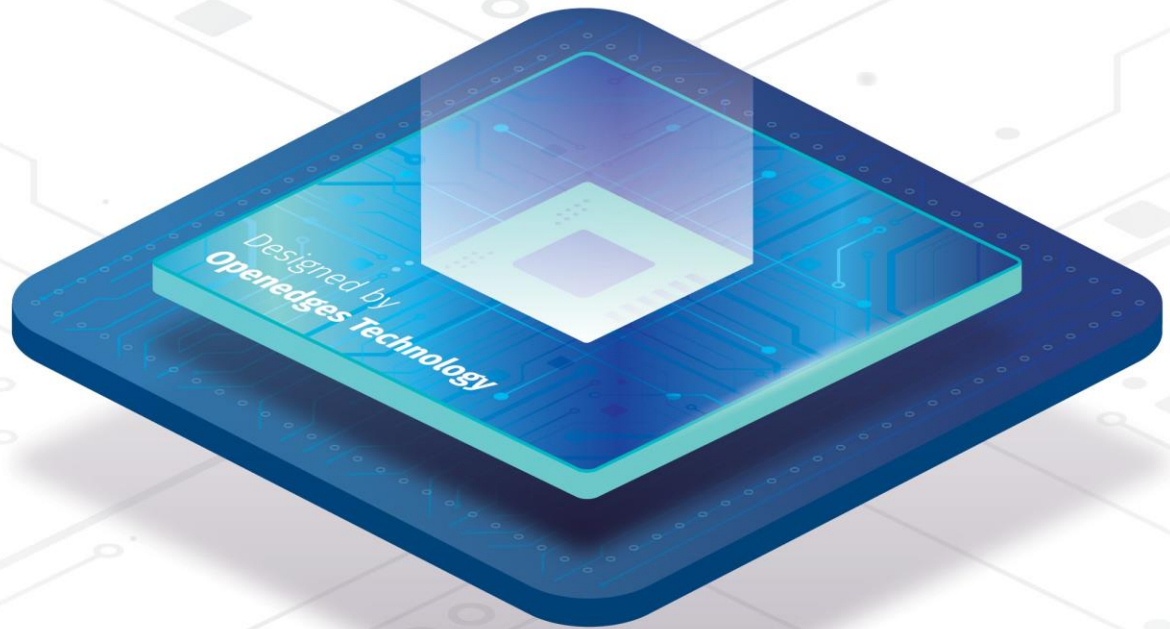


AI for Everyone, Everywhere



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The Future of AI Computing

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CPU, GPU, NPU 등 SoC에
세분화된 설계/검증/평가

Prologue

01
Structural Growth of
System Semiconductor
Market

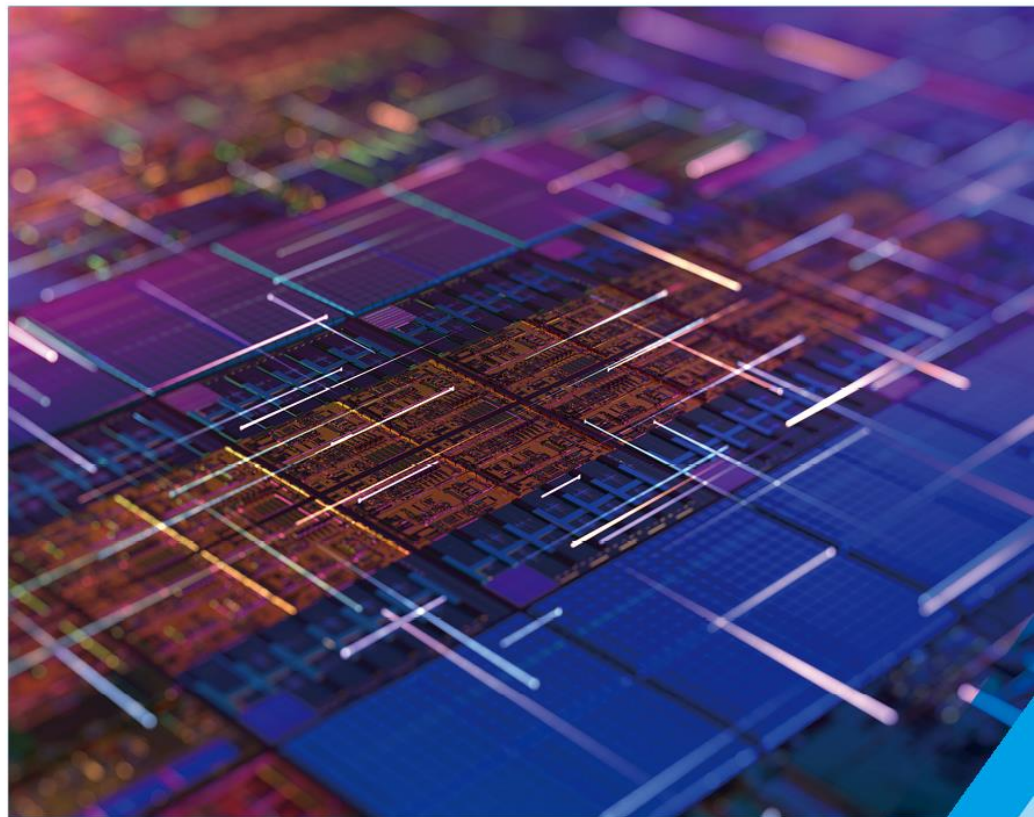
02
OPENEDGES Technology,
as Korea's most renowned
AI semiconductor IP
design company

03
Financials

Prologue

OPENEDGES Technology's Business Areas

AI for Everyone, Everywhere



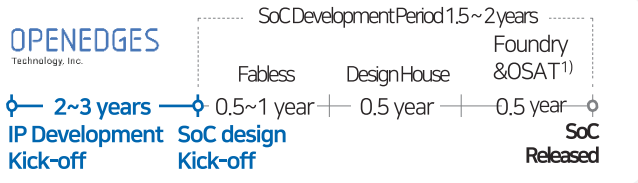
OPENEDGES Technology's Business Areas ①

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



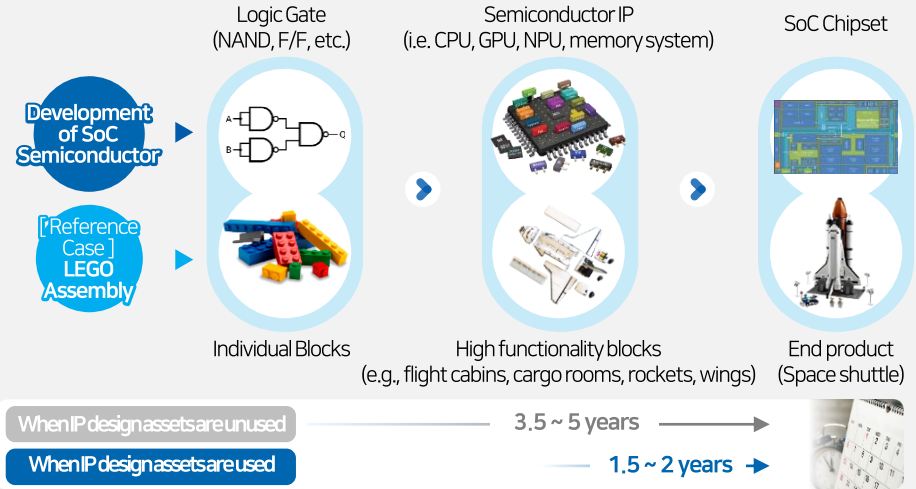
What is Semiconductor IP?

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

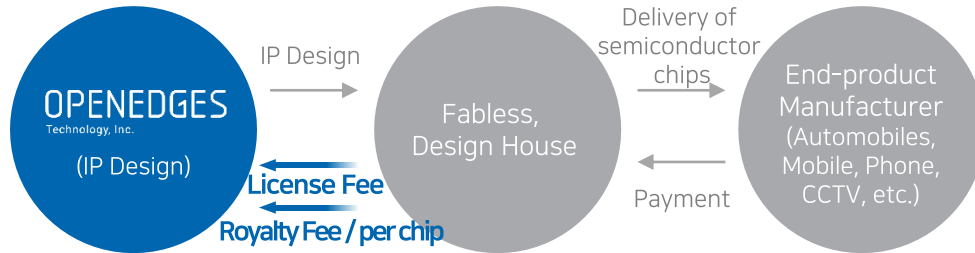


※ Note 1) Outsourced Semiconductor Assembly and Test (Packaging and backend company)

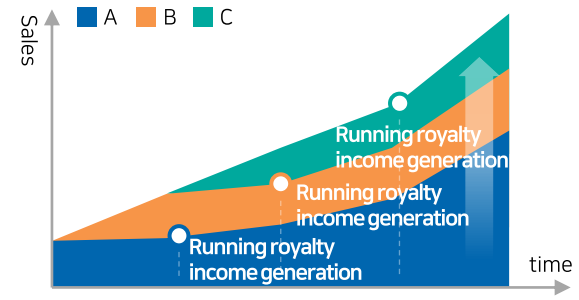
Reduction in SoC design time and cost for fabless companies



Semiconductor IP Business Profit Structure

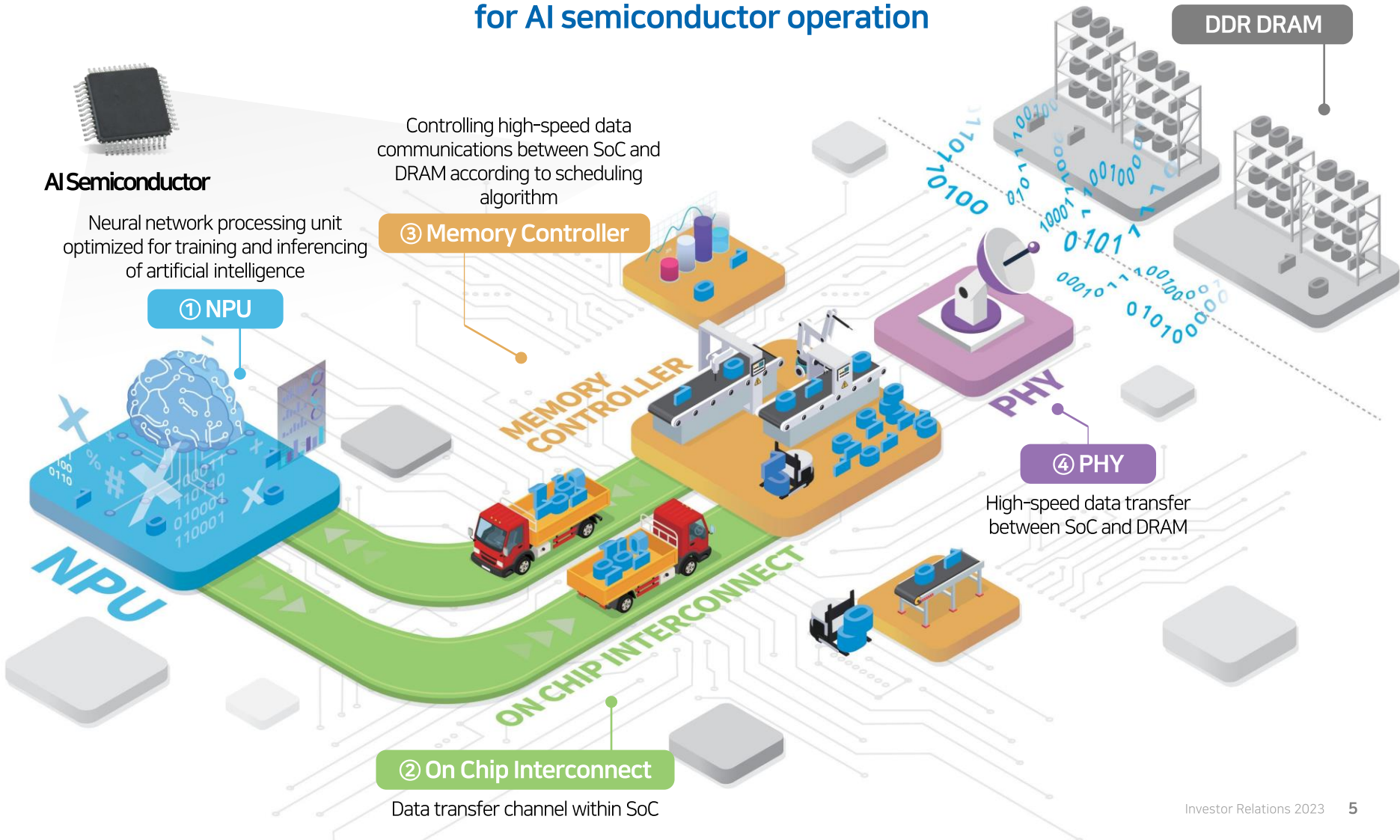


※ The semiconductor IP industry has been oligopolistic, dominated by a few market players due to high technical barriers to entry.



OPENEDGES Technology's Business Areas ②

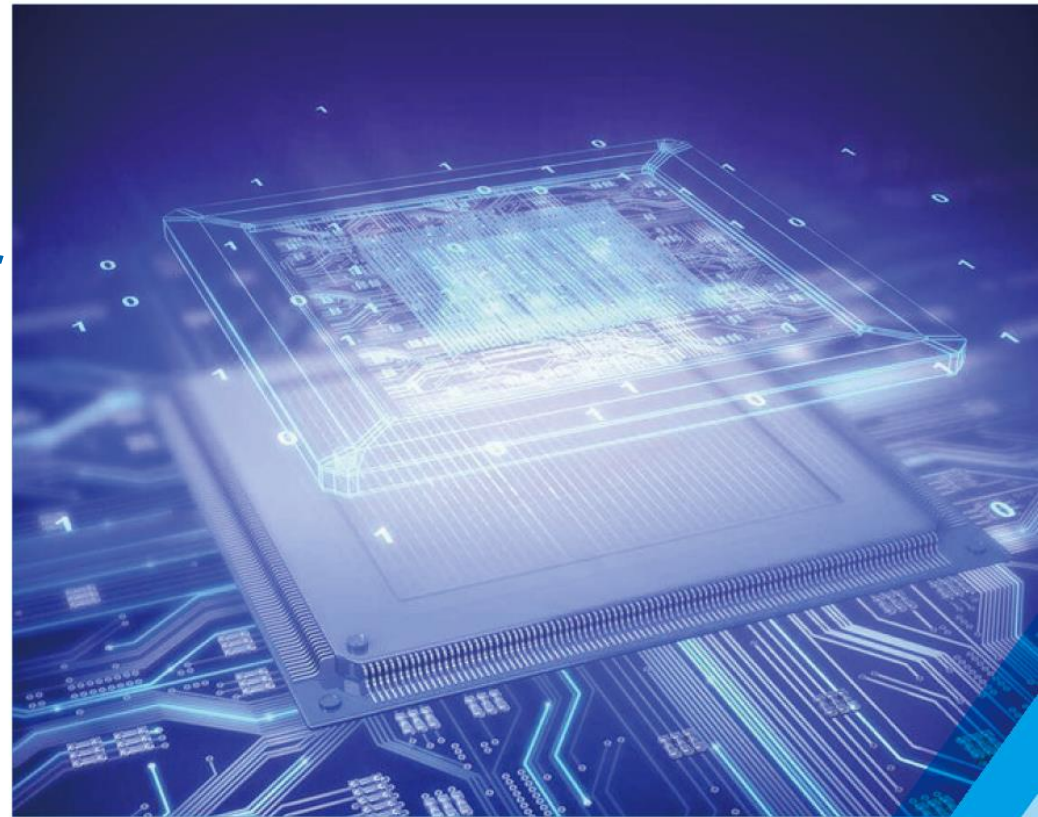
Design and provision of integrated IP solution that serves as a basis for AI semiconductor operation



01

Structural Development of System Semiconductor Market

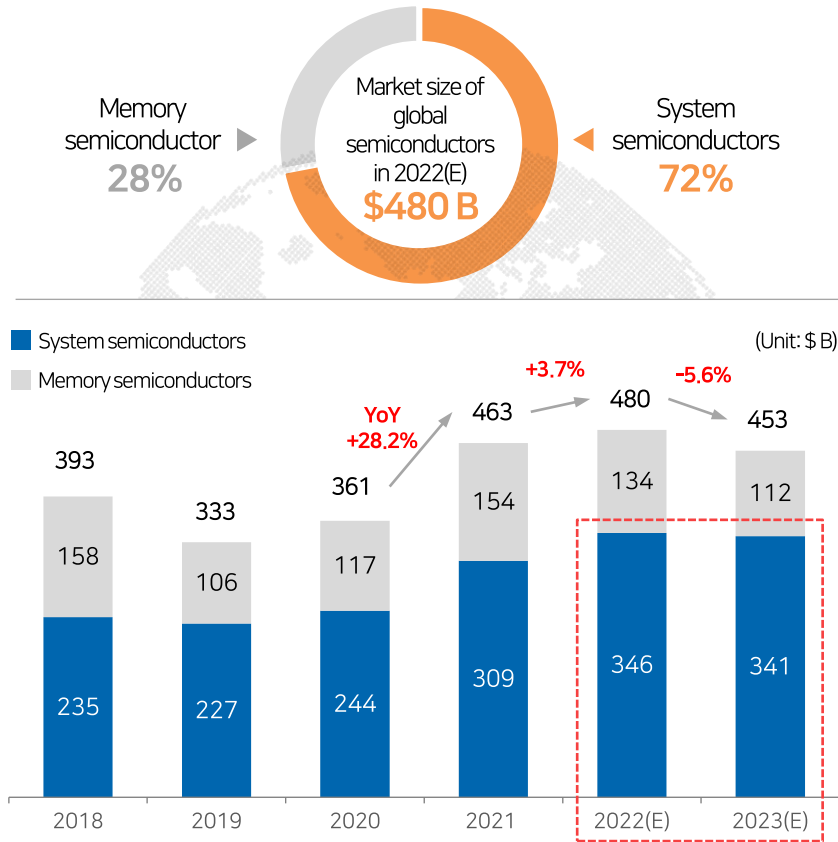
01. Growth of the Global System Semiconductor Market
02. Continuation Growth of the Global Semiconductor IP Market
03. Roles of Semiconductor IP Design Company
04. Increased Significance of System Semiconductor IP Design
05. Korea's Full-fledged System Semiconductor Market Investment



01 | Growth of Global System Semiconductor Market

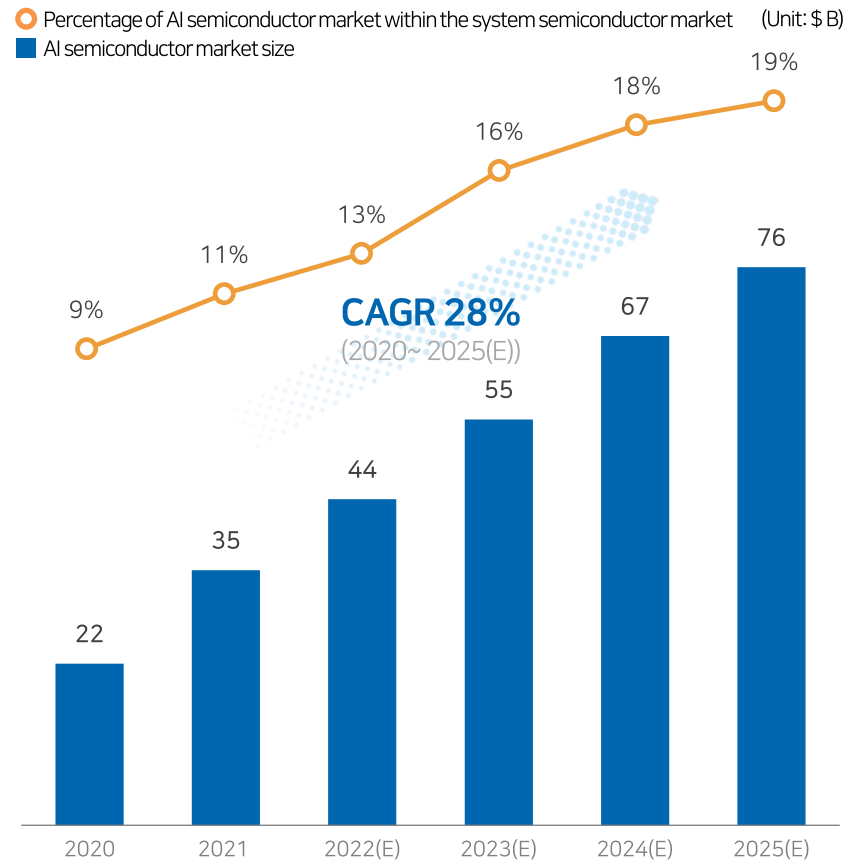
Contrary to memory semiconductors, system semiconductors are continuing their steady growth

Prospects for Global Semiconductor Market during 2018-2023



※ Source: WSTS (The World Semiconductor Trade Statistics, Nov 2022),
The size of the semiconductor market, excluding Discrete Semiconductors, sensors, and optoelectronics

Prospects and Percentage of Global AI Semiconductor Market



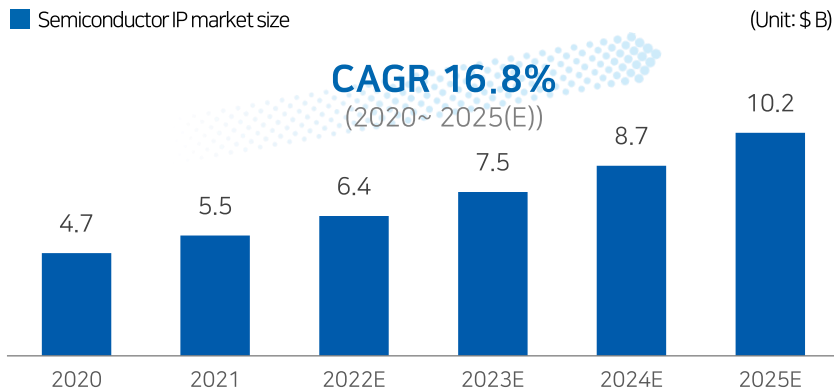
※ Source: AI Semiconductor (Gartner, May 2022)

02 | Continuation Growth of Global Semiconductor IP Market

Semiconductor IP market with rapid growth potential for start-ups

Global Semiconductor IP market forecast

Company	2021 Sales (\$ M)	CAGR (2017-2021)
arm	2,665	10%
SYNOPSYS	1,077	20%
cadence	315	19%
Alpha	90	106%
Others		10%
Total		13%



※ Source: IPnest 2022.05, Press Clipping

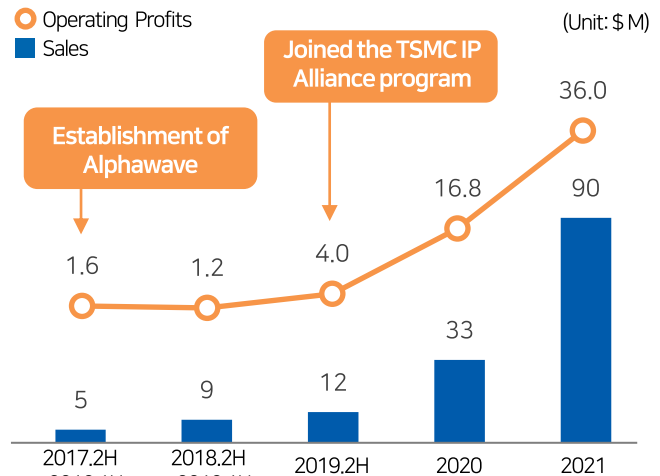
“
With the increase in AI semiconductor data throughput, high-speed interface demand skyrockets
”

Start-up reference with high growth in IP design

AlphaWave
Focusing on SerDes IP, a high-speed interface for servers

Employs engineers with at least 20 years of experience in the PHY IP areas

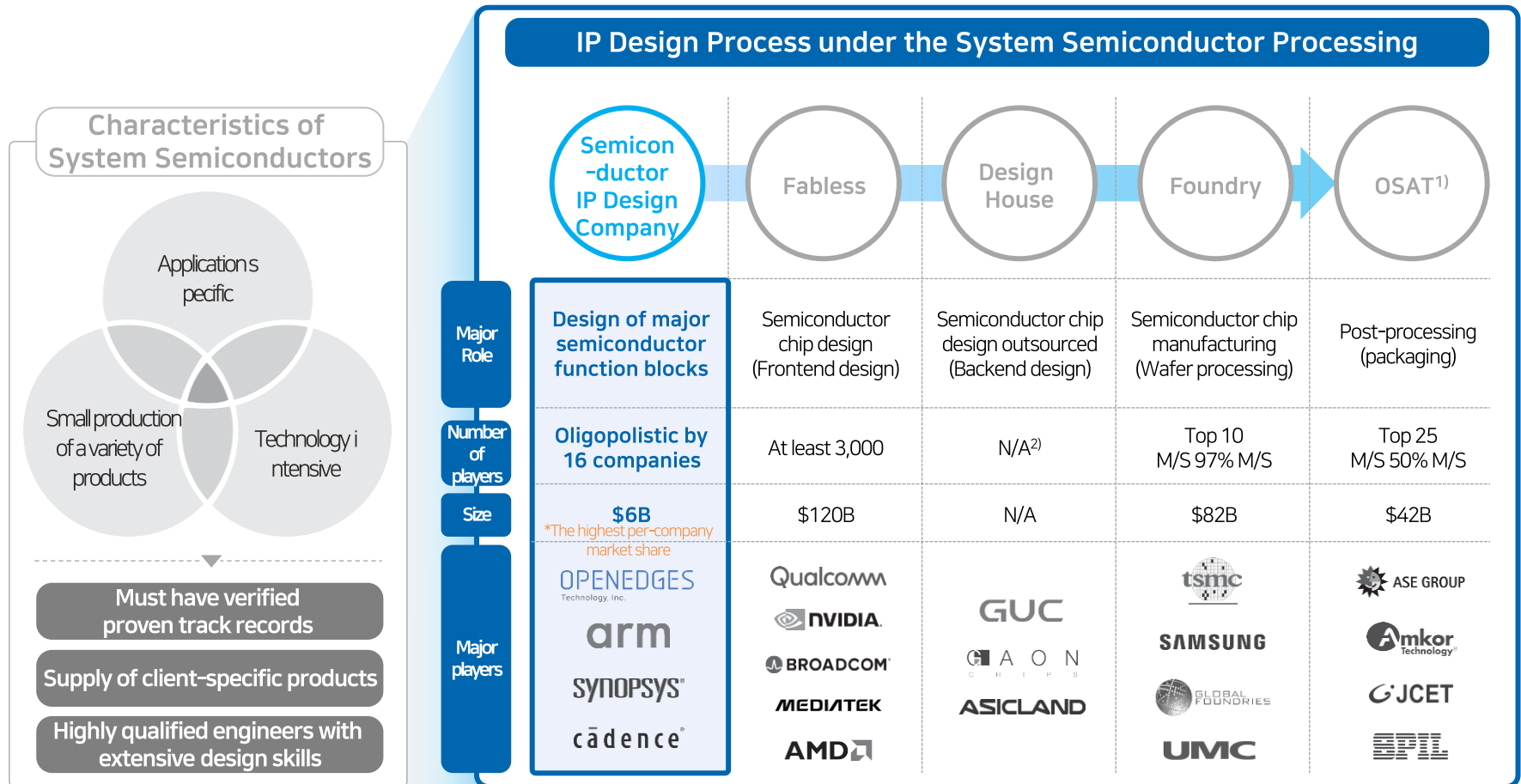
2017~2021 CAGR 106%



※ Source: Documents publicly disclosed by AlphaWave

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.

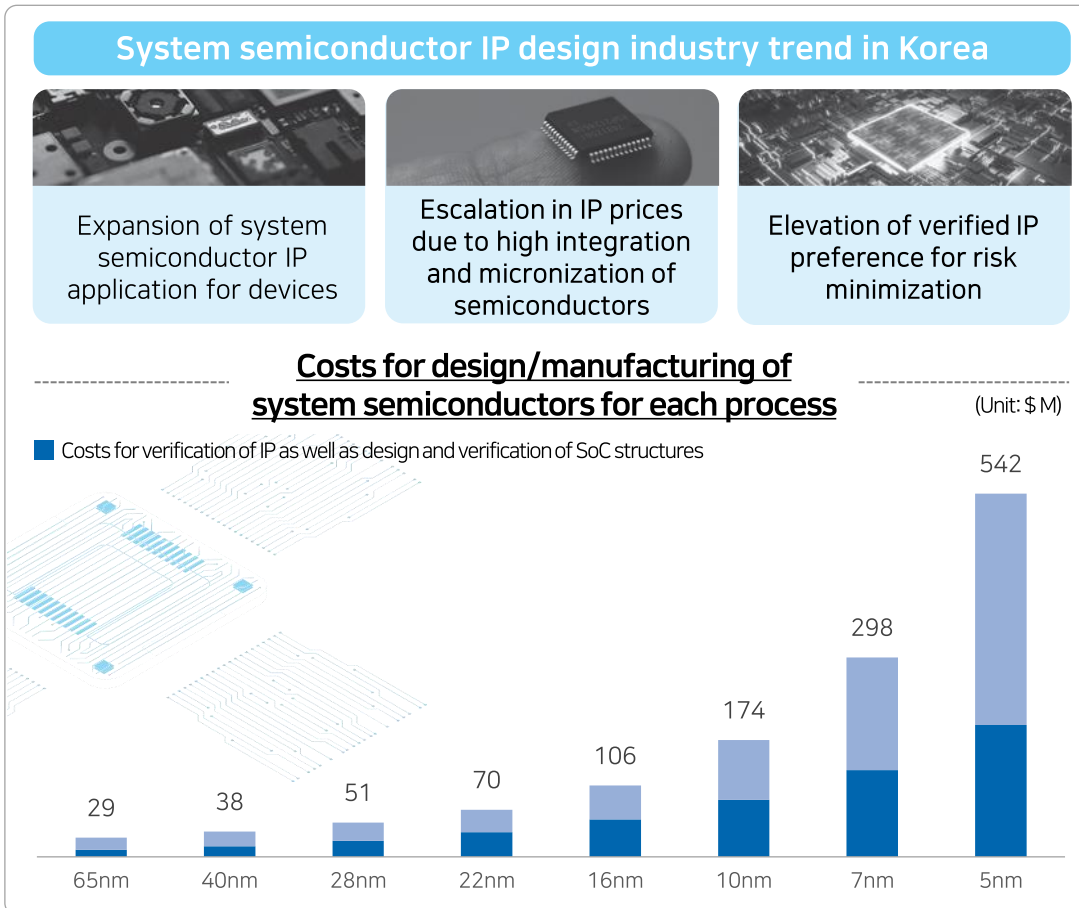


※ Note 1) (Outsourced) Semiconductor Assembly and Test: Semiconductor package assembly and test company that is responsible for performing post-processing after wafer process


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**



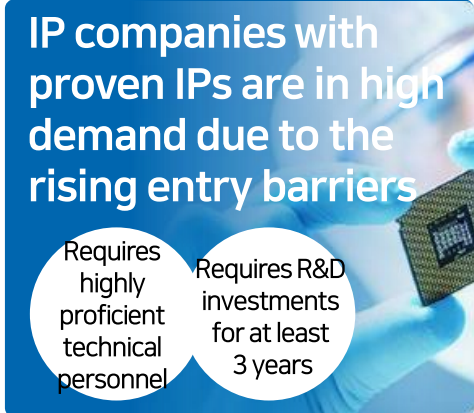
Higher demand for proven IPs



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)

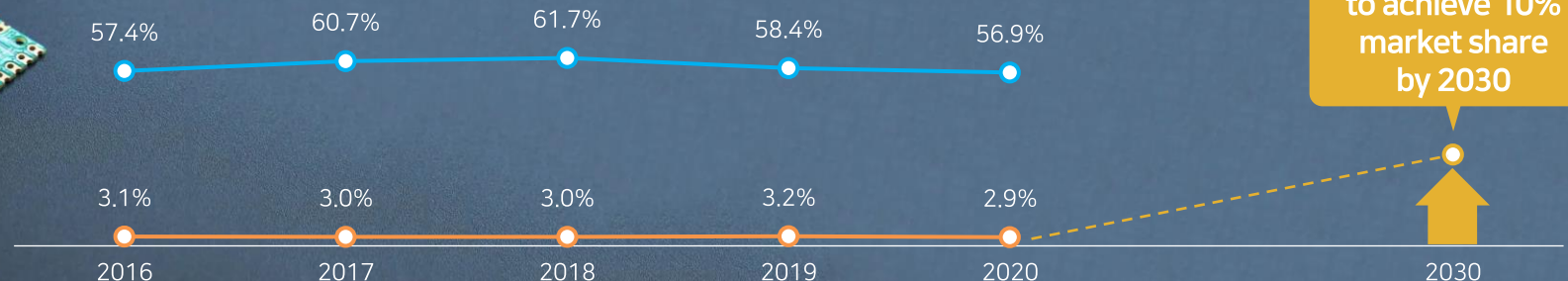
Announcement of investment plans for high-performance/low-power AP, super high-speed communication semiconductor, fabless system semiconductor, image sensor, etc.



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

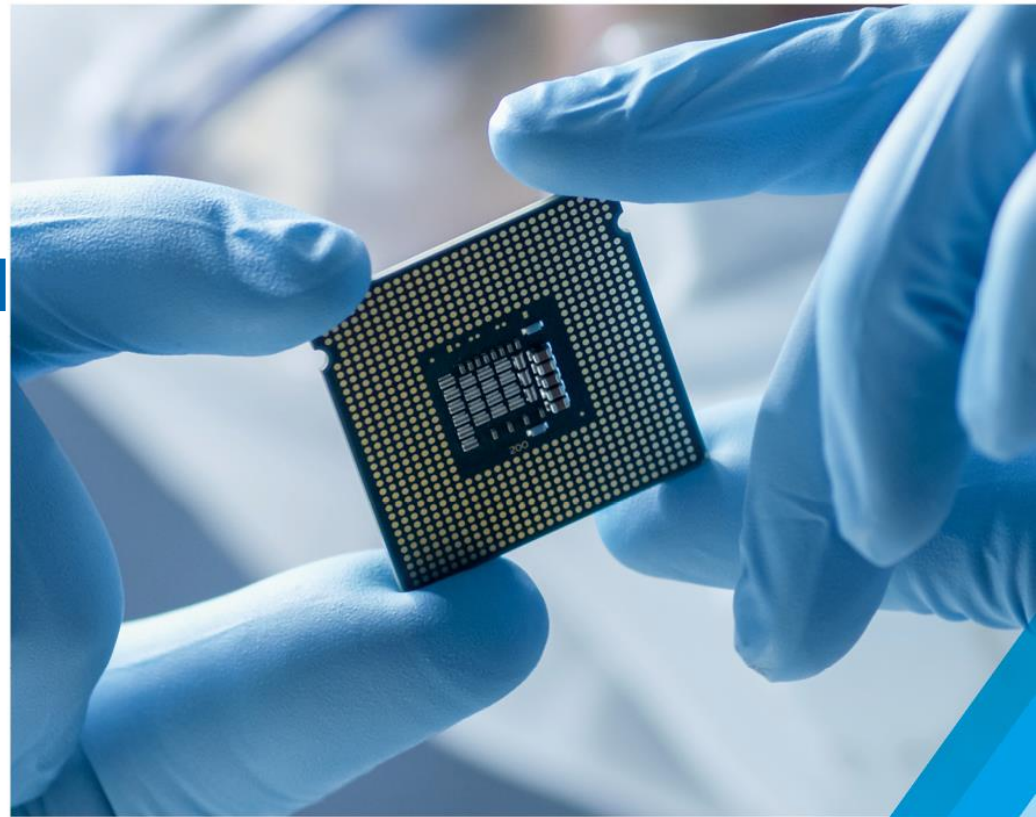


Government plans to achieve 10% market share by 2030

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

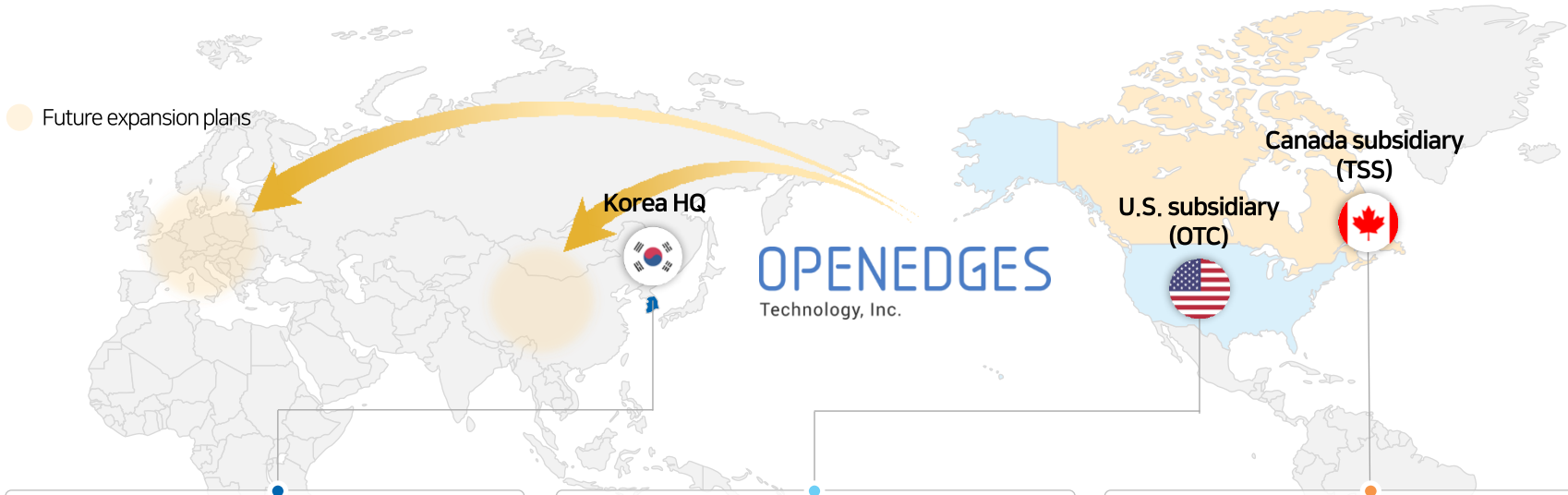


Strategic
partnership
with global
enterprises



02 | A Global Team of Professionals - 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	79 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 NPU 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	39 team members (as of the end of December 2022)
CEO	Richard Fung (Co-Founder)
Major roles	Development of DDR PHY IP

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

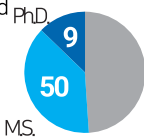
Among the total personnel (126 team members)

79%



Percentage of Ph.D. and MS. degree holders (59 members) among the R&D personnel

59%



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 | PRODIGE | 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)

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

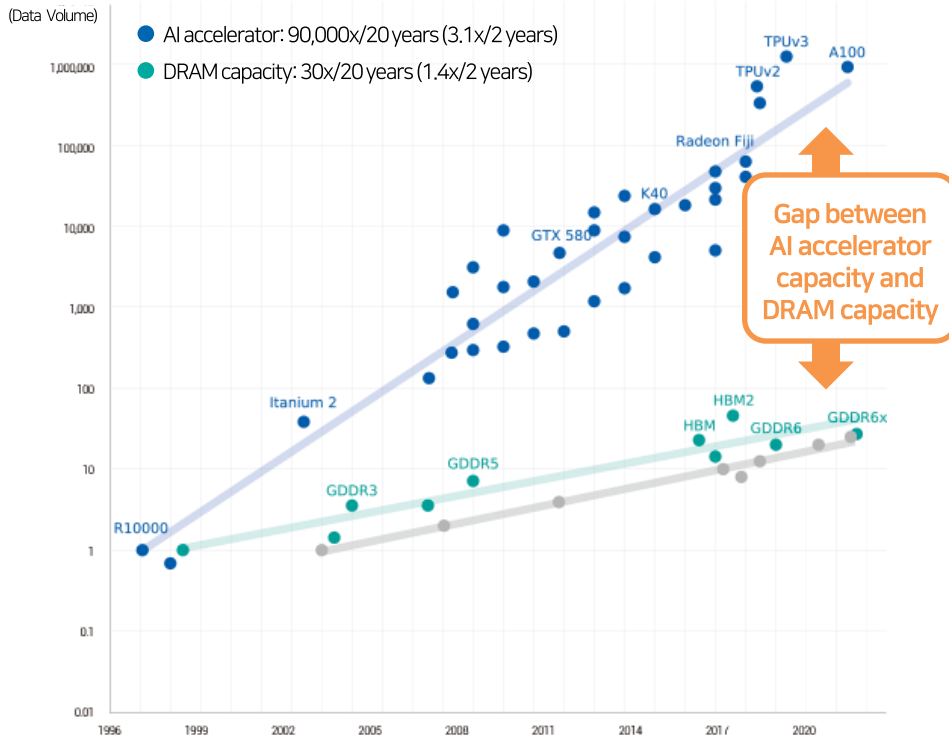
ARTERIS IP | AMD | intel

- 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.

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

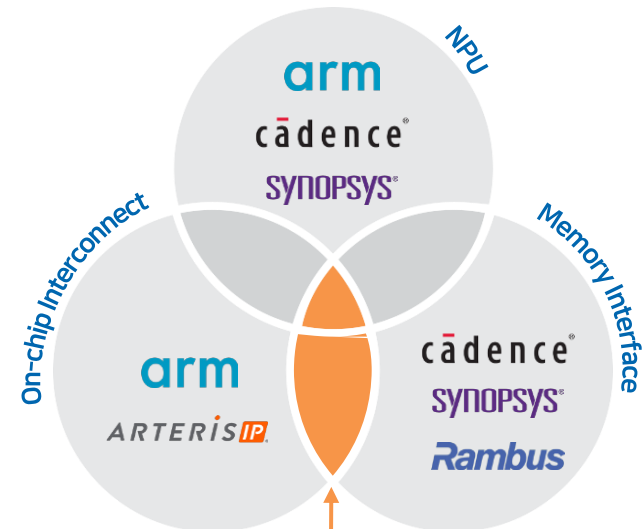
The gap between the required data processing volume and the capacity provided by DRAMs has increased due to the development of AI accelerator technologies



※ Source: AI And Memory Wall By Riselab

AI Platform IP for Edge Computing

OPENEDGES is globally the only company that is capable of supplying NPU IP (the core of AI semiconductors) and memory system IP (functions as the 'Back Bone' for all semiconductors) at the same time.



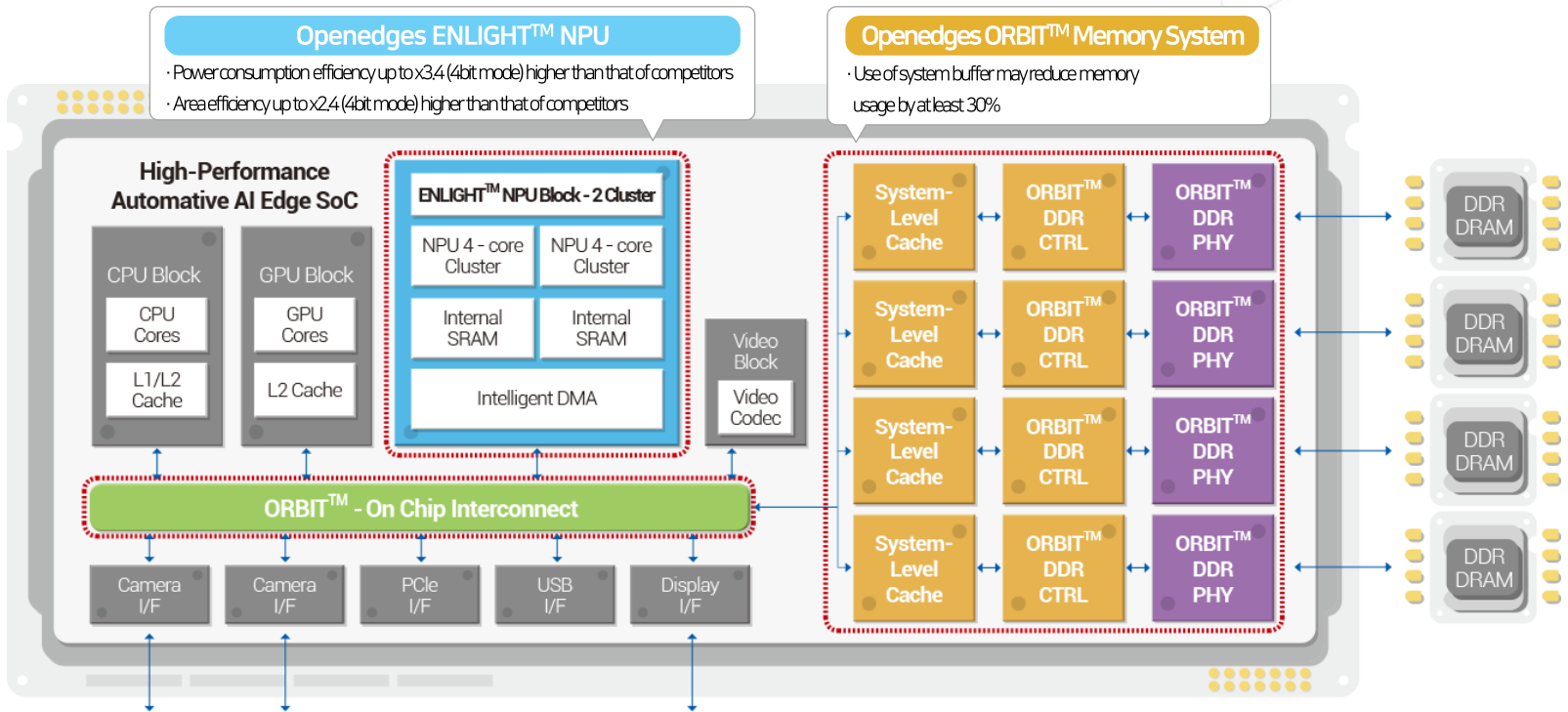
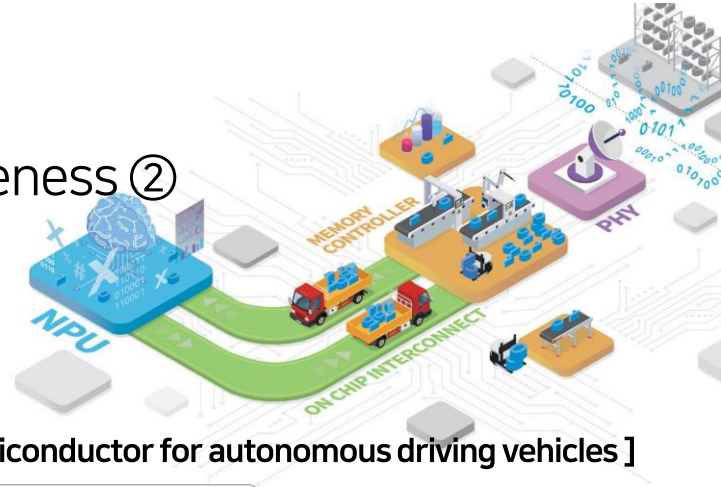
Bare spot of AI semiconductor IP market filled by OPENEDGES

OPENEDGES
Technology, Inc.

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

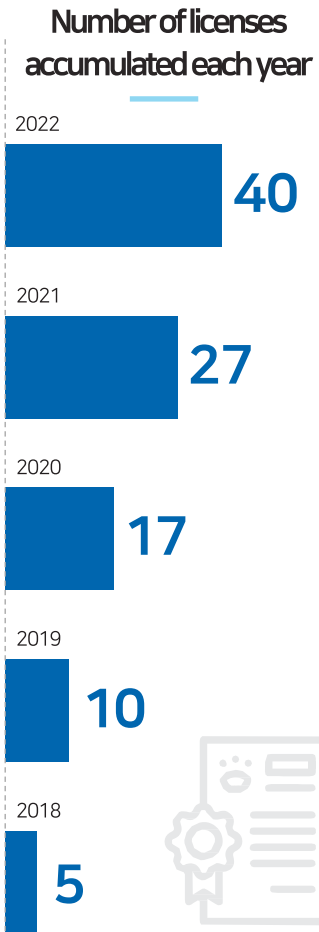
Maximize first-mover advantage of AI semiconductor integrated IP solutions, based on the continued development of leading-edge processing

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 [Target Product] Light-weight IoT application products (keyword recognition, security camera application)		[Performance] 2~16 TOPS [Target Product] Medium or higher level of IoT application products (autonomous driving auxiliary application)		[Performance] 16~250 TOPS [Target Product] High-performance application products for vehicles (Application of autonomous driving vehicles with Level 3 or higher)		[Performance] 250~1,000 TOPS [Target Product] 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		
OPHY™ PHY Die to Die (Chiplet)	SAMSUNG 								OPHY-D2D (5/8nm)	
									OPHY-D2D (6nm)	
OMCT™ Memory Controller + OPHY™ DDR PHY	SAMSUNG 	LP4/4X/5 (14nm)			DDR5 (MEMC)	LP4X/5/5X (5nm)		LP5X/6 (5nm) DDR5 (4nm)		
			LP4/4X/5 (12nm) GDDR6 (12nm)	LP4/4X/5 (22nm)	HBM3 (7nm)	LP4X/5/5X (7nm)		HBM3 (4nm)	LP5X/6 (4nm)	

● R&D started in 2022 ● R&D to be launched from 2023

04 | Verified Global Track Records

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



Intelligent security camera

Hanwha Techwin, nextchip, eyenix, dNP PnpNetwork Technologies, Inc.

Autonomous driving/ In-vehicle face recognition

Telechips, nextchip, G A O N CHIPS

Server/storage devices

novachips, SAMSUNG, ASICLAND, G A O N CHIPS, Global company I

IoT / Mobile

Telechips, MONTAGE Technology, JLQ TECHNOLOGY, GCT

AI

Micron, StarFive 赛昉科技, 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

Financials

- 01. Financial Statement Summary
- 02. 2022 Sales revenue Breakdown
- 03. Annual Sales revenue Analysis



01 | Financial Statements Summary

Summary of Financial Statements

(Unit: KRW 1 million)

	2022	2021	2020	2019
Current Assets	44,304	29,020	6,216	6,503
Non-current Assets	9,552	7,077	4,075	4,225
Total Assets	53,855	36,097	10,291	10,728
Current Liabilities	18,318	9,171	5,477	1,631
Non-current Liabilities	3,288	6,374	31,550	17,916
Total Liabilities	21,606	15,545	37,027	19,547
Capital	2,116	1,653	15	15
Capital Surplus	96,376	58,927	-	-
Other Capital	2,026	3,006	1,697	348
Earned Surplus	-68,269	-43,034	-28,449	-9,183
Total Capital	32,249	20,552	-26,737	-8,820

※ Based on the consolidated financial statements

Summary of Income Statements

(Unit: KRW 1 million)

	2022	2021	2020	2019
Sales	10,012	5,186	1,089	1,238
Sales Cost	-	-	-	-
Gross Margin	10,012	5,186	1,089	1,238
Sales Management Expenses	35,273	16,241	9,581	4,784
Operating Profits	-25,261	-11,055	-8,492	-3,546
Financial Profits	1,409	194	170	425
Financial Costs	1,101	3,679	11,131	5,757
Other Profits	476	58	425	39
Other Costs	368	42	6	7
Net Profit before Corporate Tax Costs	-24,846	-14,524	-19,034	-8,845
Corporate Tax Costs	381	84	237	-37
Current Net Income	-25,227	-14,608	-19,271	-8,808

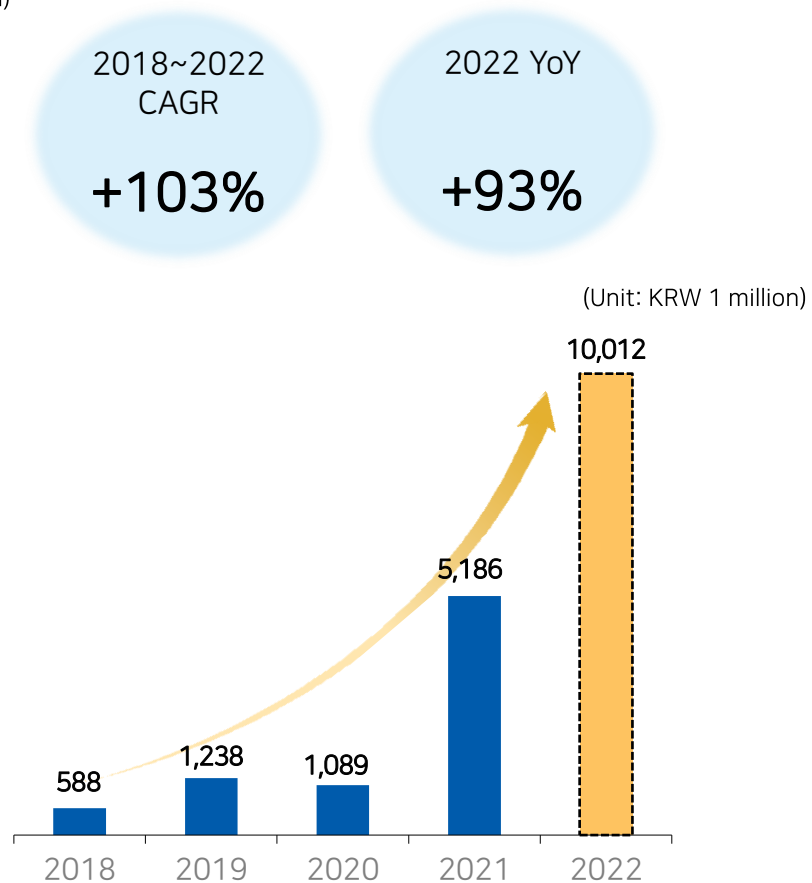
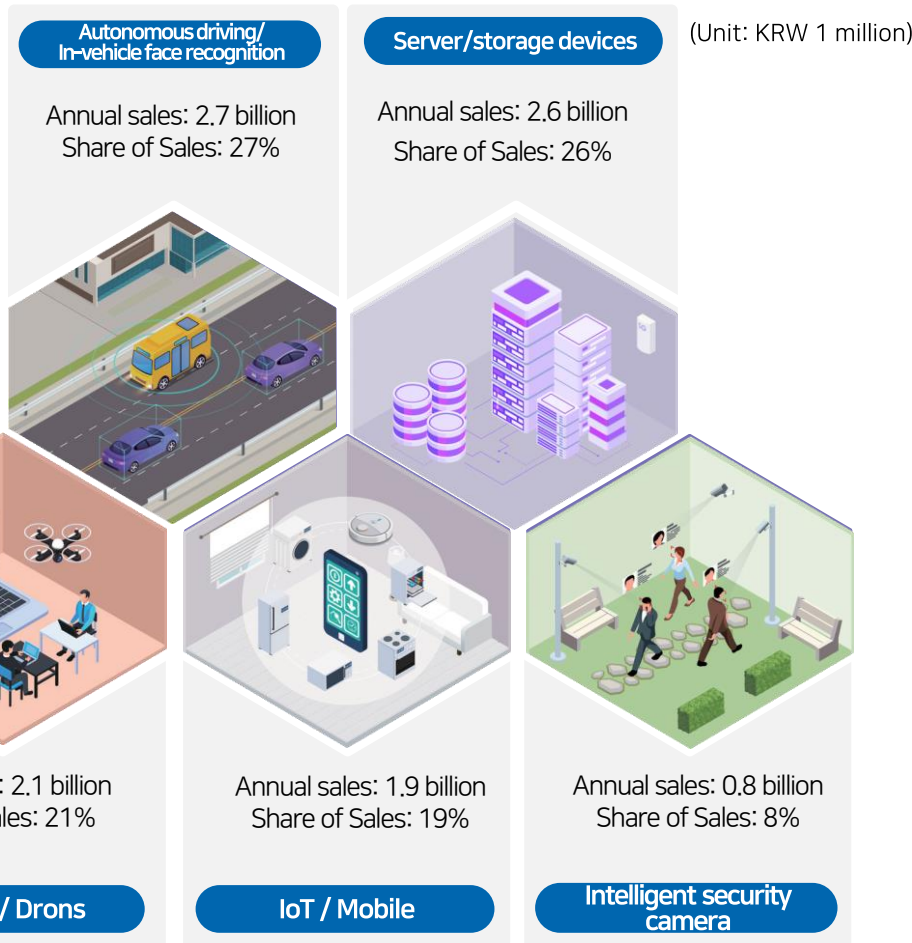
※ Based on the consolidated financial statements

02 | 2022 Sales revenue Breakdown

Expect continuous sales growth according to various industrial needs

Generates various sales such as automotive and storage devices

Full-year sales growth after 2018



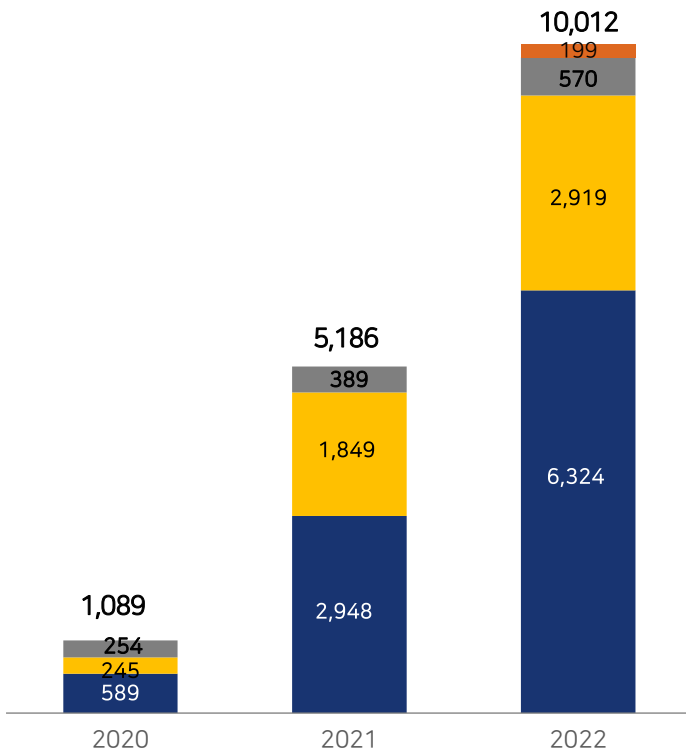
03 | Annual Sales revenue Analysis

Expansion of fabless and design house-centered customer pool + Sales by industry are growing in all sectors

Sales revenue Breakdown by Customer

■ Fabless ■ DSP ■ Tier-1 ■ Etc.

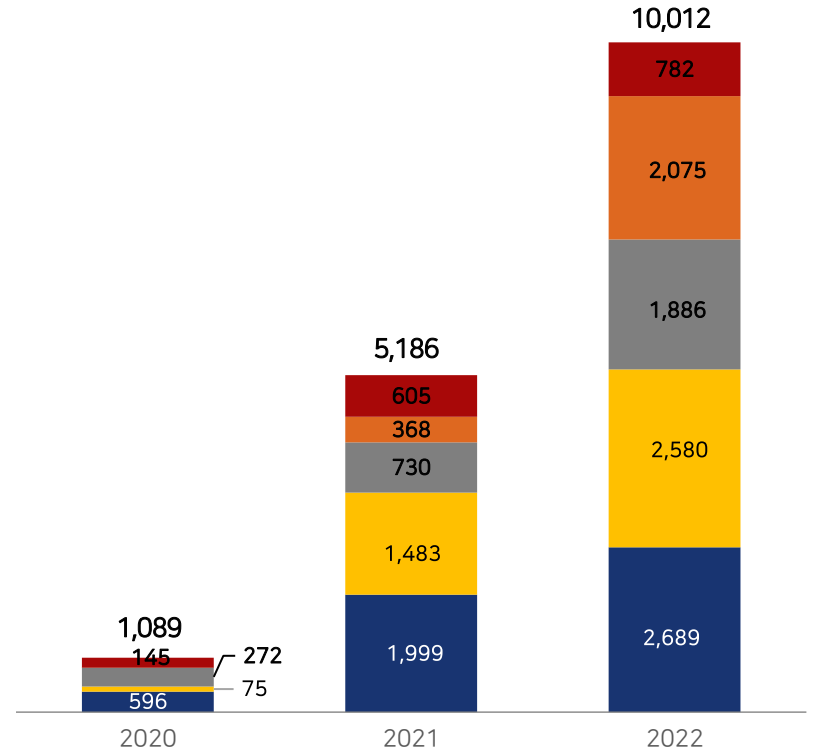
(Unit: KRW 1 million)



Sales revenue Breakdown by Industry

■ Automotive ■ PC/Server/Storage
■ IOT/Mobile ■ Display/Drons
■ Intelligent security camera

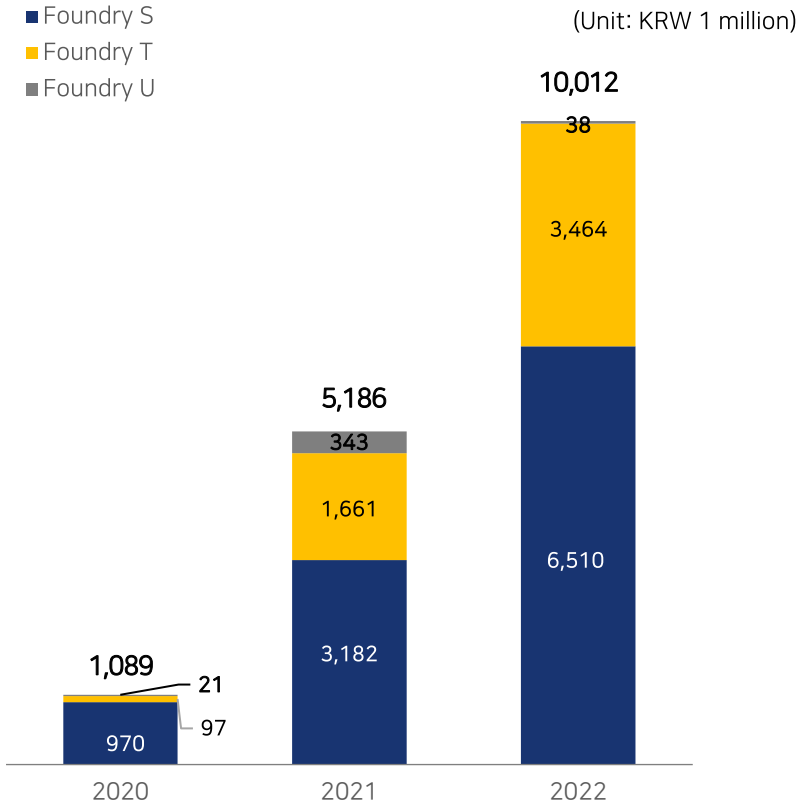
(Unit: KRW 1 million)



03 | Annual Sales revenue Analysis

Foundry S and Foundry T Sales to the top two foundries grew by over 100% YoY

Sales by foundry (based on SoC producers equipped with our IP) (Unit: KRW 1 million)



Breakdown of Openedges sales revenue by foundry

Continued growth in sales volume of the two major foundries

Foundry S: joined the IP Alliance (2018) and strengthening cooperation

Foundry T: Securing mass production performance for joining the IP Alliance

* After joining the IP Alliance of T, orders from T's customers are expected to surge

'20~'22 Openedges sales revenue by Foundry

	'20	'21	'22	YoY	CAGR ('20~'22)
S	970	3,182	6,510	105%	159%
(%)	(89%)	(61%)	(65%)		
T	97	1,661	3,464	109%	498%
(%)	(9%)	(32%)	(35%)		
U	21	343	38	Δ89%	
SUM	1,089	5,186	10,012	-	-