# AI for Everyone, Everywhere

Designed by
Openedges Technology

OPENEDGES
Technology, Inc.
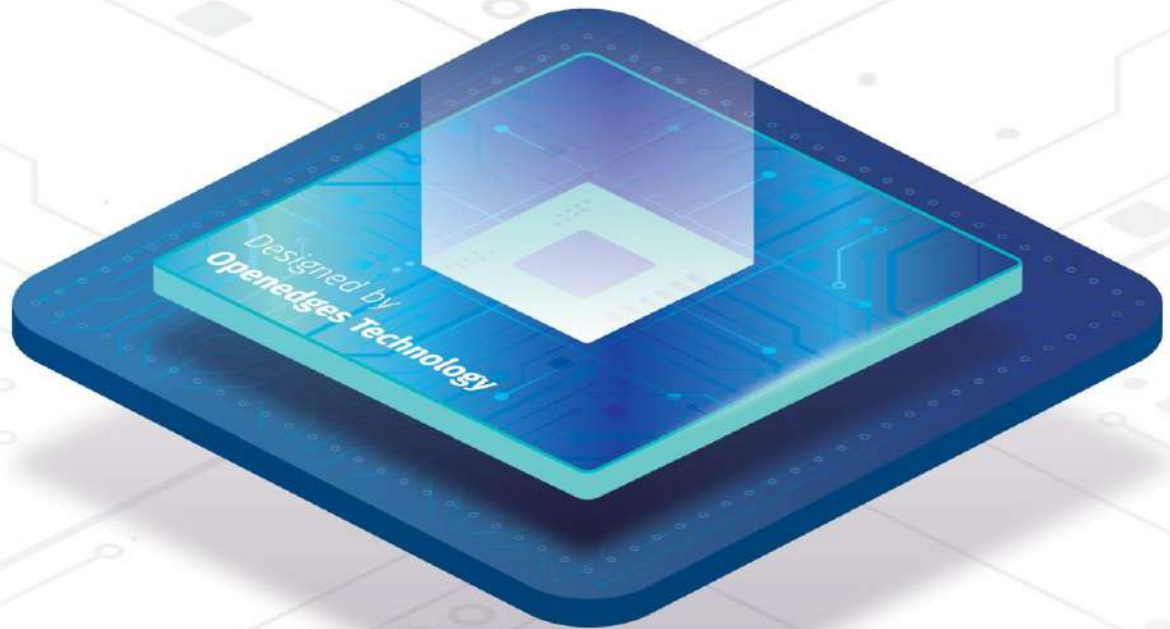
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# The Future of
# AI Computing

OPENEDGES
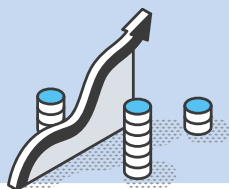Technology, Inc.

# Table of Contents

# Openedges Technology at a Glance

**98%**
Sales Revenue CAGR(Last 5yrs)

* FY2019~2023

**52**
Number of Cumulative License Agreements

* As of 2023.12.31

**130**
Global R&D Engineers

* Largest among Korean IP Providers

## AI for Everyone, Everywhere

**30+**
Number of Clients

* Secured global top-tier customers such as Samsung Electronics, SK Hynix, and Micron

**20+**
IP products available for sale
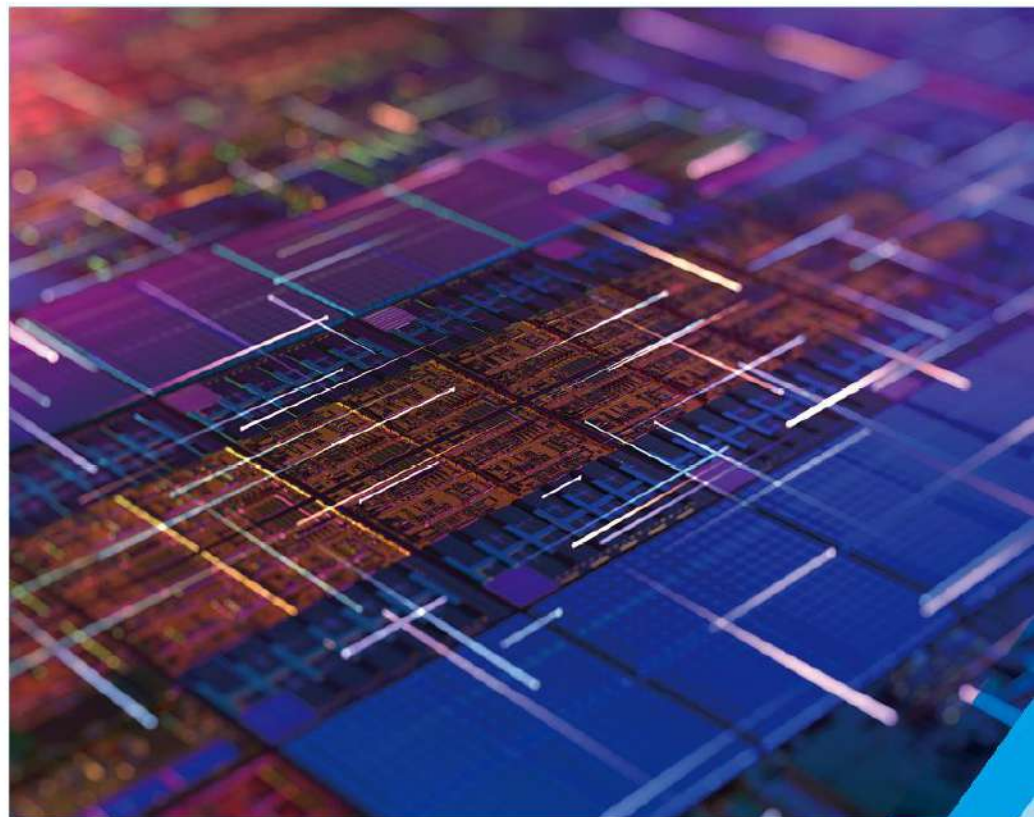
* Number of IP Products within 4 IP categories

**3**
Global R&D Centers

* Located in Korea, US & Canada

# Prologue

OPENEDGES Technology's Business Areas

AI for Everyone, Everywhere
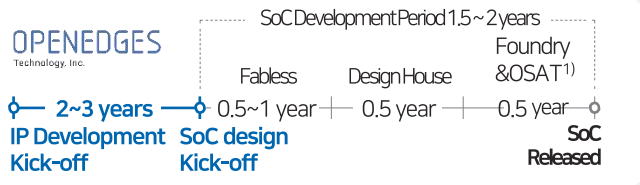
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# | OPENEDGES Technology's Business Areas ①

**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**
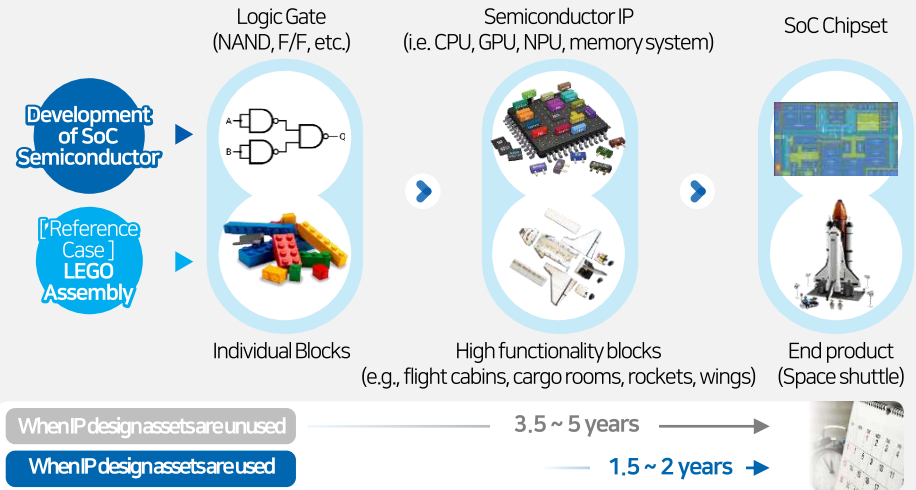
## What is Semiconductor IP?

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

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SoC Development Period 1.5 ~ 2 years

| Fabless | Design House | Foundry &OSAT[1] |

2~3 years → 0.5~1 year ┼ 0.5 year ┼ 0.5 year

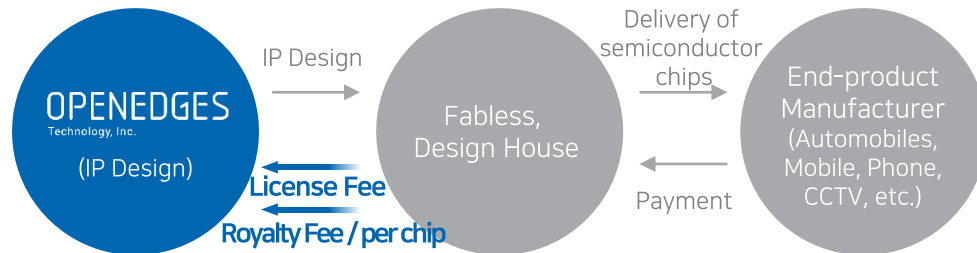**IP Development Kick-off**    **SoC design Kick-off**    **SoC Released**

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

**Reduction in SoC design time and cost for fabless companies**

Logic Gate
(NAND, F/F, etc.)

Semiconductor IP
(i.e. CPU, GPU, NPU, memory system)

SoC Chipset

**Development of SoC Semiconductor**

**[ Reference Case ] LEGO Assembly**

Individual Blocks

High functionality blocks
(e.g., flight cabins, cargo rooms, rockets, wings)

End product
(Space shuttle)

When IP design assets are unused    3.5 ~ 5 years

When IP design assets are used    1.5 ~ 2 years

## Semiconductor IP Business Profit Structure

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(IP Design)

IP Design →

Fabless, Design House

Delivery of semiconductor chips →

← Payment

End-product Manufacturer
(Automobiles, Mobile, Phone, CCTV, etc.)

← **License Fee**

← **Royalty Fee / per chip**

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

Sales

■ A   ■ B   ■ C

**Running royalty income generation**

**Running royalty income generation**

**Running royalty income generation**

time
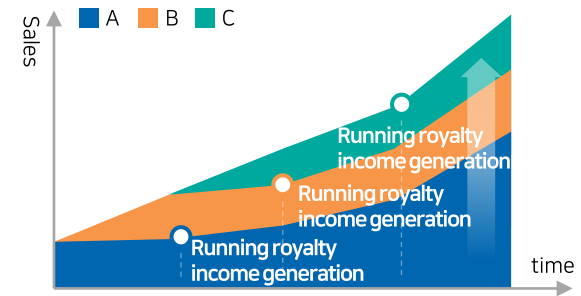
# OPENEDGES Technology's Business Areas ②

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

**DDR DRAM**

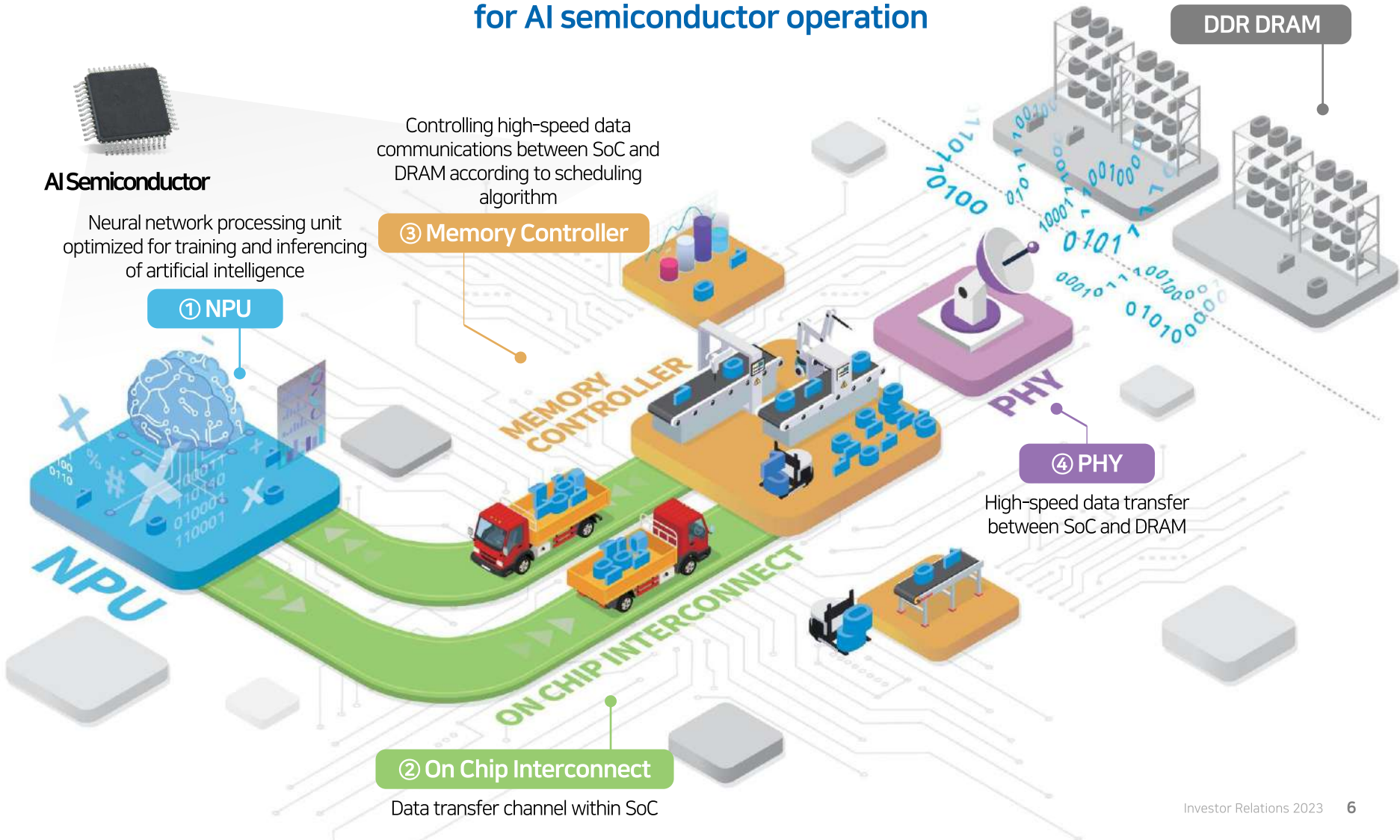Controlling high-speed data communications between SoC and DRAM according to scheduling algorithm

**AI Semiconductor**

Neural network processing unit optimized for training and inferencing of artificial intelligence

**③ Memory Controller**

**① NPU**

**④ PHY**

High-speed data transfer between SoC and DRAM

**② On Chip Interconnect**

Data transfer channel within SoC

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# 01

## Structural Development of System Semiconductor Market

01. Growth of AI Semiconductor & IP Market
02. Roles of Semiconductor IP Design Company
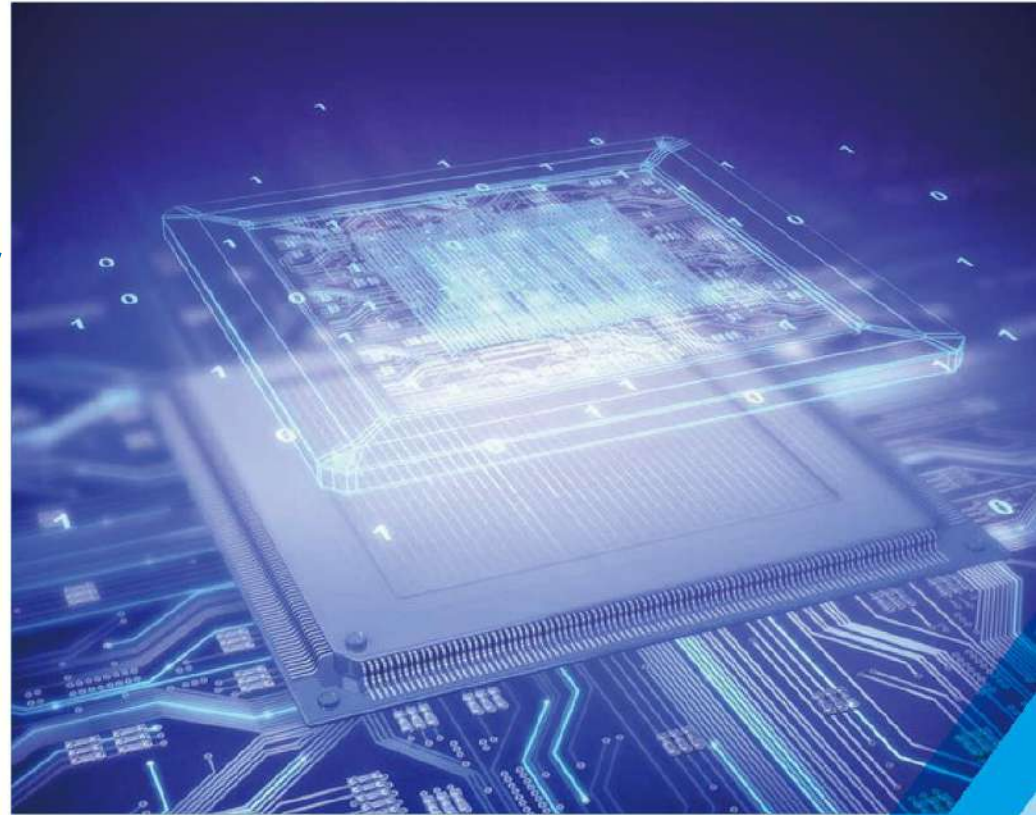
# 01 | Growth of Global System Semiconductor Market

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

### Prospects for Global Semiconductor Market 2024

Memory semiconductor **27%**

Market size of global semiconductors in 2024(E) **$487 B**

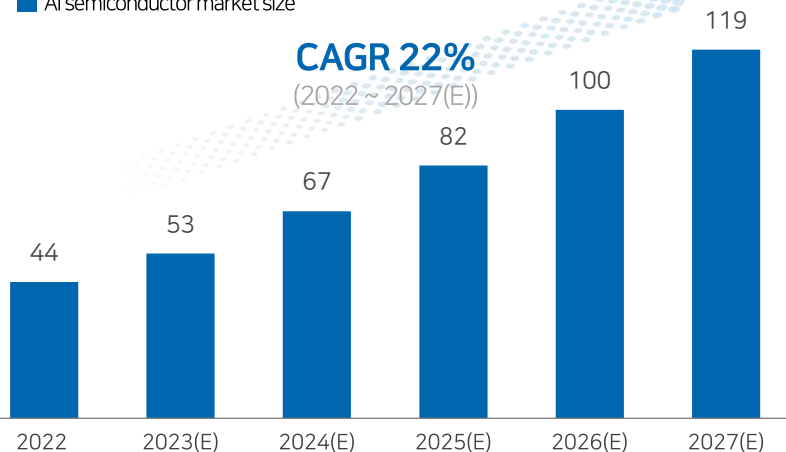System semiconductors **73%**

※ Source: WSTS, Nov 2023 (Excluding Optoelectronics, Discrete Semiconductors and sensors)

### Prospects of Global AI Semiconductor Market

(Unit: $ B)
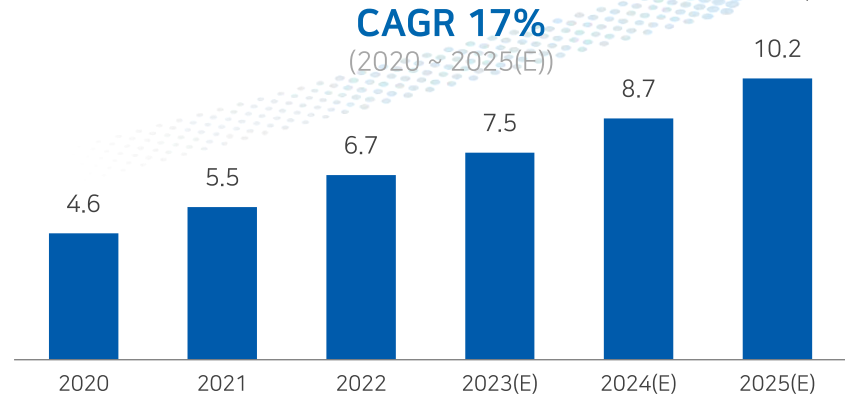
■ AI semiconductor market size

**CAGR 22%**
(2022 ~ 2027(E))

| 2022 | 2023(E) | 2024(E) | 2025(E) | 2026(E) | 2027(E) |
|------|---------|---------|---------|---------|---------|
| 44   | 53      | 67      | 82      | 100     | 119     |

※ Source: AI Semiconductor (Gartner, Aug 2023), Estimated by company

### Global Semiconductor IP market forecast

| Company | 2022 Sales ($ M) | CAGR (2018-2022) |
|---------|------------------|------------------|
| arm | 2,742 | 14% |
| synopsys | 1,315 | 20% |
| cadence | 358 | 17% |
| OPENEDGES Technology, Inc. | 7.7 | 95% |
| Others |  | 14% |
| Total |  | 16% |

■ Semiconductor IP market size

(Unit: $ B)

**CAGR 17%**
(2020 ~ 2025(E))

| 2020 | 2021 | 2022 | 2023(E) | 2024(E) | 2025(E) |
|------|------|------|---------|---------|---------|
| 4.6  | 5.5  | 6.7  | 7.5     | 8.7     | 10.2    |

※ Source: Design IP revenues (Ipnest, Apr 2023), Press Clipping

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# 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.**

## System Semiconductor Ecosystem

**Semicon -ductor IP Design Company** → **Fabless** → **Design House** → **Foundry** → **OSAT[1]**

| | Semicon-ductor IP Design Company | Fabless | Design House | Foundry | OSAT[1] |
|---|---|---|---|---|---|
| **Major Role** | Design of major semiconductor function blocks | Semiconductor chip design (Frontend design) | Semiconductor chip design outsourced (Backend design) | Semiconductor chip manufacturing (Wafer processing) | Post-processing (packaging) |
| **Number of players** | Oligopolistic by ~20 companies | At least 3,000 | N/A[2] | Top 10 M/S 97% M/S | Top 25 M/S 50% M/S |
| **Size** | $7B *The highest per-company market share | $170B | N/A | $104B | $50B |
| **Major players** | OPENEDGES Technology. Inc. / arm / SYNOPSYS / cādence | Qualcomm / NVIDIA / BROADCOM / MEDIATEK / AMD | GUC / AON CHIPS / ASICLAND | tsmc / SAMSUNG / GLOBAL FOUNDRIES / UMC | ASE GROUP / Amkor Technology / JCET / SPIL |

### Reasons for IP oligopoly

**Higher demand for proven IPs**

VERIFIED

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

Requires highly proficient technical personnel
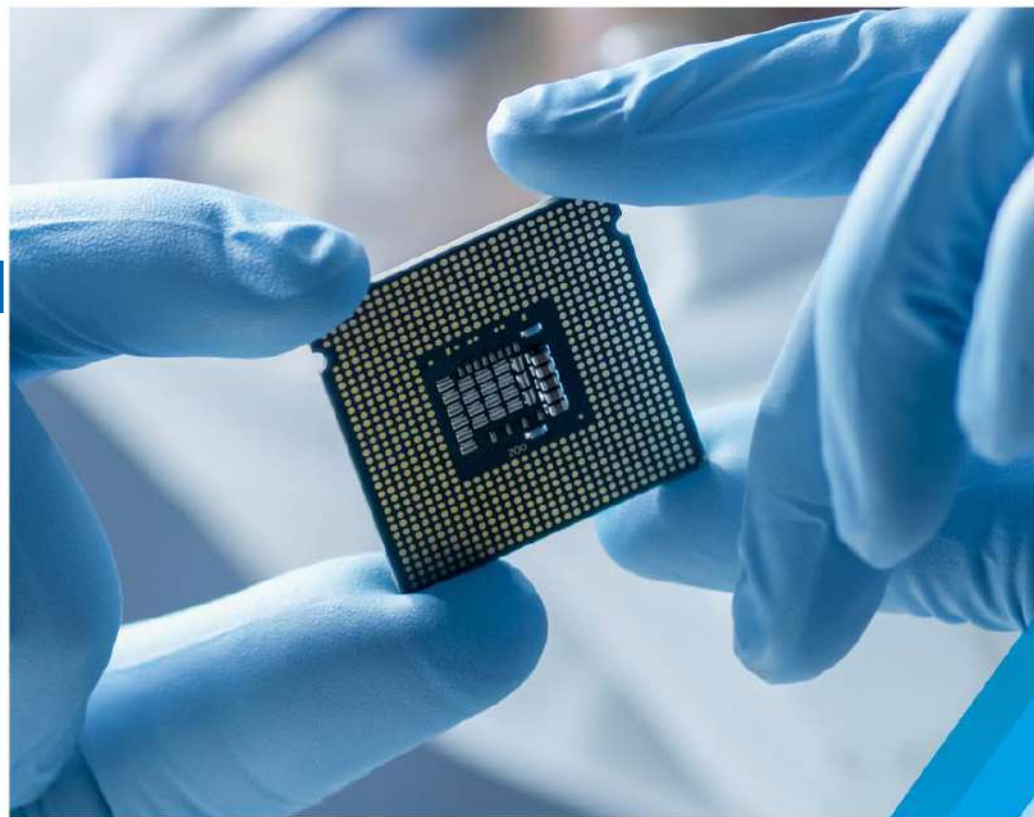
Requires R&D investments for at least 3 years

※ 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.

# 02

AI for Everyone, Everywhere

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

# 01 | The Overview of OPENEDGES' Core Competitiveness

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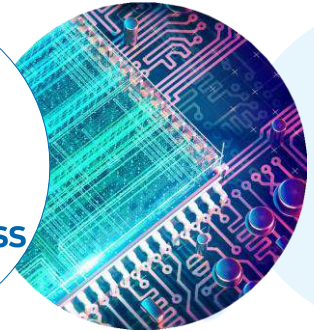to become a global leader in the AI semiconductor IP market

**01**

A Global team of Professionals

★★★

**02**

Industry's highest technological competitiveness

★★★

OPENEDGES
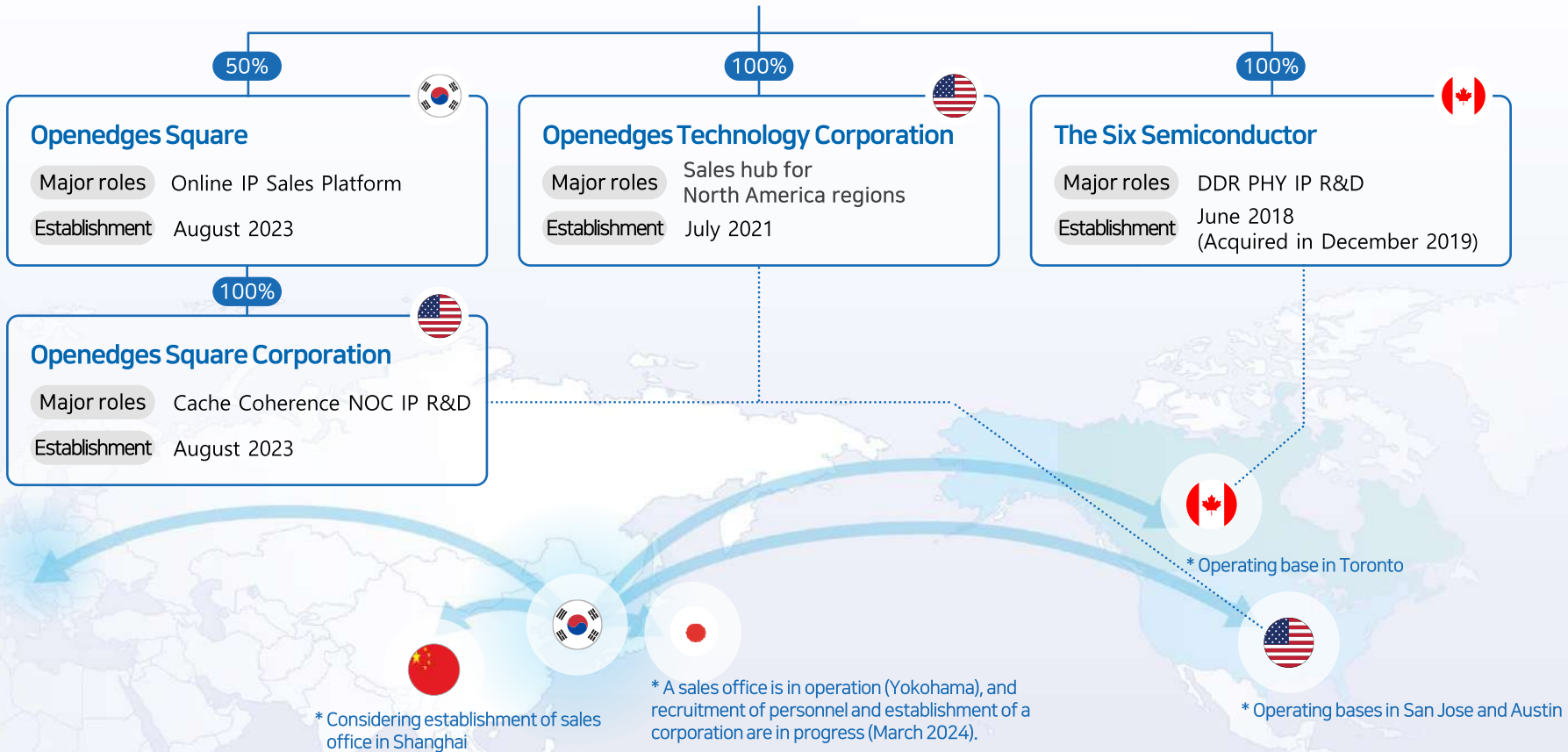Technology, Inc.

**03**

Verified global track records

★★★

**04**

Strategic partnership with global enterprises

★★★

# 02 | A Global Team of Professionals – Global Presence

OPENEDGES
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**50%**

### Openedges Square

| Major roles | Online IP Sales Platform |
| Establishment | August 2023 |

**100%**

### Openedges Technology Corporation

| Major roles | Sales hub for North America regions |
| Establishment | July 2021 |

**100%**

### The Six Semiconductor

| Major roles | DDR PHY IP R&D |
| Establishment | June 2018 (Acquired in December 2019) |

**100%**

### Openedges Square Corporation

| Major roles | Cache Coherence NOC IP R&D |
| Establishment | August 2023 |

* Operating base in Toronto

* Considering establishment of sales office in Shanghai

* A sales office is in operation (Yokohama), and recruitment of personnel and establishment of a corporation are in progress (March 2024).

* Operating bases in San Jose and Austin

( **Expansion of global bases in addition to offices in the U.S. and Canada** )

# 02 | A Global Team of Professionals

## Leadership of industry-leading experts with over 20 years of experience from Samsung Electronics/SK Hynix, and more.
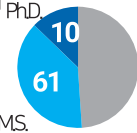
### R&D personnel
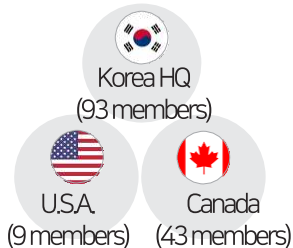
Among the total personnel (152 team members)

**86%**

**130**
R&D personnel

Percentage of Ph.D. and M.S. degree holders (71 members) among the R&D personnel

**47%**

Ph.D. **10**

**61**

M.S.

### Status of Each Country

Korea HQ
(93 members)

U.S.A.
(9 members)

Canada
(43 members)

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**Sean Lee**
Representative Director / CEO

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

**Jake Choi**
NPU Team Head

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

**Richard Fung**
TSS / CEO

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

**Moez Cherif**

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.

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

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

**Henry Moon**
Memory controller Team Head

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

**Ricky Lau**
TSS / CTO

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

**Roger Jennings**
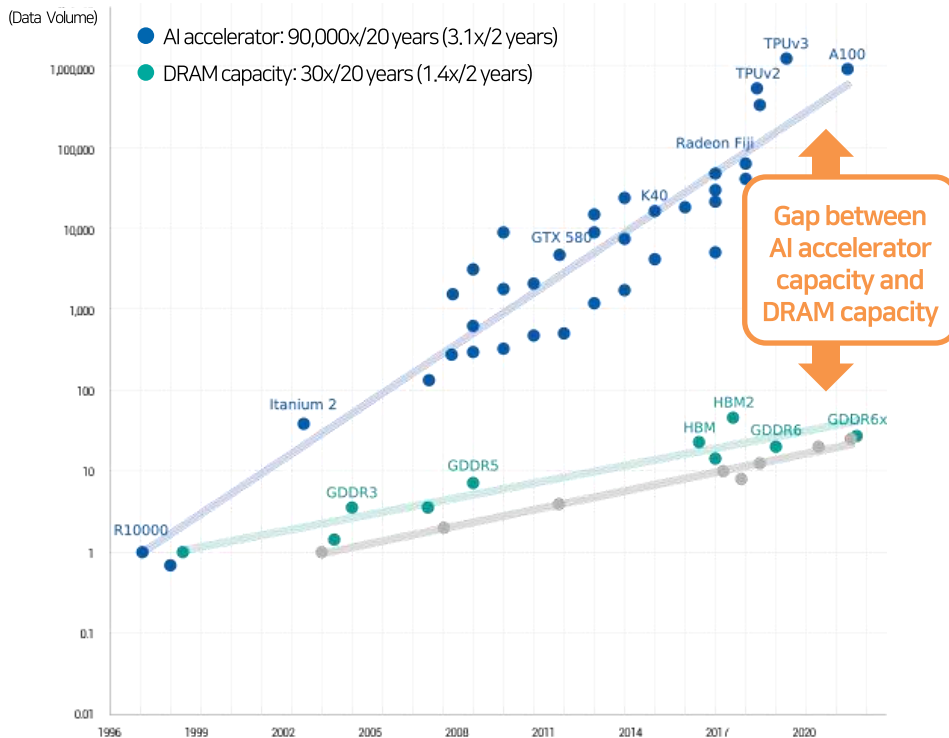OTC / VP of Engineering

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.
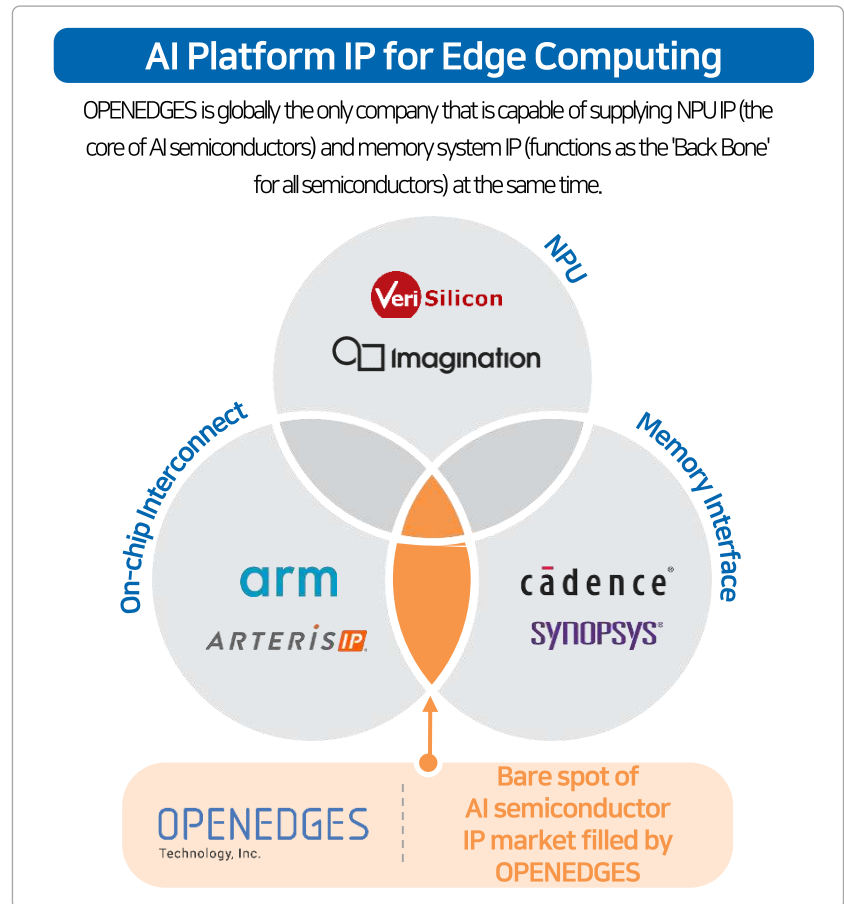
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※ As of the end of Dec. 2023

# 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**



(Data Volume)

- AI accelerator: 90,000x/20 years (3.1x/2 years)
- DRAM capacity: 30x/20 years (1.4x/2 years)

Gap between AI accelerator capacity and DRAM capacity

### 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.



NPU

Memory Interface

On-chip Interconnect

Bare spot of AI semiconductor IP market filled by OPENEDGES
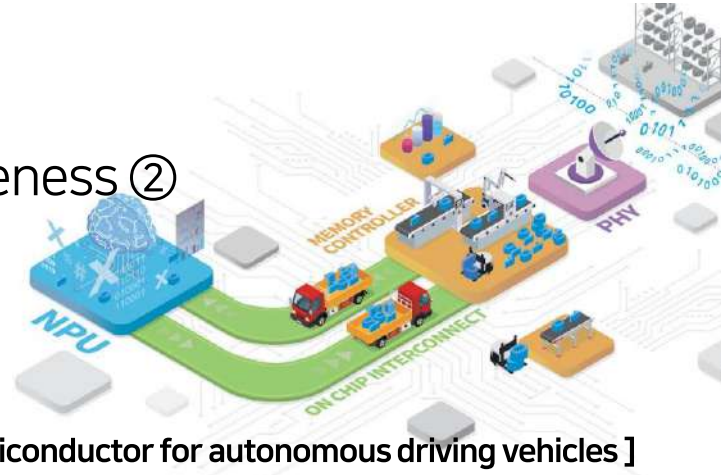
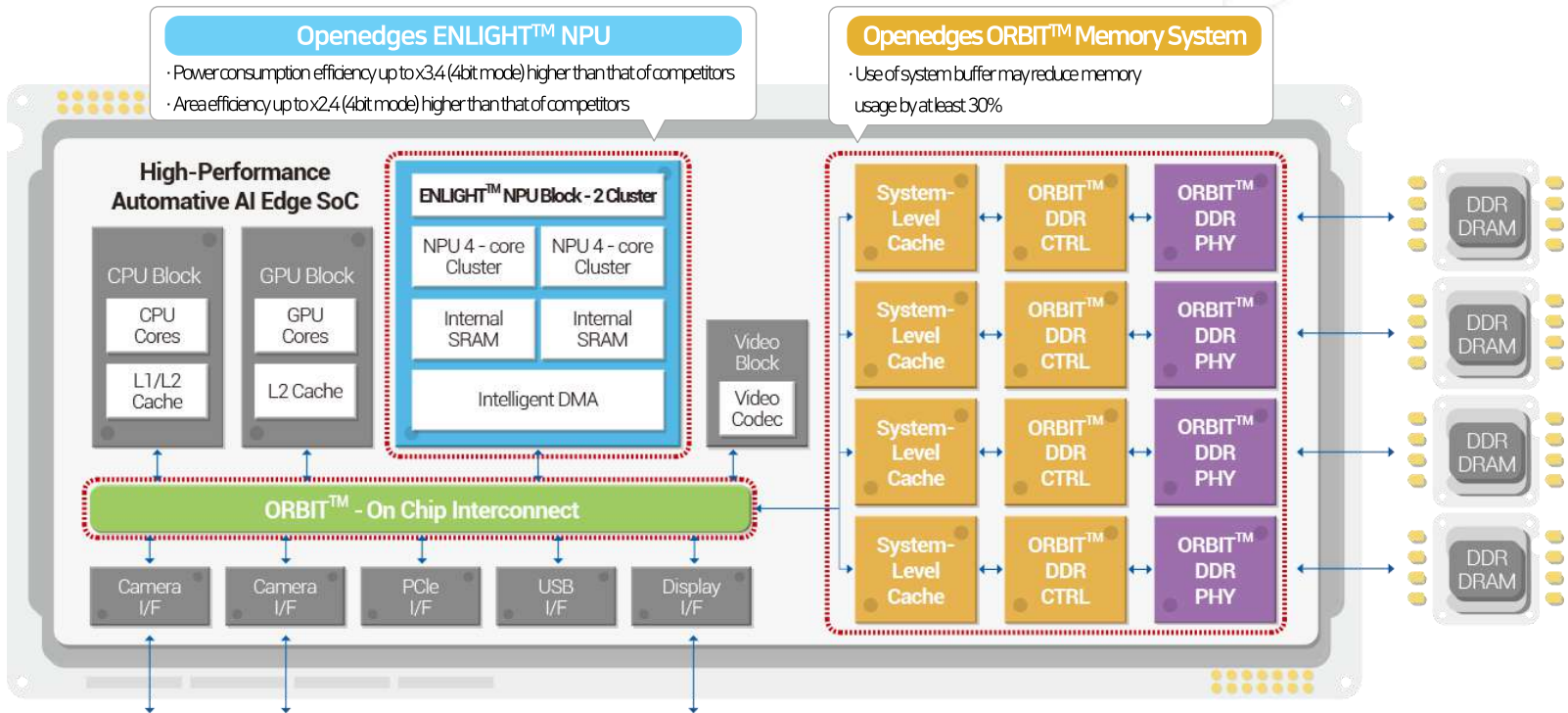※ Source: AI And Memory Wall By Riselab

# 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 ]**



**Openedges ENLIGHT™ NPU**
· Power consumption efficiency up to x3.4 (4bit mode) higher than that of competitors
· Area efficiency up to x2.4 (4bit mode) higher than that of competitors

**Openedges ORBIT™ Memory System**
· Use of system buffer may reduce memory
  usage by at least 30%

# 03 | Industry's Highest Technological Competitiveness ③

## Leading the market through the development of cutting-edge technology

| 구분 | IP | Description | 개발현황 | 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 ('24 1H release)** | **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 |
| | | HBM3 | Now | Server and ultra-high-performance products |
| | | DDR5 | Now | Next-generation Mainstream Technology |
| | | GDDR6 | Now | High-performance AI product |
| | | GDDR7 | In the future | High-performance AI product |
| | | **LPDDR6** | **Near future('24)** | **Next-generation Mainstream Technology** |
| | **OPHY™ (DDR PHY)** | LPDDR4X/4 | Now | TSMC 22nm Nodes |
| | | LPDDR5/4X/4 | Now | TSMC 16nm Nodes |
| | | LPDDR4X/4, LPDDR5/4X/4 | Now | TSMC 12nm Nodes |
| | | GDDR6 | Now | TSMC 12nm Nodes |
| | | LPDDR5X/5/4X/4 | Now | TSMC 6/7nm Nodes |
| | | HBM3 | Now | TSMC 6/7nm Nodes |
| | | **DDR5** | **Near future('24)** | **TSMC 5nm Nodes** |
| | | LPDDR6 | In the future | TSMC 4nm(or less) Nodes |
| | | LPDDR3, DDR4/3 | Now | Samsung 28nm Nodes |
| | | LPDDR4X/4, LPDDR5/4X/4 | Now | Samsung 14nm Nodes |
| | | LPDDR5/4X/4 | Now | Samsung 8nm Nodes |
| | | LPDDR5X/5/4X/4 | Now | Samsung 5nm Nodes |
| | | **LPDDR6** | **Near future('24)** | **Samsung 4nm(or less) Nodes** |
| | | GDDR7 | In the future | – |
| | **OIC™ (On-Chip-Interconnect)** | OIC™ | **Now (v2 released in '24)** | Non- Cache-Coherent NoC |
| | | OIC™-AI | **In the process** | Cache-Coherent NoC |

# 03 | Industry's Highest Technological Competitiveness ④

## Concentrate on areas that major global competitors cannot cover & expand M/S

**DDR PHY IP Competition status**

| Openedges | Synopsys | Cadence |
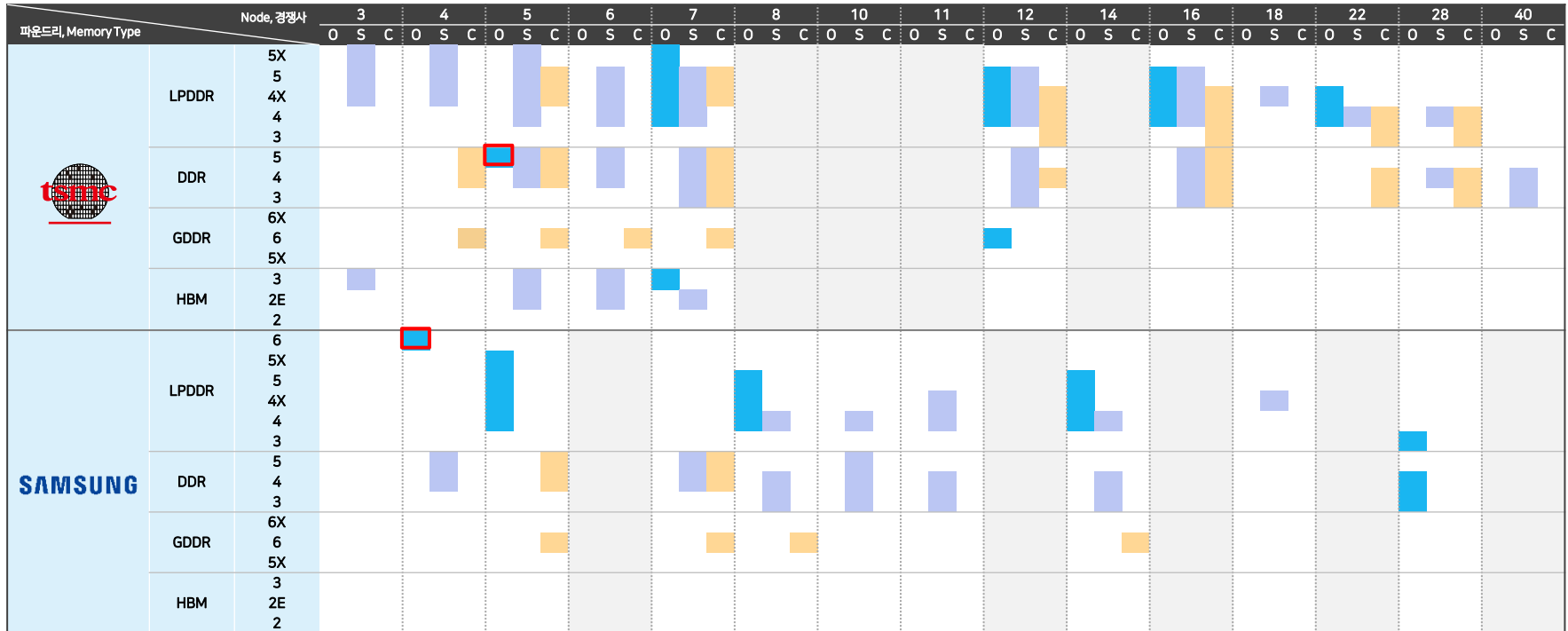


□ IP to be developed

**M/S expansion strategy**

✓ Synopsys and Cadence are focusing on TSMC 5nm and below leading-edge processes

✓ OE is the only one who provides LPDDR5X/5 PHY IP for supporting the SSF 5nm process

✓ OE is expecting customer pool through the development of PHY IP for SF 4nm & TSMC 5nm processes

✓ OE's PHY IP requires area less than 50% compared to competitors by provding through the test chips

# 03 | Industry's Highest Technological Competitiveness ⑤

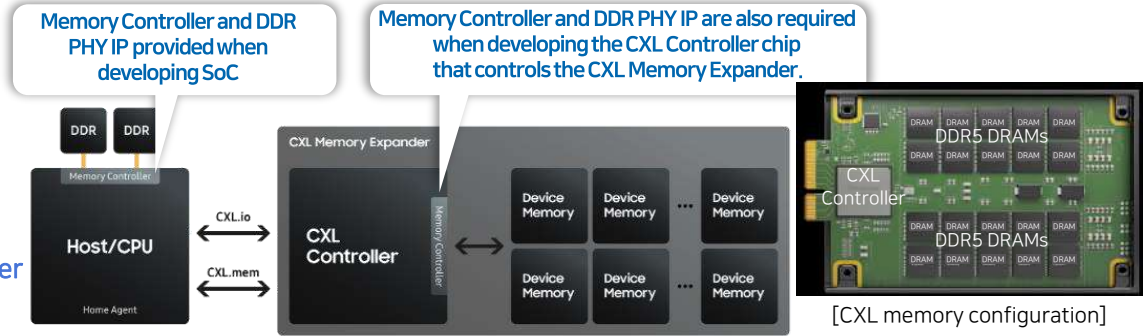## Maximize first-mover advantage of AI semiconductor integrated IP solutions

**OPENEDGES** Technology, Inc.

| 예상 출시 일정 | | 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 | NPU4.0 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)

Security Camera → Driver Support System such as E-Mirror → Fully Autonomous Driving

**OIC™** On-Chip Interconnect
- Non-Cache Coherent NOC: OIC v.1.X | OIC v.2.0
- Cache Coherent NOC: OIC-AI

**OMC™** Memory Controller: GDDR6 | LP5X/5 /4X/4 | HBM3 | DDR5 | LP6

**OPHY™** DDR PHY
- **SAMSUNG**: LP4/4X/5 (14nm) | LP5X/5/4X (5nm) | LP6 (4nm)
- **tsmc**: LP4/4X/5 GDDR6 (12nm) | LP4/4X/5 (22nm) | HBM3 LP4X/5/5X (7nm) | DDR5 (5nm)

**OUC(TBD)** Controller Die to Die (Chiplet): UCIe v1.1 Controller (AXI streaming) | UCIe v1.1 Controller (Full spec.)

**OPHY™** PHY Die to Die (Chiplet)
- **SAMSUNG**: OPHY-D2D (5/8nm)
- **tsmc**: OPHY-D2D (6nm)

○ R&D started in 2023    ○ R&D to be launched from 2024

# 03 | Industry's Highest Technological Competitiveness ⑥

## Leading the next generation of high value-added semiconductor technology expected to grow rapidly
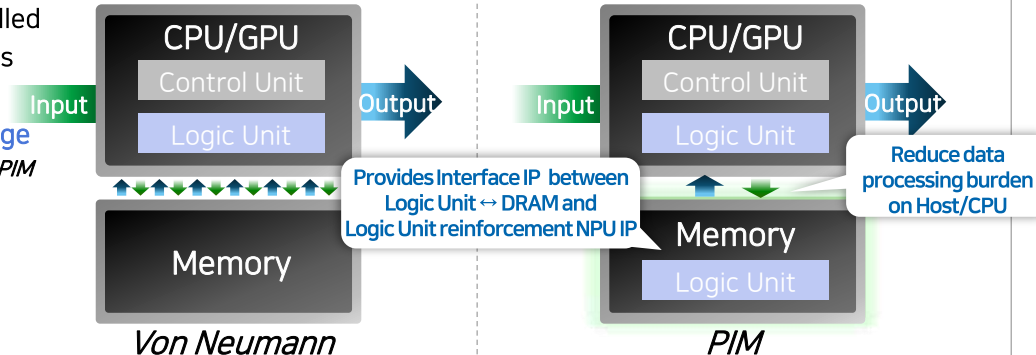
**CXL (Compute eXpress Link)**

- CXL interface can flexibly expand memory without limitations on memory standard capacity and performance dependent on existing Host/CPU
  → Effectively supports data intensive high-performance calculations such as AI chips
- supplies IP for the design of the CXL Controller chip, the core of the CXL Memory Expander.

> Memory Controller and DDR PHY IP provided when developing SoC

> Memory Controller and DDR PHY IP are also required when developing the CXL Controller chip that controls the CXL Memory Expander.

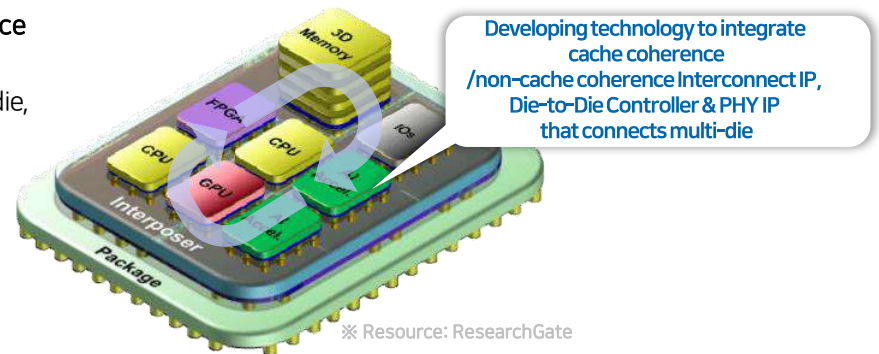[CXL memory configuration]

**PIM (Process-in-Memory)**

- PIM off-loads some of the computational functions handled by the Host/CPU (von Neumann structure) and processes them in the PIM.
  → Speed↑, Power↓ by simultaneous calculation & storage
  ※ Samsung is using HBM and SK Hynix is using GDDR6 for developing PIM
- Supplies Memory System IP, which is responsible for the data interface between Logic Unit and DRAM in PIM semiconductors, and NPU IP required to improve the performance of Logic Unit.

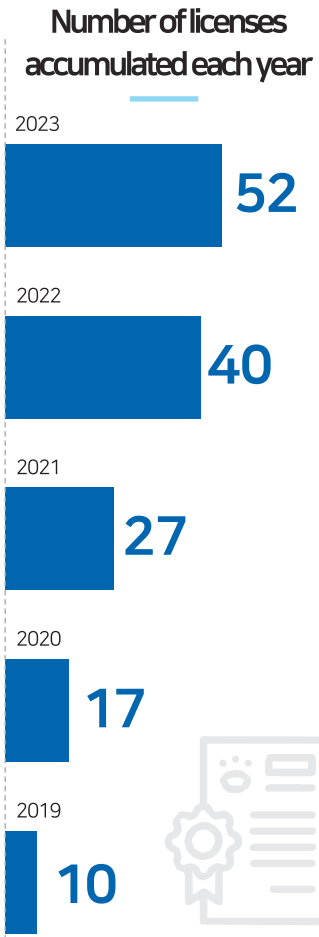> Provides Interface IP between Logic Unit ↔ DRAM and Logic Unit reinforcement NPU IP

> Reduce data processing burden on Host/CPU

*Von Neumann*          *PIM*

**Chiplet**

- A chiplet is a SoC that is manufactured by dividing high-performance SoC functions into multiple dies and then packaging them.
  → SoC development cost & Risk↓: Optimal process selection for each die, net die increase by reducing chip area
  → Development period ↓: Independent design for each die, use of previously verified chiplets possible
- provides 'On-chip & Chip-to-Chip Interconnect IP Solution' that can implement multi-die interconnect technology beyond single-die standard interconnect IP.

> Developing technology to integrate cache coherence /non-cache coherence Interconnect IP, Die-to-Die Controller & PHY IP that connects multi-die

※ Resource: ResearchGate

# 04 | Verified Global Track Records

**OPENEDGES** Technology, Inc.

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

### Number of licenses accumulated each year

- 2023: **52**
- 2022: **40**
- 2021: **27**
- 2020: **17**
- 2019: **10**

**Intelligent security camera**

VISIONEXT    nextchip
eyenix *the great eyes*    dNP PnpNetwork Technologies Inc.

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

AISIN    Telechips
nextchip    GAON CHIPS

**Server/storage devices**

SAMSUNG    SK hynix
ASICLAND    GLENFLY
*Global company I*    novachips

**IoT / Mobile**

JLQ TECHNOLOGY    MONTAGE Technology
SENSCOMM    GCT

**AI**

Micron    StarFive 赛昉科技
SemiFive    DeepX

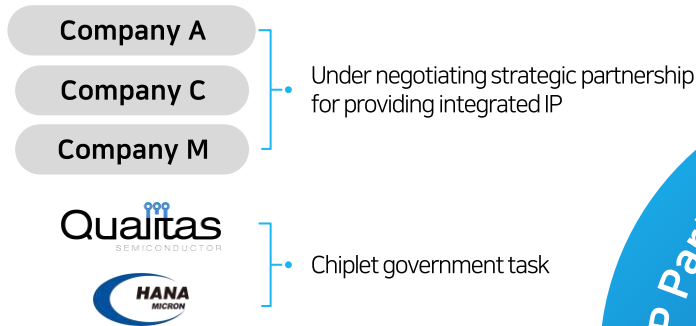**Others (drones, PC, etc.)**

LX Semicon    EYL
ASICLAND

**OPENEDGES** Technology, Inc.

AI for Everyone, Everywhere
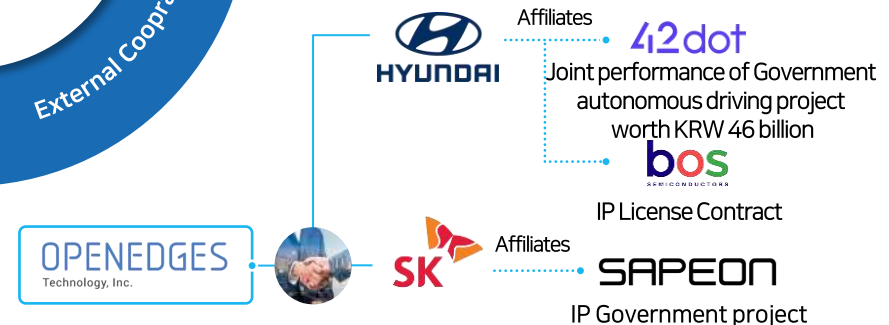
# 03

# 2023 Business Performance

**OPENEDGES** Technology, Inc.

# 01 | Sales Revenue

## Annual sales of KRW 18.9 billion due to growth in license sales (YoY 89%), the 4th quarter also achieved the highest ever quarterly sales (YoY 822%, QoQ 597%). Continued high growth expected in 2024 based on already secured IP product competitiveness

### Sales status

(Unit: KRW 1 million)



**Annual**

- ■ License
- ■ Maintenance
- ■ Royalty
- ■ Others

| 2021 | 2022 | 2023 |
|---|---|---|
| 5,186 | 10,012 | 18,930 |
| 35 | 32 | 71 |
| 808 | 1,387 | 1,699 |
| 4,342 | 8,593 | 2,308 |
|  |  | 14,852 |

**Quarterly**

| 2022.4Q | 2023.1Q | 2023.2Q | 2023.3Q | 2023.4Q |
|---|---|---|---|---|
| 1,426 | 1,059 | 2,842 | 1,885 | 13,144 |
| 10 | 17 | 18 | 20 | 17 |
| 415 | 487 | 454 | 604 | 1,699 |
| 1,001 | 555 | 2,370 | 1,261 | 762 |
|  |  |  |  | 10,666 |
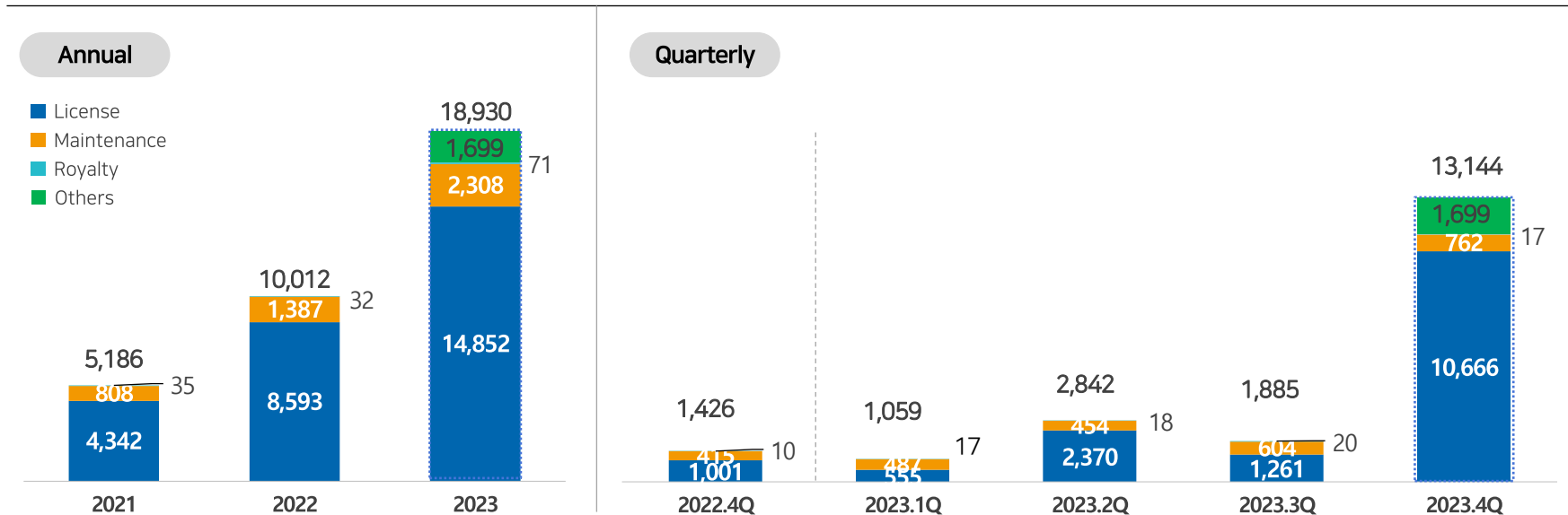
**Sales Analysis**

✓ **License** : Due to increase in license since 1H of 2023, sales were recognized in earnest from the 4Q23

✓ **Maintenance:** Sales are being generated from a total 28 projects

✓ **Royalty:** Expected to continue to grow in the future due to increased mass production of chips by customers

✓ **Others:** Sales for operational and technical support services for Openedges Square

**OPENEDGES**
Technology, Inc.

# 01 | Operating Profit(Loss)

## An annual operating loss of KRW 16.6 billion, improved by KRW 8.7 billion YoY
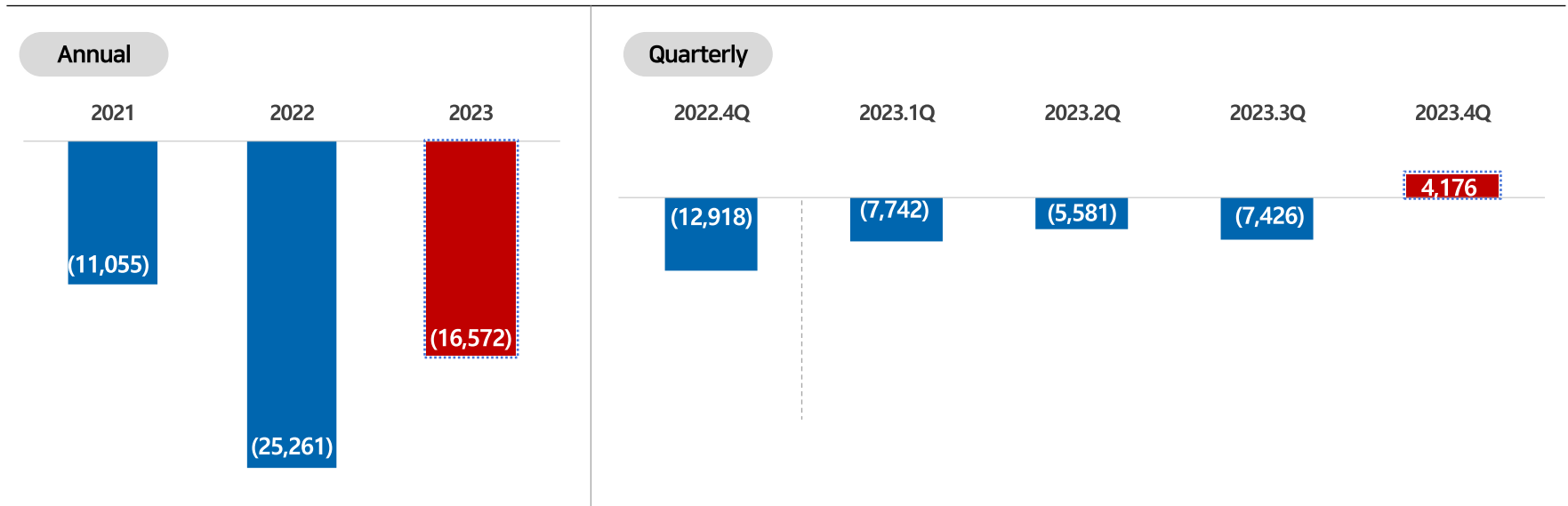## First quarterly surplus in the 4Q23 due to significant growth in sales.
## Expecting to improve Profitability significantly in 2024 due to sales growth.

**Operating Profit(Loss)**

(Unit: KRW 1 million)

**Annual**

| 2021 | 2022 | 2023 |
|------|------|------|
| (11,055) | (25,261) | (16,572) |

**Quarterly**

| 2022.4Q | 2023.1Q | 2023.2Q | 2023.3Q | 2023.4Q |
|---------|---------|---------|---------|---------|
| (12,918) | (7,742) | (5,581) | (7,426) | 4,176 |

**Operating Profit Anlaysis**

✓ Costs in 4Q23 stabilized, sales grew significantly, achieved company's first quarterly surplus.

✓ Most of the R&D expenses are for developing new IP, are being managed stably at around KRW 8 to 9 billion per quarter without burdening large one-off costs.

✓ Profitability is expected to improve significantly in 2024 due to stable costs and increased sales from IP licensing.

# 03 | Contract Status

OPENEDGES
Technology, Inc.

## Sales growth slowed in the first half due to the delays in signing license contracts, but expected to grow from the 4Q based on gradually improved market situation

### Financial and contract status

(Unit: KRW 1 million)

| 구분 | Quarter | | | | |
|---|---|---|---|---|---|
| | 23.4Q | 23.3Q | QoQ(%) | 22.4Q | YoY(%) |
| Sales | 13,144 | 1,885 | 597% | 1,426 | 822% |
| Operating Profit (Loss) | 4,176 | (7,426) | N/A | (12,918) | N/A |
| Net Income (Loss) | 4,955 | (7,310) | N/A | (12,745) | N/A |

### Contract status

| (Unit: case/$M) | License Contract (FY2023) | License Contract (FY2022) | Note |
|---|---|---|---|
| Numbers | 12 | 13 | – |
| Sum of Contract value | $15.5M | $7.5M | 2x growth |

### Performance Analysis and outlook

#### 2023 Results

**Significant growth in sales by providing IP tailored to advanced processes & the latest memory standards**

• Sales and profitability continue to improve due to ASP increase
  → ASP increase due to provision of advanced process IP such as Samsung 5nm, TSMC 6nm, etc.

• First quarterly surplus and preparing for preemptive market response through continuous IP development
  → Efforts to dominate the market through the development of market leading IPs such as NPU V3.0, LP6 related IPs

#### 2024 Outlook

**Expect high sales growth and improved profitability due to IP licensing**

• Steady improvements in opportunities to secure contracts from 2H23
• Negotiating with more than 30 customers, including global top-tiers

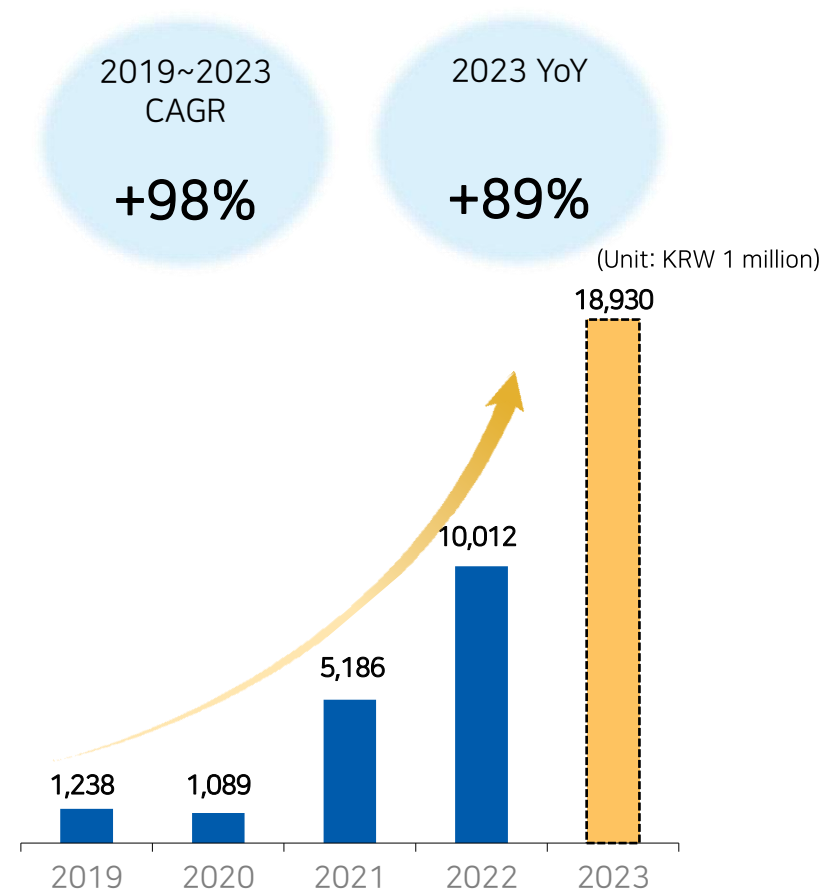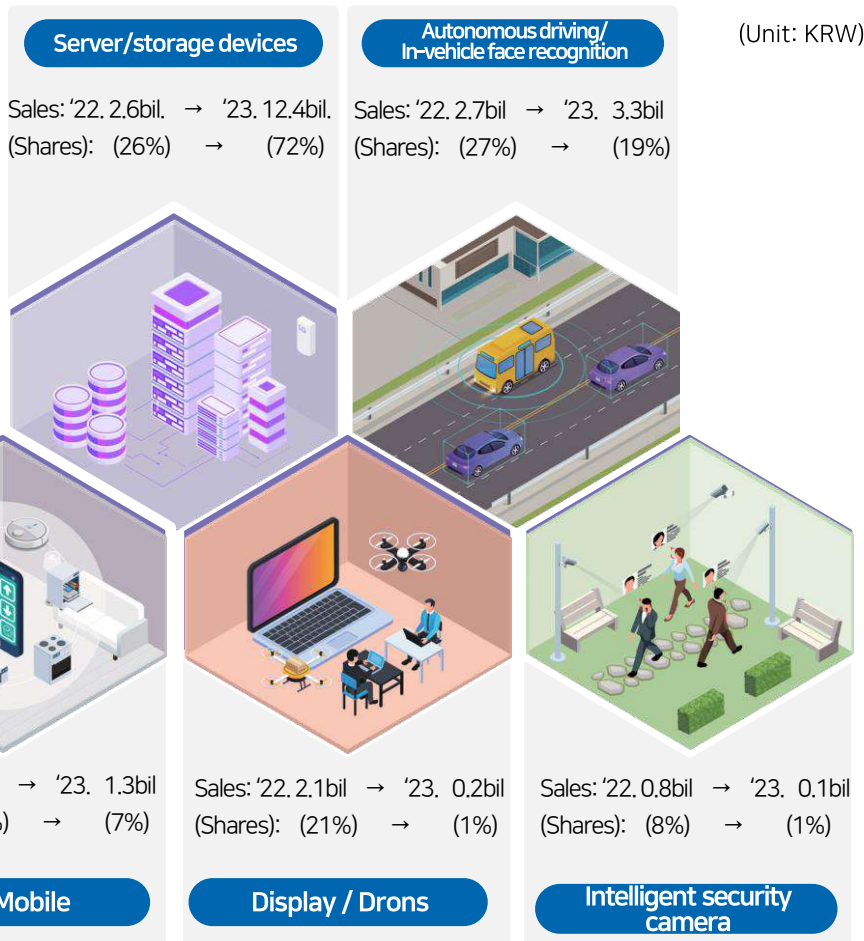**Expansion of collaboration in technology such as CXL, PIM, & Chiplet**

• 3 projects related to CXL ordered in 2023 are in progress
• In 2024, customized projects in the next semiconductor field such as CXL, PIM, and Chiplet are expected to further expand.

# 04 | Sales revenue Breakdown

## Approximately doubles every year, and sales volume by industry also steadily increases

### Generates various sales such as automotive and storage devices

(Unit: KRW)

**Server/storage devices**

Sales: '22. 2.6bil. → '23. 12.4bil.
(Shares): (26%) → (72%)

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

Sales: '22. 2.7bil → '23. 3.3bil
(Shares): (27%) → (19%)

Sales: '22. 1.9bil → '23. 1.3bil
(Shares): (19%) → (7%)

**IoT / Mobile**

Sales: '22. 2.1bil → '23. 0.2bil
(Shares): (21%) → (1%)

**Display / Drons**

Sales: '22. 0.8bil → '23. 0.1bil
(Shares): (8%) → (1%)

**Intelligent security camera**

### Sales growth begins in earnest after '21

2019~2023 CAGR

**+98%**

2023 YoY

**+89%**

(Unit: KRW 1 million)



| Year | Value |
|------|-------|
| 2019 | 1,238 |
| 2020 | 1,089 |
| 2021 | 5,186 |
| 2022 | 10,012 |
| 2023 | 18,930 |

* Excluding other sales (Openedges Square operating and technical support service sales)

# 04 | Sales revenue Breakdown

## As server needs, such as those related to data centers and CXL, increase, related sales grow significantly.

### Sales revenue Breakdown by Customer

■ Fabless ■ Designhouse ■ Top-Tier ■ Others

(Unit: KRW 1 million)



### Sales revenue Breakdown by application

■ Automotive
■ PC/Server/Storage
■ IOT/Mobile
■ Display/Drons
■ Intelligent security camera
■ Others
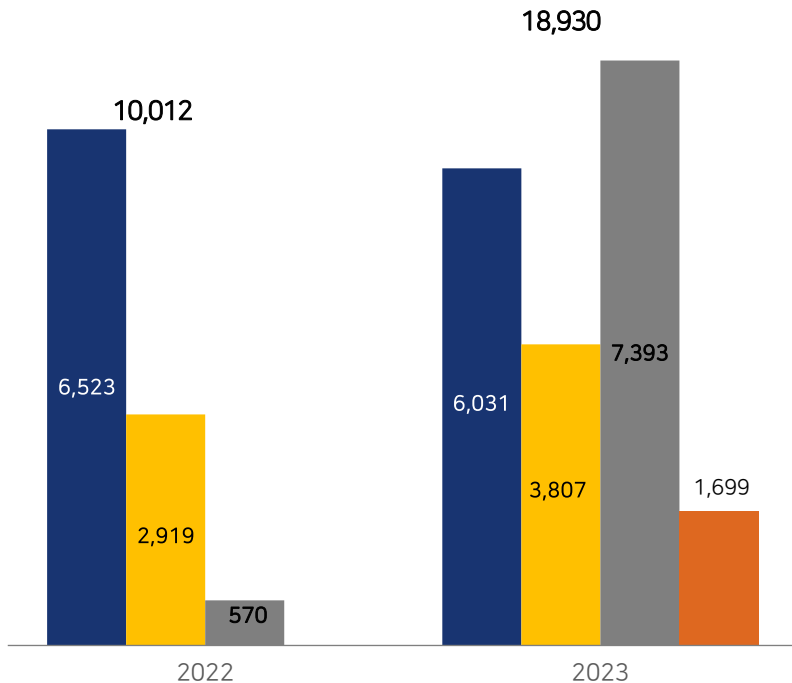
(Unit: KRW 1 million)



Others: Sales of operational and technical support services for Openedges Square
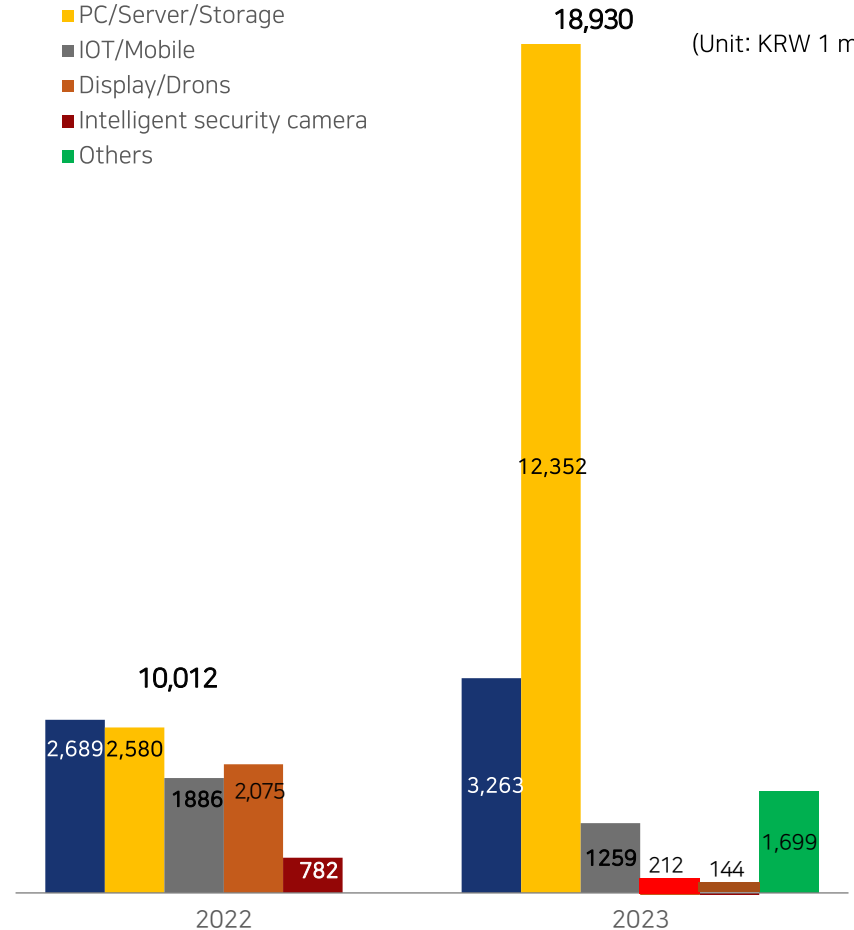
# 04 | Sales revenue Breakdown

## Sales volume for both of foundry S and T is growing rapidly YoY

### ● Sales by foundry (based on SoC producers equipped with our IP)

(Unit: KRW 1 million)

- ■ Foundry S
- ■ Foundry T
- ■ Foundry U

**2022**
- 10,012
- 6,510
- 3,464
- 38

**2023**
- 17,231
- 10,908
- 6,323

### Breakdown of Openedges sales revenue by foundry

□ **Continued growth in sales volume of the two major foundries**

Foundry S: Growth continues due to increased sales of lp5x related PHY IP

Foundry T: Rapid increase in related IP sales even before joining IP Alliance

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

   expected to surge

#### '21~'23 Openedges sales revenue by Foundries

| | '21 | '22 | '23 | YoY | CAGR ('21~'23) |
|---|---|---|---|---|---|
| S | 3,182 | 6,510 | 10,908 | 67.6% | 85% |
| (%) | (61%) | (65%) | (63%) | | |
| T | 1,661 | 3,464 | 6,323 | 82.5% | 95% |
| (%) | (32%) | (35%) | (37%) | | |
| U | 343 | 38 | - | - | |
| Total | 5,186 | 10,012 | 17,231 | - | - |

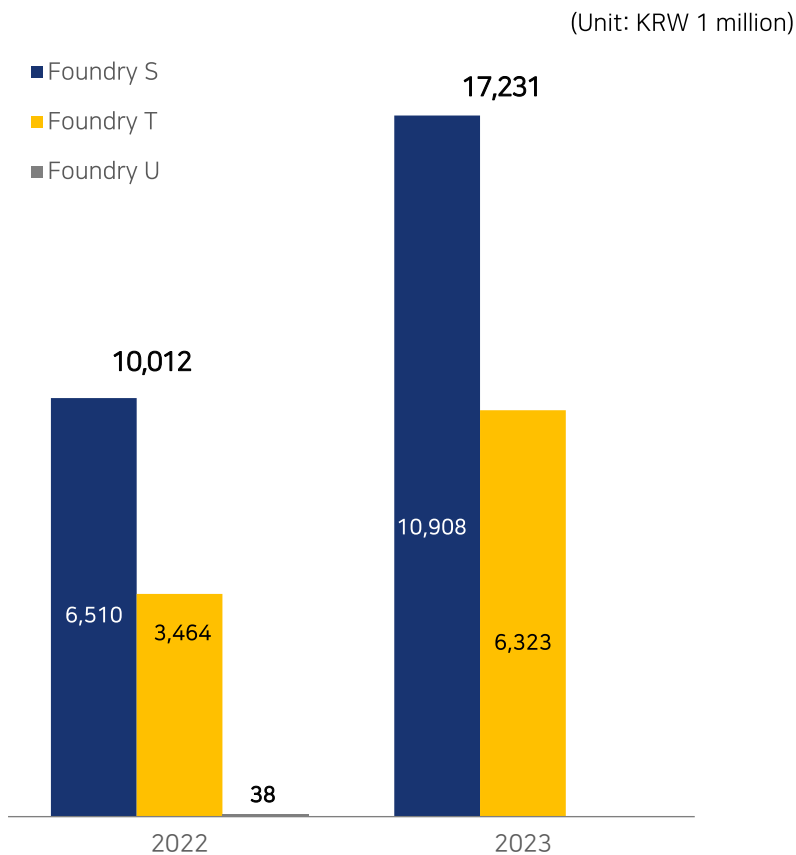* Excluding other sales (Openedges Square operating and technical support service sales)

# 04

AI for Everyone, Everywhere

# Appendix
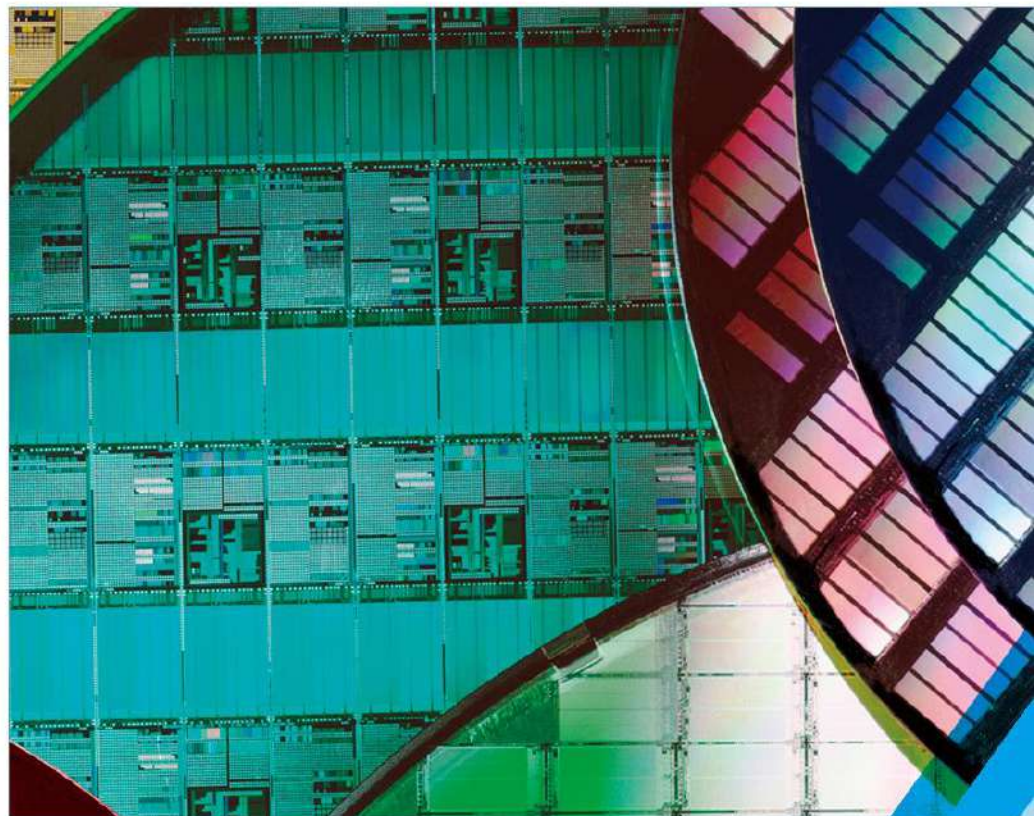
# 01 | Shareholders

**Sean Lee(including related parties) owns a stake of 30.45%, securing management rights through stable ownership.**

## Shareholders
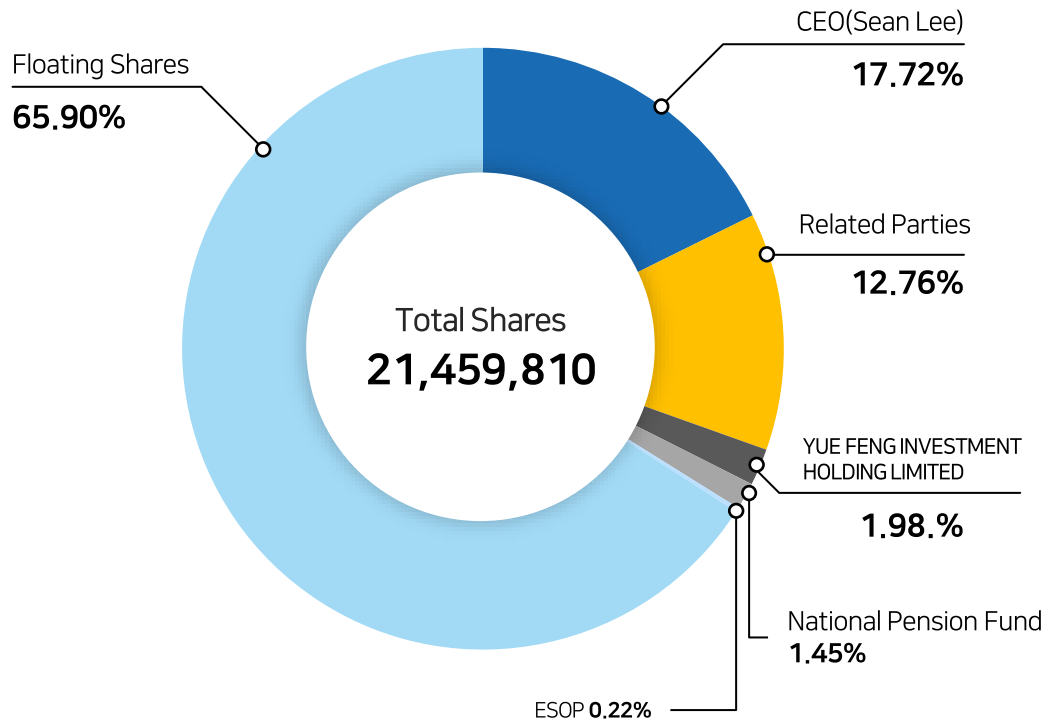


| Name | Type | # of shares | % |
|------|------|-------------|---|
| CEO(Sean Lee) | Common | 3,796,314 | 17.72% |
| Related Parties | Common | 2,738,293 | 12.76% |
| YUE FENG INVESTMENT HOLDING LIMITED | Common | 425,000 | 1.98% |
| National Pension Fund | Common | 311,095 | 1.45% |
| ESOP | Common | 47,999 | 0.22% |
| Floating Shares | Common | 14,141,109 | 65.90% |
| **Total** | | **21,459,810** | **100.00%** |

※ As of Dec. 31, 2023

# 02 | Openedges Square - Summary

## Company Profile

| Name | OPENEDGES Square |
|---|---|
| CEO | Sean Lee |
| Establishment | August 2023 |
| Capital | 36 bil.(Openedges l8 bil. Investment in kind )<br>(2 financial investors: 18 bil. Investment in cash) |
| Employees | 7 people (as of November 1, 2023) |
| Workplace | Headquarters: 10th floor, Hyeonjuk Building, 114 Yeoksam-ro, Gangnam-gu, Seoul |
| Key points | Openedges HQ holds a call option for 35% of the financial investor's shares. |

## Shareholders

**50%**

**50%**

OPENEDGES
Technology, Inc.

**Financial Investors
(Stonebridge &
Aitinum Investment)**

18 billion(KRW) investment in kind     Cash investment of 18 billion(KRW)

## Business Status

OPENEDGES
Technology, Inc.

Tarteting fast commercialization and make stable growth
through the synergy with the current Openedges' IP product portfolio

"OPENEDGES Square"

**Multi-core Processor based IP development**

Processor's computation burden
within AI semiconductors
→ Target to develop core functional blocks
*Cache-Coherent NoC
to reduce the burden

**IP Sales platform business**

To change the current resource-consuming
SoC design paradigm,
→ Target to develop and supply IP Sales platform

# 02 | Openedges Square - Main business areas

## Multi-core processor-based IP development business

### Cache-Coherent NoC(CC NoC) Necessity

As semiconductor design becomes more complex, data transmission inconsistencies between each processor cause calculation errors.



Requires cache memory coherence in multicore

A core functional block within the AI semiconductor responsible for maintaining the same cache data between multi-cores.

### IP development and success factors | IP development to prevent calculation errors

Multi-core Chip ········ IP development

OPENEDGES
Technology, Inc.

**Technology success DNA**
- 4 Core IPs in AI chip market
- Technological correlation with NCC-NoC from Openedges

**Market entry through existing sales channels**
- Sales personnel & 9 overseas sales agents
- Total solution can be supplied by linking with existing IP

**Present**

**Future**

## IP sales platform business

### The need for an IP sales platform due to the exhaustive IP licensing process

| Fabless, Design House | — Face-to-face contact — | IP Companies |

Thousands of companies

OPENEDGES
Technology, Inc.

**IP sales platform**

- Platform usage fee
- Commission based on some portion of orders

Check order information

Efficiently connect supply and demand

Sales Opportunity

| Fabless, Design House | IP Companies |

comparing various IPs → Reduce cost

Expansion of customer pool Reduces assessment resources

### Success factors for web-based SoC design platform

| Memory System IP developed by Open edges can be actively utilized | Openedges enables effective market entry targeting existing customers | Efficient operation possible through shared service agreement with Openedges |

# 03 | Financial Statements Summary

## ● Summary of Financial Statements

(Unit: KRW 1 million)

| | 2023 | 2022 | 2021 | 2020 |
|---|---|---|---|---|
| Current Assets | 29,903 | 44,304 | 29,020 | 6,216 |
| Non-current Assets | 14,447 | 9,552 | 7,077 | 4,075 |
| **Total Assets** | **44,350** | **53,855** | **36,097** | **10,291** |
| Current Liabilities | 19,704 | 18,318 | 9,171 | 5,477 |
| Non-current Liabilities | 4,762 | 3,288 | 6,374 | 31,551 |
| **Total Liabilities** | **24,466** | **21,606** | **15,545** | **37,028** |
| Capital | 2,146 | 2,116 | 1,653 | 15 |
| Capital Surplus | 98,259 | 96,376 | 58,927 | - |
| Other Capital | 3,578 | 2,026 | 3,007 | 1,697 |
| Retained earnings | -84,099 | -68,269 | -43,035 | -28,449 |
| **Total Equity** | **19,884** | **32,249** | **20,553** | **-26,737** |

※ Based on consolidated financial statements

## ● Summary of Income Statements

(Unit: KRW 1 million)

| | 2023 | 2022 | Change | Change(%) |
|---|---|---|---|---|
| **Sales** | **18,930** | **10,012** | 8,918 | 89.1 |
| Sales Management Expenses | 35,502 | 35,273 | 229 | 0.6 |
| **Operating Profits** | **-16,572** | **-25,261** | 8,689 | *N/A* |
| Financial Profits | 1,502 | 1,409 | 93 | 6.6 |
| Financial Costs | 1,248 | 1,067 | 181 | 17.0 |
| Other Profits | 789 | 476 | 313 | 65.8 |
| Other Costs | 26 | 402 | -377 | -93.6 |
| **Net Profit before Corporate Tax Costs** | **-15,556** | **-24,846** | 9,291 | *N/A* |
| Corporate Tax Costs | -12 | 380 | -393 | *N/A* |
| **Current Net Income** | **-15,543** | **-25,227** | 9,683 | *N/A* |

※ Based on consolidated financial statements