National Research Foundation of Korea

Ministry of Science and ICT

International Collaboration Program of Korea in Semiconductor R&D

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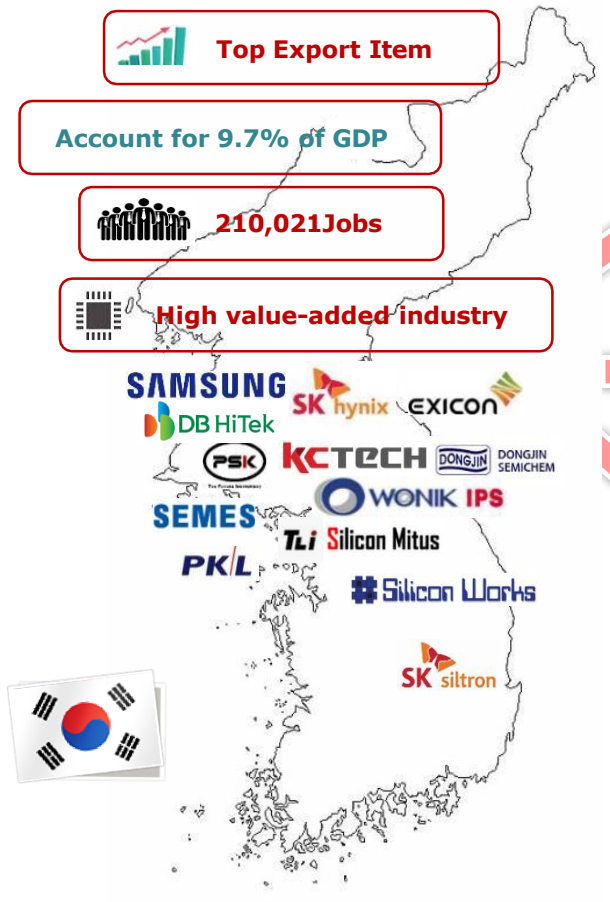
National Research Foundation of Korea (NRF)

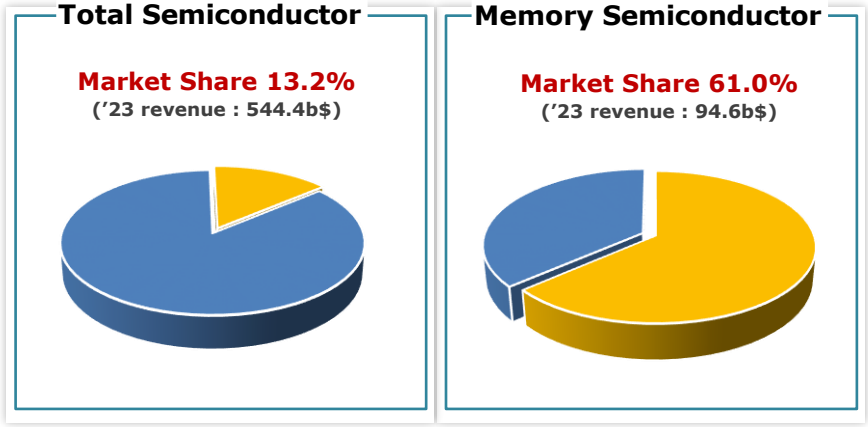
Contents

1 Korea Semiconductor Industry Overview

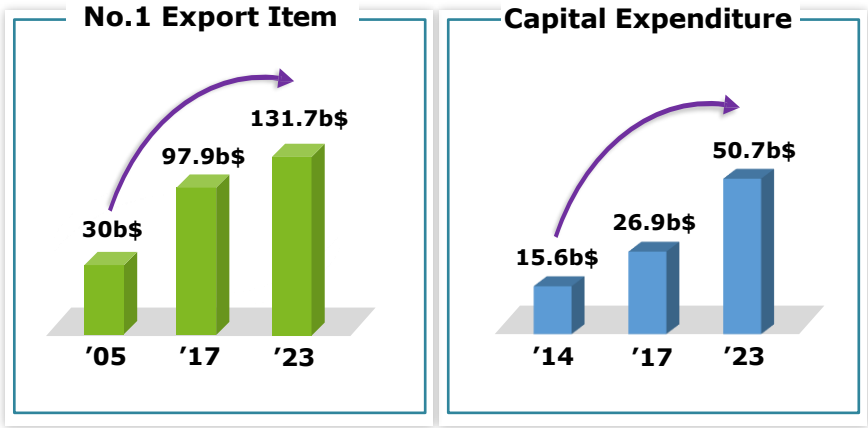
Account for 11.3% from Manufacturing



* Source : Kostat



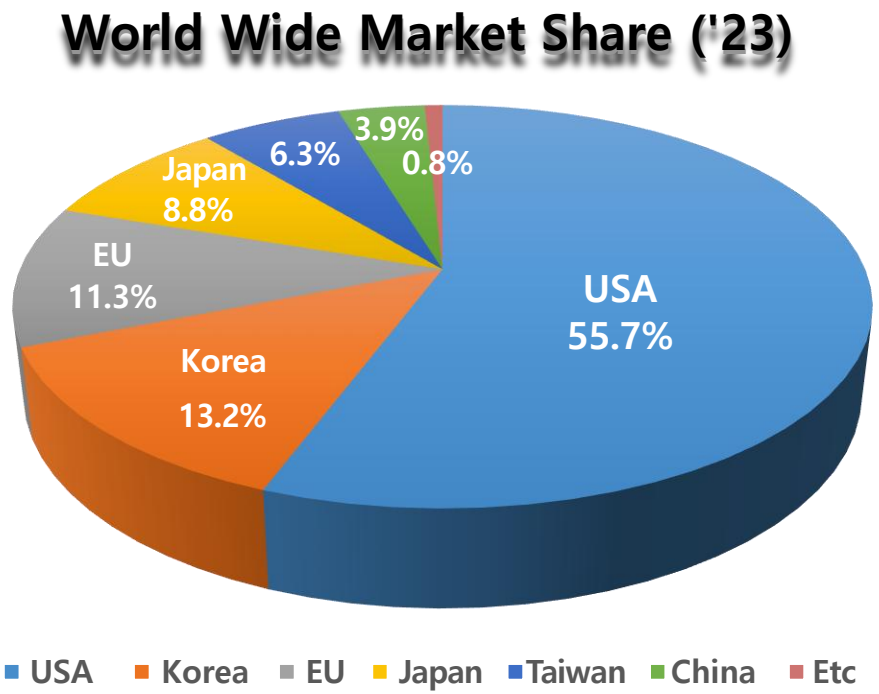
*Source : OMDIA 2024



*Source : KITA K-STAT

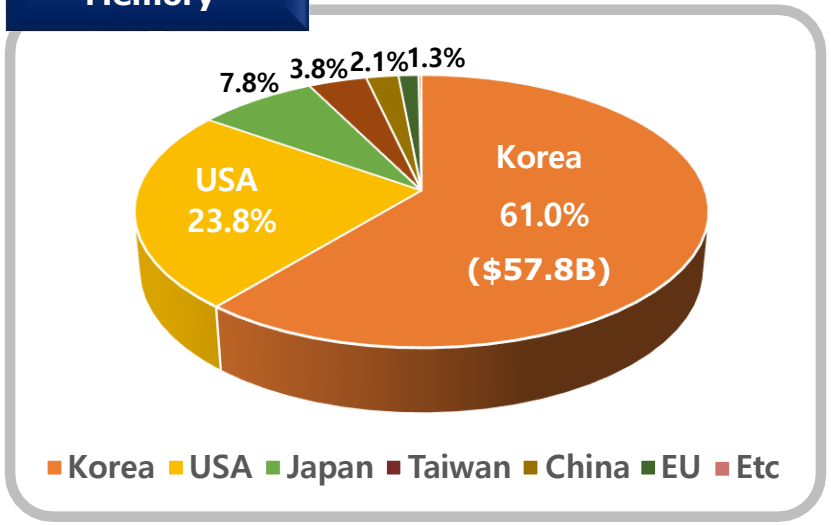
1 State of Korean Semiconductors

- Korea's market share in the global semiconductor industry was 13.2% in 2023
- Korea's market share in the system IC global market was 2.3% while in the memory market was 61.0% in 2023

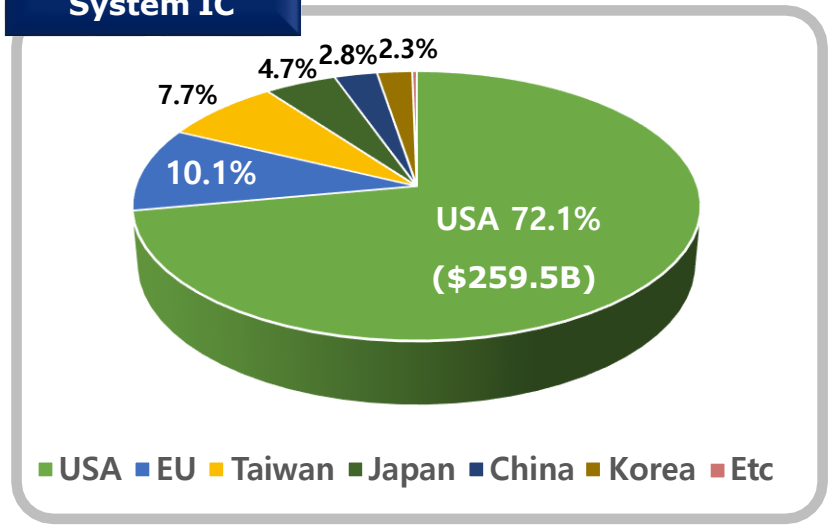


※ Source : OMDIA 2024

Memory

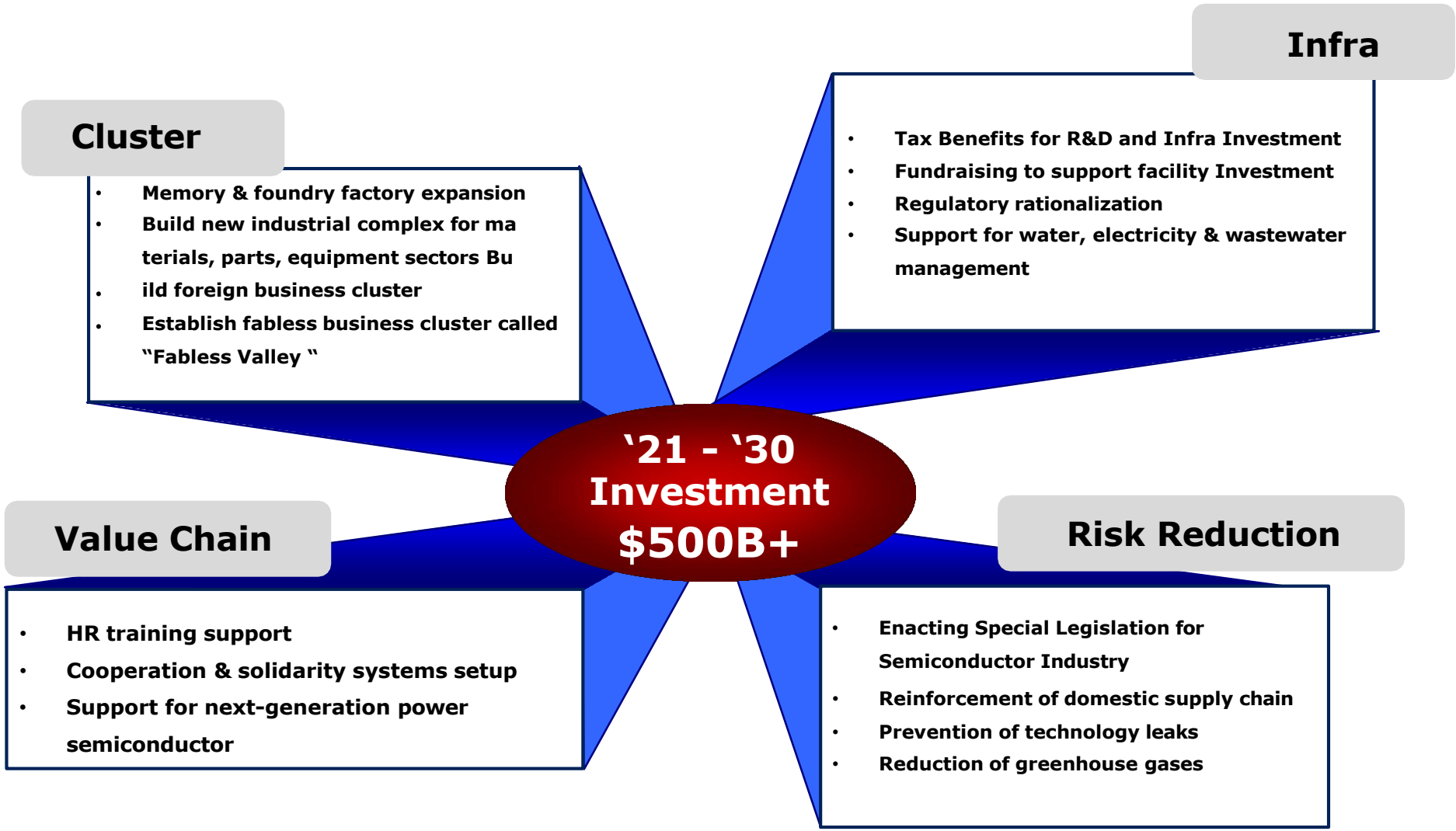


System IC



※ Source : OMDIA 2024

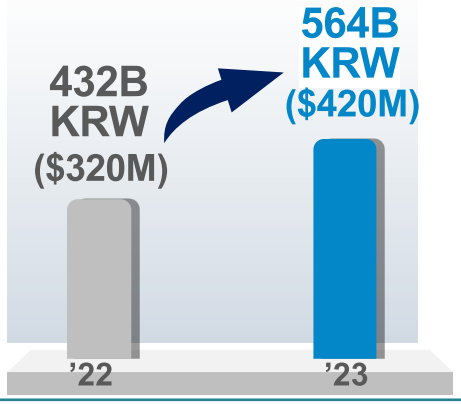
1 Korea Semiconductor Strategies



2 Government R&D

Government R&D invest

- In 2023, the government plans to invest
  KRW 564 billion=$ 420 million(up 30.4% YoY) in overall semiconductor



R&D Roles of Ministries

- **MSIT(Ministry of Science and ICT):** Development of fundamental and emerging semiconductor technology
- **MOTIE(Ministry of Trade, Industry and Energy):** Development of applied semiconductor technology

Funding Agency

- **National Research Foundation of Korea (NRF))**
  - Planning, Selection, Evaluation, and Management of R&D projects funded by MSIT

2 Semiconductor Innovation Programs of MSIT

To Support Semiconductor Research and Industry (in 2023)

	Program	Budget
R&D	• Next-generation intelligent semiconductor technology • Processing-in-memory AI semiconductor technology • National semiconductor laboratory • AI semiconductors for autonomous driving	125 M$
Manpower	• Training & Development of System IC Expertise • Highly experienced professional consultancy • AI semiconductor innovative talent development	16 M$
Infra	• Inter-university semiconductor research center • Semiconductor testbed facility • Nano Fab center	23 M$
Incubation	• AI semiconductor innovative enterprise • Implementation of AI semiconductors • Global ICT innovation clusters	19 M$

Total 183M$

3 International Collaboration Programs

Semiconductor international Joint Research of MSIT (on-going)

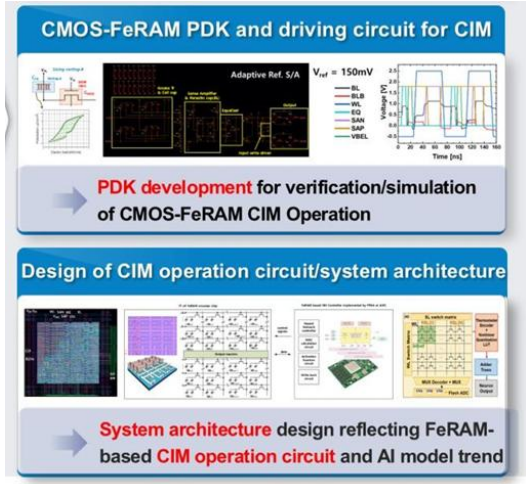
ROK-US	ROK-EU	Open Int'l Collaboration
• Agency: NRF-NSF • Scope - semiconductors (device, design, process, packaging) • # of Awards: 6 • Budget: 677k$ • Period: 3 years • Supplementary to NSF awards	• Agency: NRF-Chips JU • Scope - Heterogeneous integration - Neuromorphic computing • # of Awards: 4 • Budget: 1.5M€ (each) • Period: 3 years • Mutual Award Funding	• Agency: NRF • Scope - semiconductors - display • # of Awards: 8 • Budget: 386k$ • Period: 2 years • Awards from Korean government only

※New Int'l collaboration will start from July, 2025 open to all foreign countries. (6 projects)

3 Partners of Semiconductor International Collaboration

3 ROK-EU Collaboration Research Projects

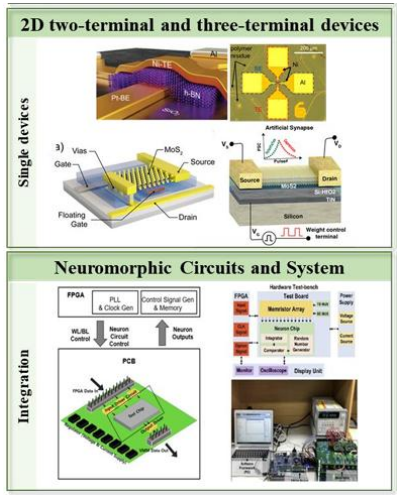
3D FeRAM integrated circuit/architecture for low-power and high-performance CIM (ViTFOX)



- Dae Woong Kwon, Hanyang Univ.
- Laura Begon-Lours, ETH

- Ferroelectric-augmented intelligent semiconductors technology
- Applied for vision transformer

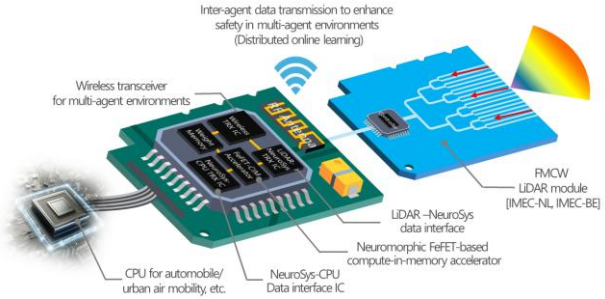
Energy-efficient neuromorphic 2D devices and circuits for edge AI computing



- Ki Kang Kim, Sungkyunkwan Univ.
- Max Christian Lemme, AMO GmbH

- 2DM-based neuromorphic technology
- Targeting wafer-scale production
- Applied for complex neural networks

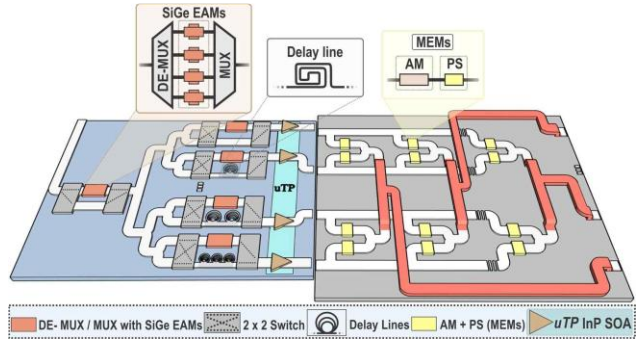
Neuromorphic Computing Systems for Heterogeneously-Integrated Silicon Photonics (LiDAR)



- Jong Hyeok Yoon, DGIST
- Ruud Oldenbeuving, IMEC-NL

- FeFET-based CIM accelerators
- PIC on reservoir computing
- Applied for FMCW LiDAR

Heterogeneously Integrated Multi-Material Photonic Chiplets for Neuromorphic Photonic Transfer Learning AI Engines



- Sang Yoon Han, DGSIT
- Nikolaos Pleros, ARISTOTLE UNIVERSITY OF THESSALONIKI

- low-energy statically-weighted photonic neurons
- energy-efficient photonic neuromorphic hardware

4 Future Plan

Enhanced Activity of ROK Researchers

- ROK became an Associate Country of Horizon Europe starting Jan. 2025.
- Enables Korean researchers to participate in Horizon Europe program on equal footing with EU member states.
- New multilateral funding programs will be strategically developed to support international research collaborations.

Semiconductor Researchers Forum

- Bring Semiconductor Researchers from ROK and EU together for Discussion & Networking
- EU hosted 1st Forum in Brussel, 2024. ROK hosts 2nd Forum in Jeju, 2025.
- Next ROK-EU Researchers Forum is being discussed

Thank You

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