2000-2010: Daewoo Electronics, Chips&Media



Jake Choi
NPU Team Head

SK hynix | SAMSUNG

Ph.D. in Electrical and Computer Engineering, Purdue University
 • 2018-Present: NPU Team Head, OPENEDGES Technology, Inc.
 • 2015-2018: Principal Researcher, SK Hynix
 • 2009-2014: Architecture Lab Part Head, Samsung Electronics



Henry Moon
Memory controller Team Head

SK hynix | SAMSUNG

M.S.in Computer Engineering, Seoul National University
 • 2018-Present: MC Team Head, OPENEDGES Technology, Inc.
 • 2017-2018: Memory System Laboratory Part Head, SK Hynix
 • 2000-2016: AP Development Team Part Head, Samsung Electronics



Sunny Kim
PHY Team Head

SK hynix | SAMSUNG

M.S.in Electrical Engineering, Sungkyunkwan University
 • 2021-Present: PHY Team Head, OPENEDGES Technology, Inc.
 • 2018-2021: NAND IP Development Team Head, SK Hynix
 • 1998-2017: Principal Researcher, Samsung Electronics



Dean Kim
Verification Team Head

SAMSUNG | MIDAS

Master of Architecture, Seoul National University
 • 2022-Present: Verification Team Head, OPENEDGES Technology, Inc.
 • 2005-2022: Digital Technology Team Part Head, Samsung Electronics
 • 2001-2005: MIDAS IT



Eric Jung
System Architecture Team Head

Imagination | D | Chips&Media

B.S. in Electronic and Electrical Engineering, Kyungpook National University
 • 2018-Present: SA Team Head, OPENEDGES Technology, Inc.
 • 2013-2018: Lead Engineer, Imagination Tech.
 • 2003-2013: DM Technology, Chips&Media



Ethan Kim
NoC Team Head

Chips&Media | adc

Ph.D. in Computer System Engineering, Korea University
 • 2021-Present: NoC Team Head, OPENEDGES Technology, Inc.
 • 2009-2021: SW Development Team Head, Chips&Media
 • 2000-2009: Advanced Digital Chips, Inc. (Adchips)

※ As of the end of March 2023

02 | Global Team of Professionals ② Global Networks

With the leading expertise of professionals from global networks with extensive experience

Starting with the HQ in 2017, OPENEDGES launched its global semiconductor IP strategy by making its presence in Canada and the United States, collaborating with semiconductor experts from both sides of the border.



Richard Fung
TSS/CEO

AMD | PERASO

- M.S. in Electrical and Electronic Engineering, Univ. of Toronto
- 2018-Present: CEO, The Six Semiconductor
- 2012-2018: Silicon Director, etc., Peraso Technologies
- 2000-2011: PHY Analog Design Manager, AMD



Ricky Lau
TSS/CTO

AMD | SYNOPSYS

- M.S. in Electrical and Electronic Engineering, Univ. of Toronto
- 2018-Present: CTO, The Six Semiconductor
- 2014-2018: PHY Digital Design Engineer, Synopsys
- 2003-2014: PHY Analog Design Engineer, etc., AMD



Ron Chan
TSS/COO

pixelworks | ATI

- M.S. in IC Design, Hong Kong Univ.
- 2018-Present: COO, The Six Semiconductor
- 2006-2016: Principal Engineer, Pixelworks
- 2001-2006: Senior Engineer, ATI Tech.



Alan Poon
TSS/VP Engineering

AMD | PERASO

- M.S. in Application Engineering, Univ. of Toronto
- 2019-Present: The Six Semiconductor Full Design Custom VP Engineering
- 2004-2019: Peraso Technology, AMD, etc.



Jason Mangattur
TSS/VP Engineering

AMD | SYNOPSYS | ATI

- B.S. in Electronic Engineering, Waterloo Univ.
- 2022-Present: Applied Eng. & IP Val. VP Engineering, The Six Semiconductor
- 1999-2021: Synopsys, AMD, ATI Tech., etc.



Nisreen Atout
TSS/Director of Program Operations & System Engineering

Rambus | SEMTECH | AMD

- B.S. in Electrical Engineering, Univ. of Toronto
- 2022-Present: Director of Program Operations & System Engineering, The Six Semiconductor
- 2016-2022: Director of Systems Engineering, Rambus
- 2006-2016: AMD, Semtech, etc.



Moez Cherif
OTC/Software Group Leader

ARTERIS IP | MAGMA | SYNOPSYS

- Ph.D. in Computer Science, INPG Univ.
- 2021-Present: S/W Group Head, U.S. entity of OPENEDGES Technology
- 2018-2021: Principal S/W Architect, Arteris IP
- 1995-2017: Synopsys, Magma Design Automation, etc.



Roger Jennings
OTC/VP of Engineering

ARTERIS IP | AMD | intel

- M.S. in Electrical and Electronic Engineering, Univ. of Memphis
- 2022-Present: VP of Engineering, U.S. entity of OPENEDGES Technology, Inc.
- 2020-2022: Arteris IP Senior Director of Engineering
- 2000-2021: Intel, Juniper Networks, AMD etc.

02 | A Global Team of Professionals - Global Presence

Seeking Global Expansion for the International hubs



Korea HQ

(Gangnam-gu, Seoul)

Openedges Technology Inc.

Date of establishment	December 2017
Number of employees	83 team members (as of the end of December 2022)
CEO	Sean Lee
Major roles	NPU, On-chip Interconnect, Memory Controller, development of DDR PHY IP, and general management of global sales



U.S. Subsidiary

(San Jose, California)

OPENEDGES Technology, Corp. (OTC)

Date of establishment	July 2021 (100% contributed establishment)
Number of employees	8 team members (as of the end of December 2022)
CEO	Jayden Seo (concurrent office held by the headquarters' VP)
Major roles	On-chip Interconnect, DDR PHY, development of high-performance NP U IP, and sales hub for the North America regions



Canada Subsidiary

(Markham, Ontario)

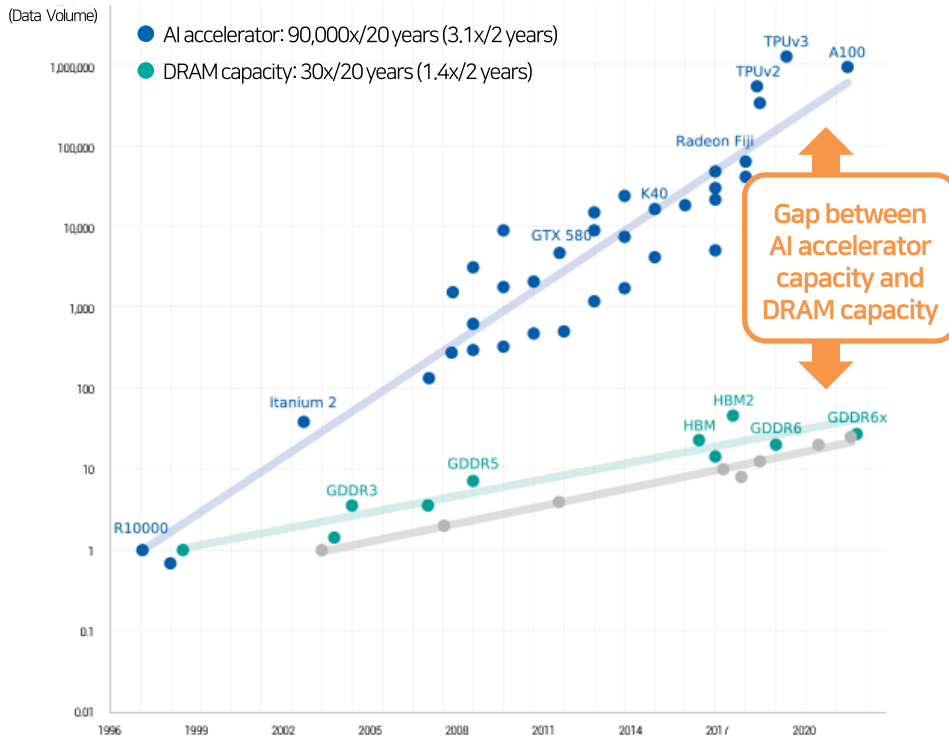
THE SIX SEMICONDUCTOR, Inc. (TSS)

Date of establishment	June 2018 (100% acquisition in December 2019)
Number of employees	41 team members (as of the end of December 2022)
CEO	Richard Fung (Co-Founder)
Major roles	Development of DDR PHY IP

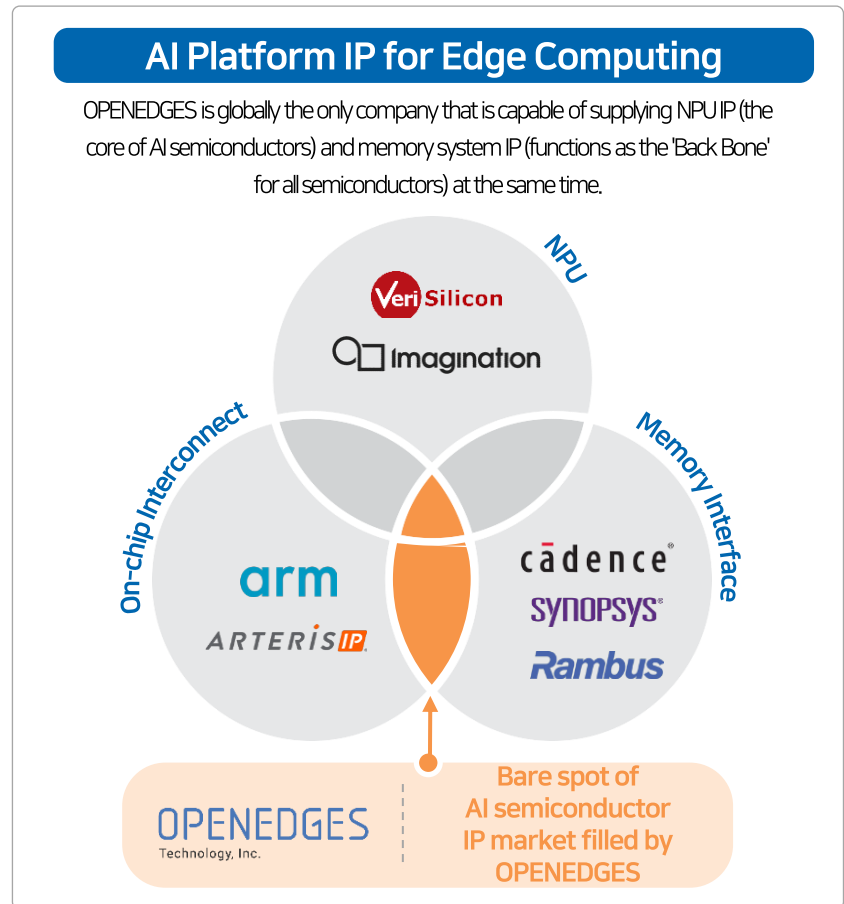
03 | Industry's Highest Technological Competitiveness ①

AI semiconductors are characterized as 'Data Intensive Computing'
 → **Most optimize NPU and memory systems in edge AI with limited resources**
 OPENEDGES is the only global leading AI semiconductor IP platform provider

The gap between the required data processing volume and the capacity provided by DRAMs has increased due to the development of AI accelerator technologies

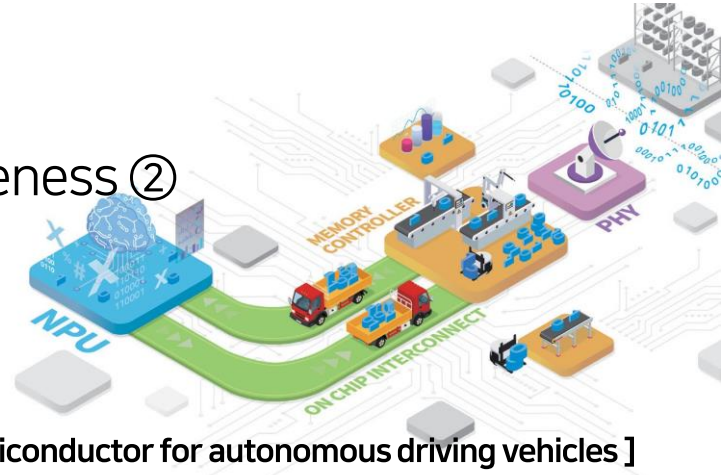


※ Source: AI And Memory Wall By Riselab

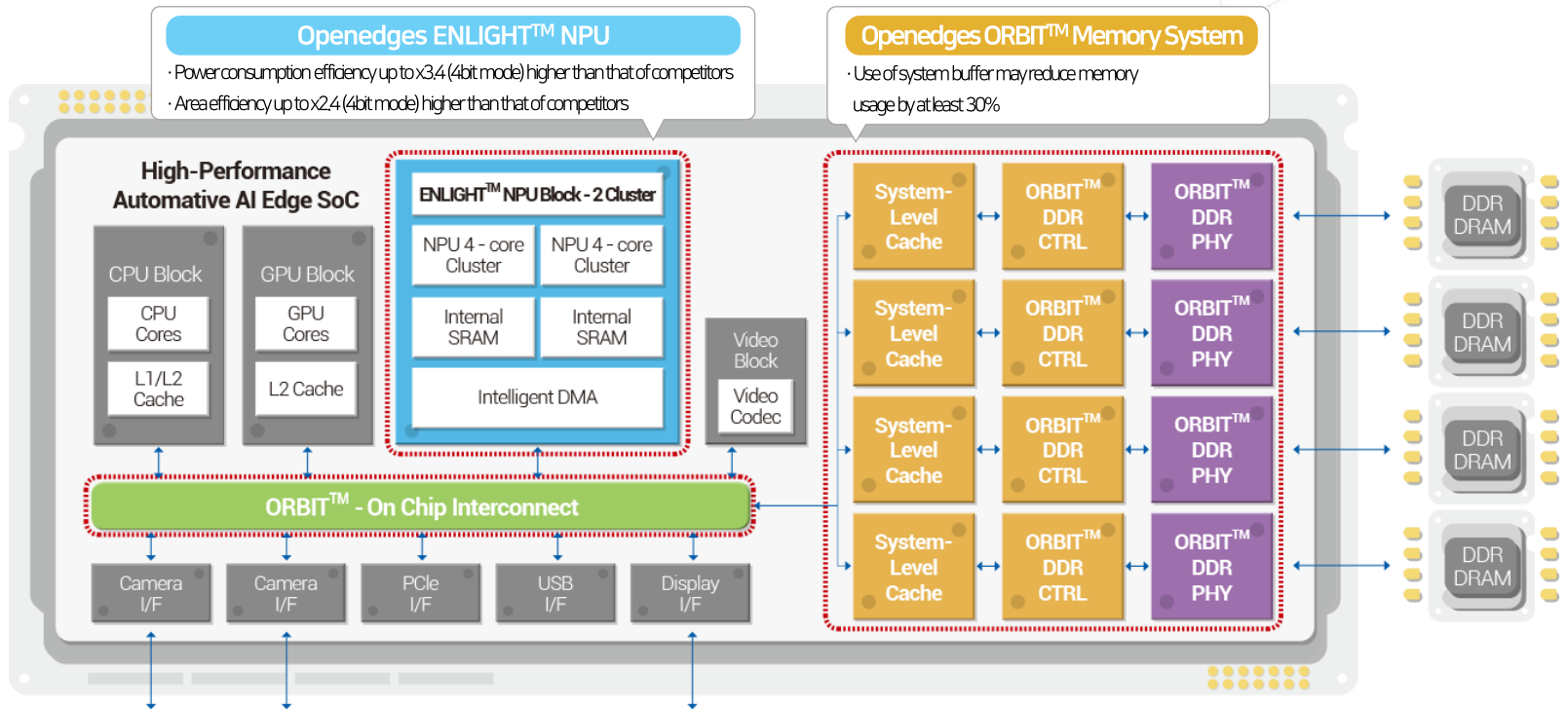


03 | Industry's Highest Technological Competitiveness ②

A leading AI semiconductor IP platform provider, OPENEDGES provides higher efficiencies in power, size, and memory compared to its competitors



[Examples showing OPENEDGES' integrated IP solutions applied to the AI semiconductor for autonomous driving vehicles]



03 | Industry's Highest Technological Competitiveness ③

Leading the market through the development of cutting-edge technology

Division	IP	Description	Development status	Remark
AI Platform IP Solution for Edge Computing	ENLIGHT™ (Neural Processing Unit)	ENLIGHT™-L (1st gen. a.k.a v1.0)	Now	Lightweight IoT applications (Keyword recognition, security camera application)
		ENLIGHT™-R (2nd gen. a.k.a v2.0)	Now	Intermediate IoT applications (ADAS)
		ENLIGHT™-P (3rd gen. a.k.a v3.0)	In the process	Automotive high-performance applications (Level 3 or higher self-driving vehicle application)
		ENLIGHT™-X (4th gen. a.k.a v4.0)	In the future	Automotive high-performance applications (Level 4 or higher self-driving vehicle application)
Total Memory System Solution IP (ORBIT™)	OMC™ (DDR Memory Controller)	DDR4/3, LPDDR4X/4/3	Now	Current Mainstream Technology
		LPDDR5X/5/4X/4	Now	Next-generation Mainstream Technology
		LPDDR6	In the future	Next-generation Mainstream Technology
		DDR5	In the process	Next-generation Mainstream Technology
		GDDR6	Now	High-performance AI product
		GDDR7	In the future	High-performance AI product
		HBM3	Now	Server and ultra-high-performance products
	OPHY™ (DDR PHY)	LPDDR4X/4	Now	TSMC 22nm Nodes
		LPDDR4X/4, LPDDR5/4X/4	Now	TSMC 12nm Nodes
		LPDDR5X/5/4X/4	Test chip	TSMC 7nm Nodes
		LPDDR6	In the future	-
		DDR5	In the future	-
		GDDR6	Now	TSMC 12nm Nodes
		HBM3	Test chip	TSMC 7nm Nodes
		LPDDR4X/4, LPDDR5/4X/4	Now	Samsung 14nm Nodes
		LPDDR5X/5/4X/4	In the process	Samsung 5nm Nodes
		LPDDR6	In the future	-
GDDR7	In the future	-		
OIC™ (On-Chip-Interconnect)	OIC™	Now	Non- Cache-Coherent NoC	
	OIC™-AI	In the process	Cache-Coherent NoC	

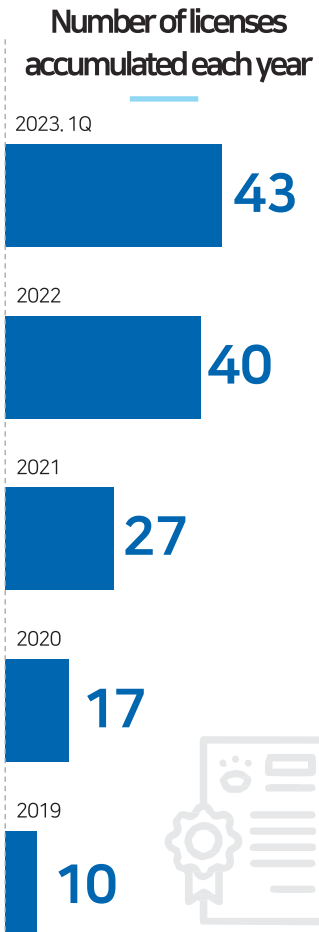
03 | Industry's Highest Technological Competitiveness ④

Maximize first-mover advantage of AI semiconductor integrated IP solutions, based on the continued development of leading-edge processing

Expected Launching Date	2021		2022		2023		2024		2025	
	1H	2H	1H	2H	1H	2H	1H	2H	1H	2H
ENLIGHT™ Neural Processing Unit	NPU v1.0		NPU v2.0				NPU v3.0 Autonomous Driving		NPU 4.0 Autonomous Driving	
	[Performance] 0.25~2 TOPS [TargetProduct] Light-weight IoT application products (keyword recognition, security camera application)		[Performance] 2~16 TOPS [TargetProduct] Medium or higher level of IoT application products (autonomous driving auxiliary application)		[Performance] 16~250 TOPS [TargetProduct] High-performance application products for vehicles (Application of autonomous driving vehicles with Level 3 or higher)		[Performance] 250~1,000 TOPS [TargetProduct] High-performance application products for vehicles (Multi-Die version application of autonomous driving vehicles with Level 4 or higher)			
OIC™ On-Chip Interconnect	OIC v.1.X					OIC v.2.0		OIC-AI		
OMC™ Memory Controller	GDDR6	LP5X/5 /4X/4		HBM3	DDR5					
OMC™ Memory Controller + OPHY™ DDR PHY	SAMSUNG 	LP4/4X/5 (14nm)				LP4X/5/5X (5nm)		HBM3 (4nm)	LP5X/6 (4nm)	
	tsmc 		LP4/4X/5 (12nm) GDDR6 (12nm)	LP4/4X/5 (22nm)	HBM3 (7nm)	LP4X/5/5X (7nm)		LP5X/6 (5nm) DDR5 (4nm)		
OPHY™ PHY Die to Die (Chiplet)	SAMSUNG 								OPHY-D2D (5/8nm)	
	tsmc 								OPHY-D2D (6nm)	

04 | Verified Global Track Records

Expanding global track record as value recognized as the essential solution in various industries



Intelligent security camera

VISIONEXT nextchip
eyenix dNP

Server/storage devices

novachips SAMSUNG
ASICLAND GLENFLY
Global company I

**Autonomous driving/
In-vehicle face recognition**

AISIN Telechips
nextchip GAON

IoT / Mobile

JLQ MONTAGE
SENSComm GCT

AI

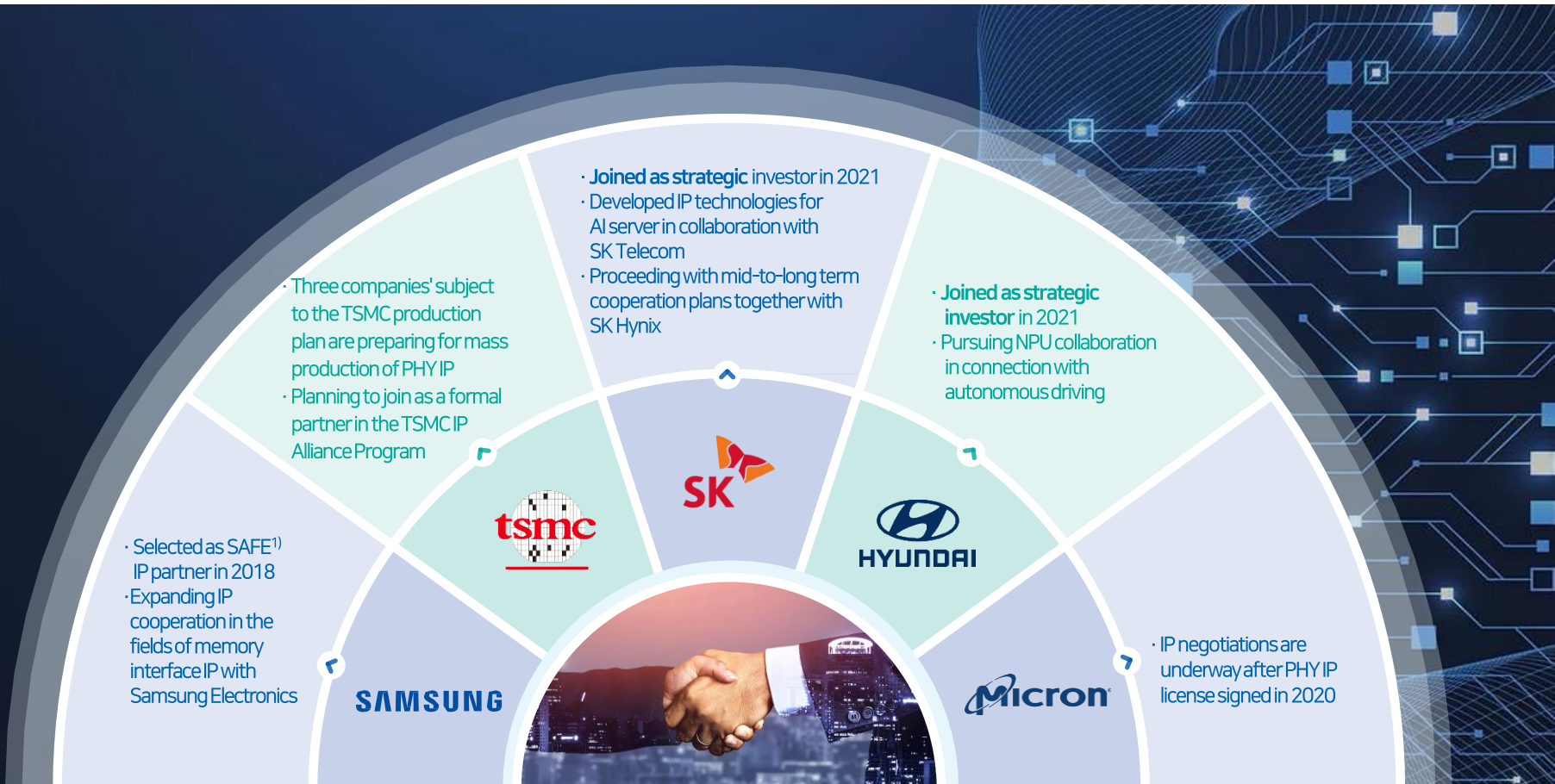
Micron StarFive
SemiFive DeepX

Others (drones, PC, etc.)

LX Semicon
ASICLAND EYE

05 | Business Partnership with Global Enterprises

Securing stable IP demands + Proactive response to advanced technologies and market trends



※ Note 1) SAFE (Samsung Advanced Foundry Ecosystem)

03

1Q23 Financials

- 01. Financial Statement Summary
- 02. 1Q23 Performance Analysis
- 03. Development Status by IP Type



01 | Financial Statements Summary

Summary of Financial Statements

(Unit: KRW 1 million)

	2023 1Q	2022	2021	2020
Current Assets	34,484	44,304	29,020	6,216
Non-current Assets	11,176	9,552	7,077	4,075
Total Assets	45,660	53,855	36,097	10,291
Current Liabilities	17,126	18,318	9,171	5,477
Non-current Liabilities	3,450	3,288	6,374	31,550
Total Liabilities	20,577	21,606	15,545	37,027
Capital	2,116	2,116	1,653	15
Capital Surplus	96,388	96,376	58,927	-
Other Capital	2,479	2,026	3,006	1,697
Earned Surplus	- 5,900	-68,269	-43,034	-28,449
Total Capital	25,083	32,249	20,552	-26,737

※ Based on the consolidated financial statements

Summary of Income Statements

(Unit: KRW 1 million)

	1Q23	4Q22	Change	Change(%)
Sales	1,059	1,426	-367	-25.7
Sales Cost	-	-	-	-
Gross Margin	1,059	1,426	-367	-25.7
Sales Management Expenses	8,801	14,344	-5,543	-38.6
Operating Profits	- 7,742	-12,918	5,176	N/A
Financial Profits	415	365	50	13.7
Financial Costs	331	197	134	68.0
Other Profits	43	422	-379	-89.8
Other Costs	19	33	-14	-42.4
Net Profit before Corporate Tax Costs	-7,634	-12,362	4,728	N/A
Corporate Tax Costs	-4	383	-387	N/A
Current Net Income	- 7,631	-12,745	5,114	N/A

※ Based on the consolidated financial statements

02 | 1Q23 Performance Analysis

**Due to the global recession, orders are delayed by one to two quarters
By increasing orders in the second half of the year,
it is expected to do its best to achieve the goal originally planned for listing.**

1Q23 Performance Analysis

□ Due to the rapid global recession from the second half of 2022, new SoC development projects are postponed

* System-on-Chip, takes about 2 years from start of development to mass production

- Recently, new SoC R&D investment due to a lack of investment funds due to a sharp decline in profits and deteriorating cash flow has been delayed
 - Funding delays due to recession also exacerbated SoC start-up delays
 - In situations where major contract conditions such as price have been agreed with multiple clients, IP license postponed due to delays in securing development funds for Fabless
- Ex.) Company A in China, Company B in Germany:
'23.1Q → Contract postponed to the second half of 2023
→ We are still discussing the timing of the contract, but several contract signings with potential clients have been delayed

Orders and Sales Forecast after 2Q23

□ In the second half of the year, development projects currently pending are expected to start.

- As the client's PJT has not been canceled or dropped, about 70% of the clients that have been negotiating since the beginning of remain as order candidates.중

Current status of order candidates

	Contract	PJT Drop	Lost	Remain	Total
Status (%)	4 (22%)	0 (0%)	2 (11%)	12 (67%)	18 (100%)

- Including existing negotiations, contract negotiations are currently underway with more than 20 domestic and foreign customers.

□ The key points are to get higher price orders and to secure global customers.

- ASP per orders will be increased
 - due to IP total solution + latest memory standard IP
- * Single IP → Expansion of 2~3 IP supply * LPDDR5X, DDR5, etc
- Expecting to secure customers(US/China/Japan)
 - Signed contracts with Aisin(Japan) and IDM(Korea)
 - Negotiating with top-tier companies in China/US

03 | Development Status by IP Type

• Status by IP

ENLIGHT™ (Neural Processing Unit)

V3.0 development in progress

- 16~250 TOPS target/Application requiring higher calculation
- Aiming to complete development by '24.1H
- Expanding flexibility for meeting various customer needs

OIC™ (On-Chip-Interconnect)

V2.0 Upgrade in progress

- Aiming to complete the upgrade by the end of 2023
- Improving performance and customer convenience
- Expecting to contribute to sales from 2024 after upgrade

OMC™ (DDR Memory Controller)

DDR5 memory standard memory controller development in progress

- Developed GDDR6, HBM3, LPDDR5X memory controller
- Will develop DDR5 memory controller the first half of 2023
- Orders are expected due to increasing use of new memory standards such as DDR5 and HBM3

OPHY™ (DDR PHY)

Superior performance with our own design know-how

- Area optimization at 50% compared to competitors
- Samsung 5nm PHY IP development in progress following TSMC 7nm at the end of last year
- Samsung 5nm (LPDDR5X) PHY is expected to preoccupy the market as it is the world's first development among major IP vendors