ICOS
International Cooperation On Semiconductors

WORKSHOP – May 12-13, 2025 - Warsaw

Semiconductor Industry in Korea & EU International Cooperation on Semiconductor

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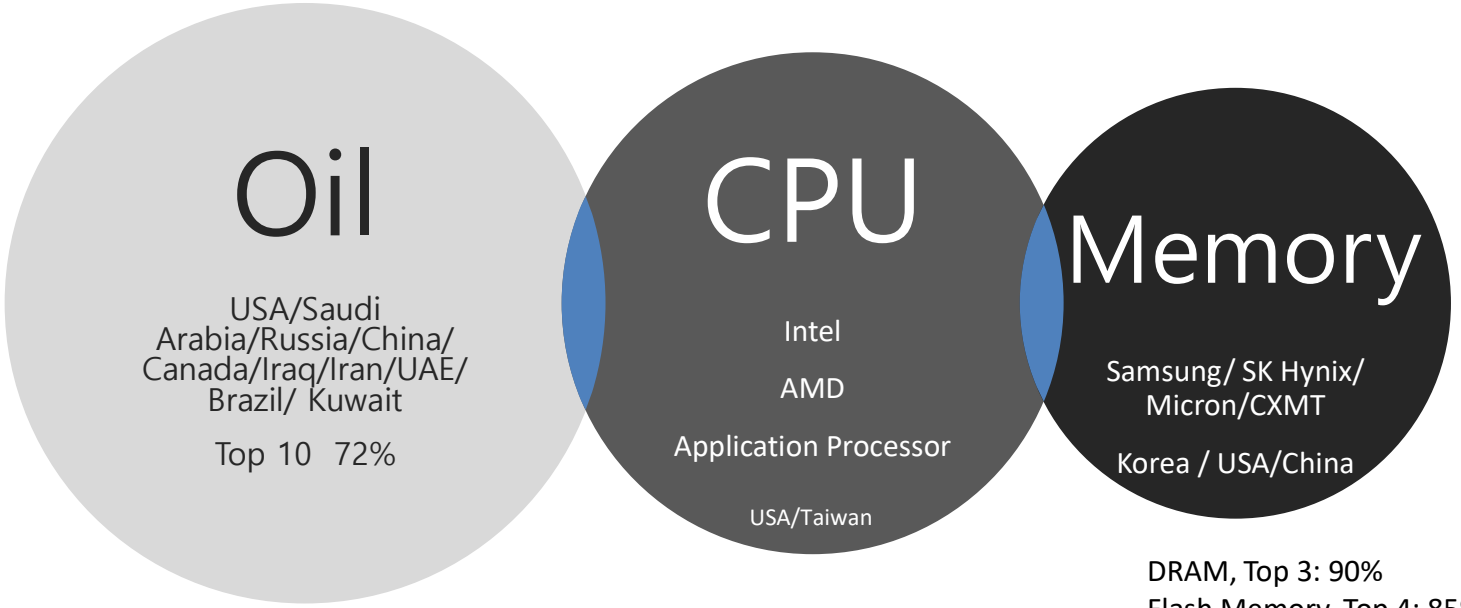
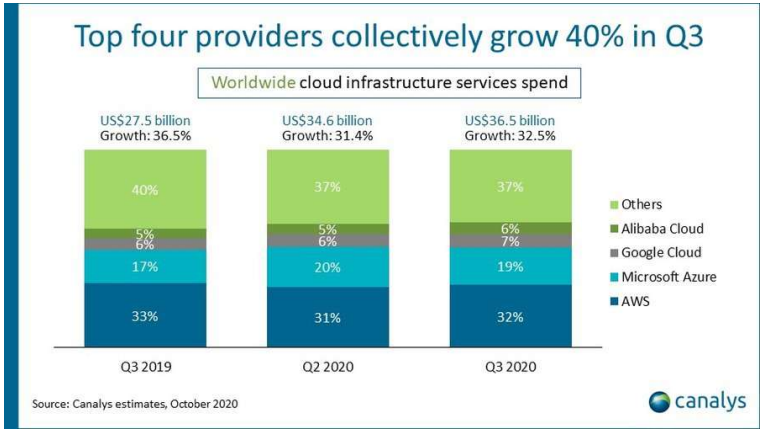
Importance of Semiconductor



https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/energy-outlook/bp-energy-outlook-2024.pdf

DRAM, Top 3: 90%
Flash Memory, Top 4: 85%

Next Generation Semiconductor Market



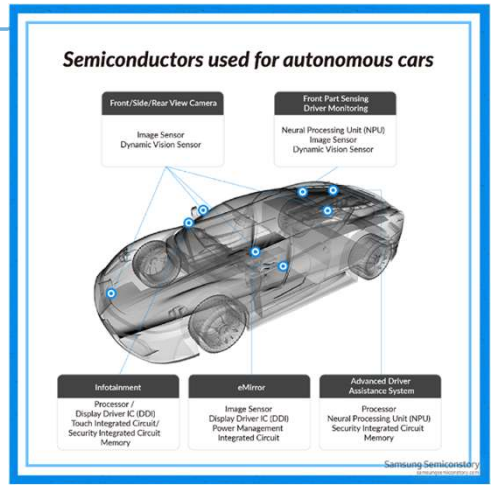
https://www.redhat.com/ko/topics/cloud-computing/what-is-paas

https://datacenters.google/advancing-security/

Cloud and Data Center

- **Cloud/Data Center**
  - Major Players: AWS, Azure, Google Cloud
  - Market Size:
    - worldwide cloud market grew 33% this quarter to $36.5 billion (2020 Q3) (Canalys reports)
- **Related Area: CPU/Memory/Communication/Power and energy**

Next Generation Semiconductor Market



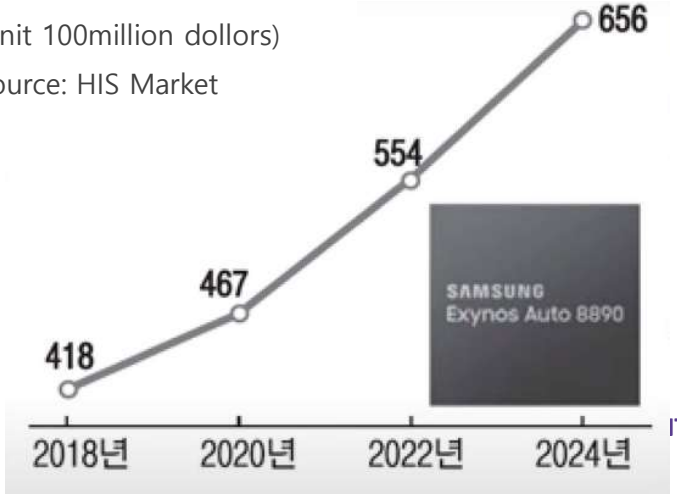
Automotive

- **Key Areas:**
  - **Power Management**: Controls battery, electric motors, and energy distribution.
  - **Safety Systems**: Powers airbag sensors, braking systems (ABS), and collision avoidance.
  - **Infotainment & Connectivity**: Enables displays, audio systems, navigation, and wireless communication.
  - **Autonomous Driving**: Supports sensors, cameras, radar, and LiDAR integration for self-driving features.
- Market Size:
  - 2018 42 Billion USD
  - 40% growth/year

Automotive Semiconductor Market

(unit 100million dollors)

Source: HIS Market



Next Generation Semiconductor Market

Sedol Lee vs. AlphaGo (2016)
4:1 AlphaGo wins
1 MW: 20 W (x50,000)

Artificial Intelligence

- The **global AI market** is projected to reach **$300–350 billion** in 2025.
- CAGR (Compound Annual Growth Rate): **~35%** from 2020 to 2025.
- **Generative AI** alone is expected to account for over **$50 billion** by 2025.

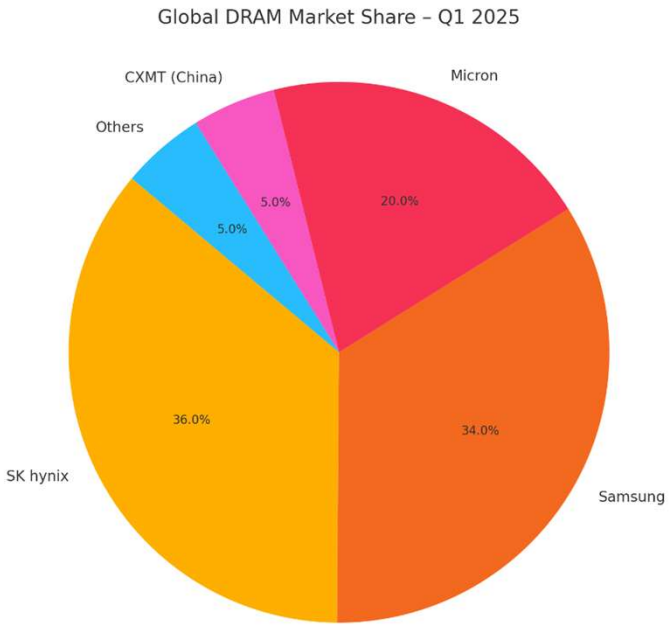
Segment	Description	Key Players
Software & Platforms	AI models, ML tools, APIs, cloud services	OpenAI, Google, Microsoft, AWS
Hardware	AI chips, GPUs, edge devices	NVIDIA, AMD, Intel
Services	AI consulting, integration, and support	Accenture, IBM, Deloitte

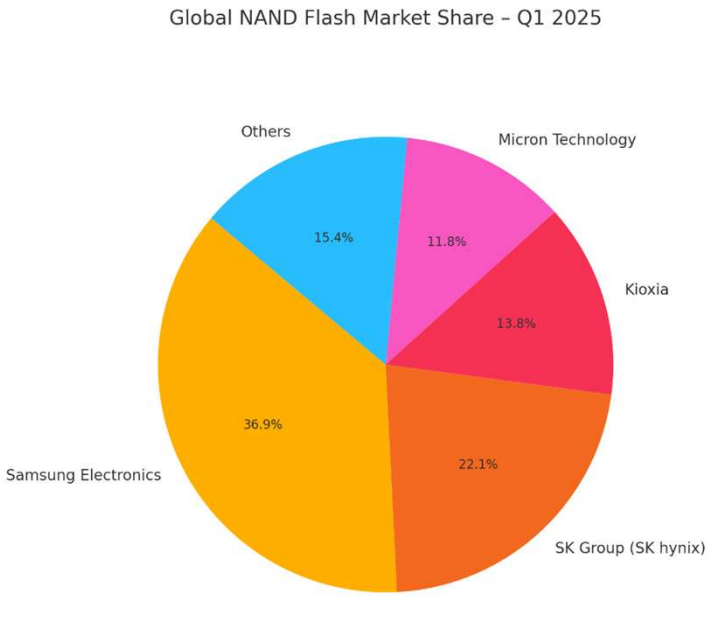
World Semiconductor Sales Leaders

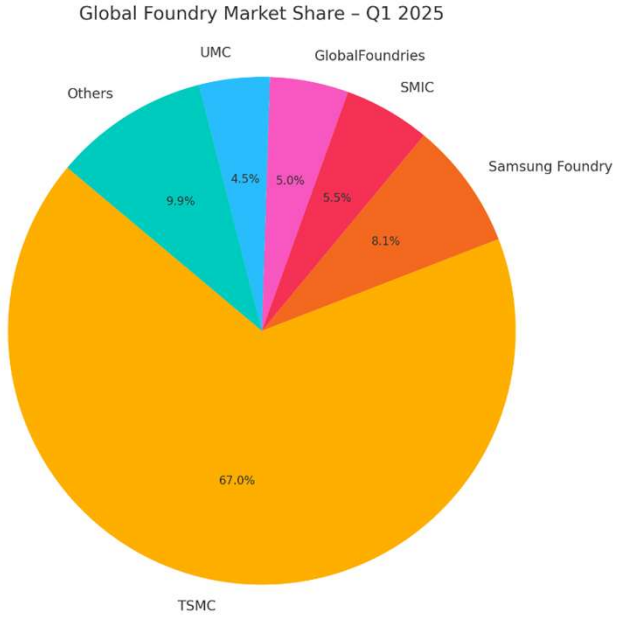
Table 1: Gartner Data Snapshot: Top 10 Semiconductor Vendors by Revenue, Worldwide, 2023-2024 (Millions of U.S. Dollars)
Source: Gartner (April 2025)

2024 Rank	2023 Rank	Vendor	2024 Revenue	2024 Market Share (%)	2023 Revenue	2024-2023 Growth (%)
1	3	NVIDIA	76,692	11.7	34,846	120.1
2	2	Samsung Electronics	65,697	10.0	40,868	60.8
3	1	Intel	49,804	7.6	49,427	0.8
4	6	SK hynix	44,186	6.7	23,077	91.5
5	4	Qualcomm	32,976	5.0	29,229	12.8
6	5	Broadcom	27,801	4.2	25,613	8.5
7	12	Micron Technology	27,619	4.2	16,153	71.0
8	7	AMD	24,127	3.7	22,307	8.2
9	8	Apple	20,510	3.1	18,052	13.6
10	13	MediaTek	15,934	2.4	13,451	18.5
		Others (outside top 10)	270,536	41.2	269,031	0.6
		Total Market	**655,882**	**100.0**	**542,054**	**21.0**

Semiconductor Industry of Korea





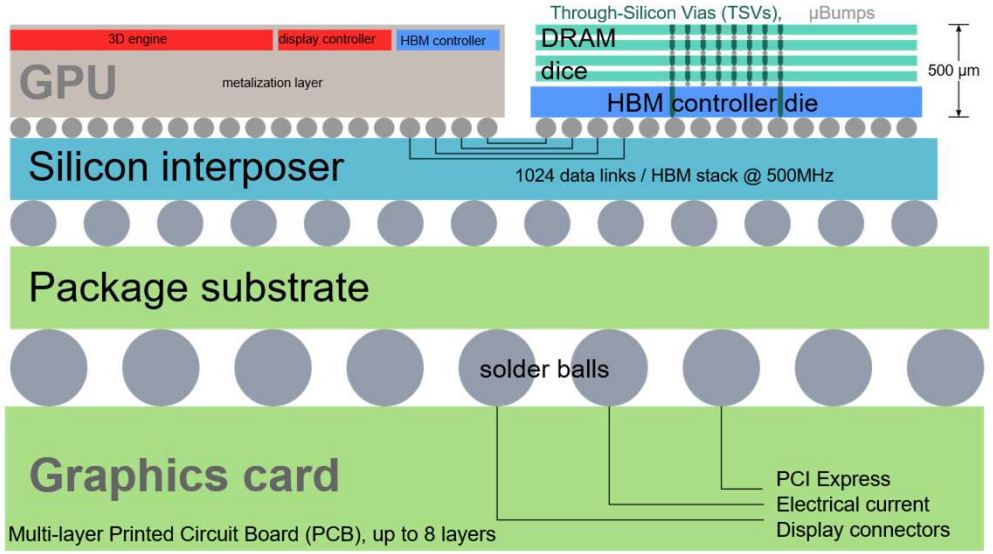


High Bandwidth Memory (HBM)

- 3D-stacked synchronous DRAM (SDRAM)

Type	Release	Max data rate speed per pin (Gb/s)	Stack	per Stack	
				Max capacity (Number of dies × Die capacity = GByte)	Max data rate (GByte/s)
HBM 3	Jan 2022	6.4	16× 64 bit	12×2 = 24	819
HBM 3E	May 2023	9.8		16×3 = 48	1229
HBM 4	2026	6.4	32× 64 bit	16×4 = 64	1638

https://en.wikipedia.org/wiki/High_Bandwidth_Memory



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Recent Changes in Semiconductor Market

- GPU: AI accelerators
- HBM
  - Major Players: SK Hynix > Samsung > Micron (low power and high performance)
- DRAM
  - SK Hynix > Samsung > CXMT
  - CXMT, YMTC : low price DRAM and NAND flash
- US Tariff and Import Regulations
  - As of April 2, 2025, under Executive Order No. 14257, a standard tariff of 10%
  - Semiconductors and related products, including memory semiconductors, are explicitly exempt from these tariffs
  - New tariffs or other trade restrictions may be introduced on semiconductors

https://dream.kotra.or.kr/kotranews/cms/news/actionKotraBoardDetail.do?SITE_NO=3&MENU_ID=190&CONTENTS_NO=2&bbsGbn=254&bbsSn=254&pNttSn=228515

Top 10 Export Items of Korea

Unit: Million US$

Rank	2022		2023		2024	
	Items	Export value	Items	Export value	Items	Export value
1	Semiconductors	129,229	Semiconductors	98,630	Semiconductors	141,920
2	Petroleum products	62,875	Automobiles	70,864	Automobiles	70,782
3	Automobiles	54,067	Petroleum products	51,999	Petroleum products	50,326
4	Synthetic resins	28,078	Auto parts	22,954	Ships, Marine Structures, and Parts	25,636
5	Auto parts	23,316	Synthetic resins	22,944	Synthetic resins	23,590
6	Steel plates	22,401	Ships, Marine Structures, and Parts	21,792	Auto parts	22,533
7	Flat panel displays & sensors	21,299	Steel plates	20,729	Steel plates	20,218
8	Fine Chemical Raw Materials	18,799	Flat panel displays & sensors	18,738	Flat panel displays & sensors	18,912
9	Ships, Marine Structures, and Parts	18,178	Fine Chemical Raw Materials	19,127	Wireless Communication Devices	17,187
10	Wireless Communication Devices	17,231	Wireless Communication Devices	15,465	Fine Chemical Raw Materials	12,427
Top 10 Export Value		- 395,473		- 363,242		- 403,531
Share of Total Exports (%)		- 57.9		- 57.5		- 53.3

Top Semiconductor Companies in Korea

Rank	Company Name	Revenue (USD Millions)	Notes
1	Samsung Electronics	66,524	Leading in DRAM and NAND memory segments.
2	SK hynix	42,824	Significant growth in AI and DRAM demand.
3	DB HiTek	1,500 (estimated)	Specializes in analog semiconductors; operates as a foundry. (Power ICs & Image Sensors)
4	Magnachip Semiconductor	1,000 (estimated)	Focuses on analog and mixed-signal semiconductors.
5	Nepes	800 (estimated)	Provides semiconductor packaging and testing services.
6	Telechips	600 (estimated)	Develops application processors for automotive and multimedia systems.
7	Silicon Works (Lx Semicon)	500 (estimated)	Designs display driver ICs for TVs and mobile devices.
8	ADTechnology	400 (estimated)	Provides design services for system-on-chip (SoC) solutions.
9	Anapass	300 (estimated)	Specializes in display driver ICs and high-speed interface solutions.

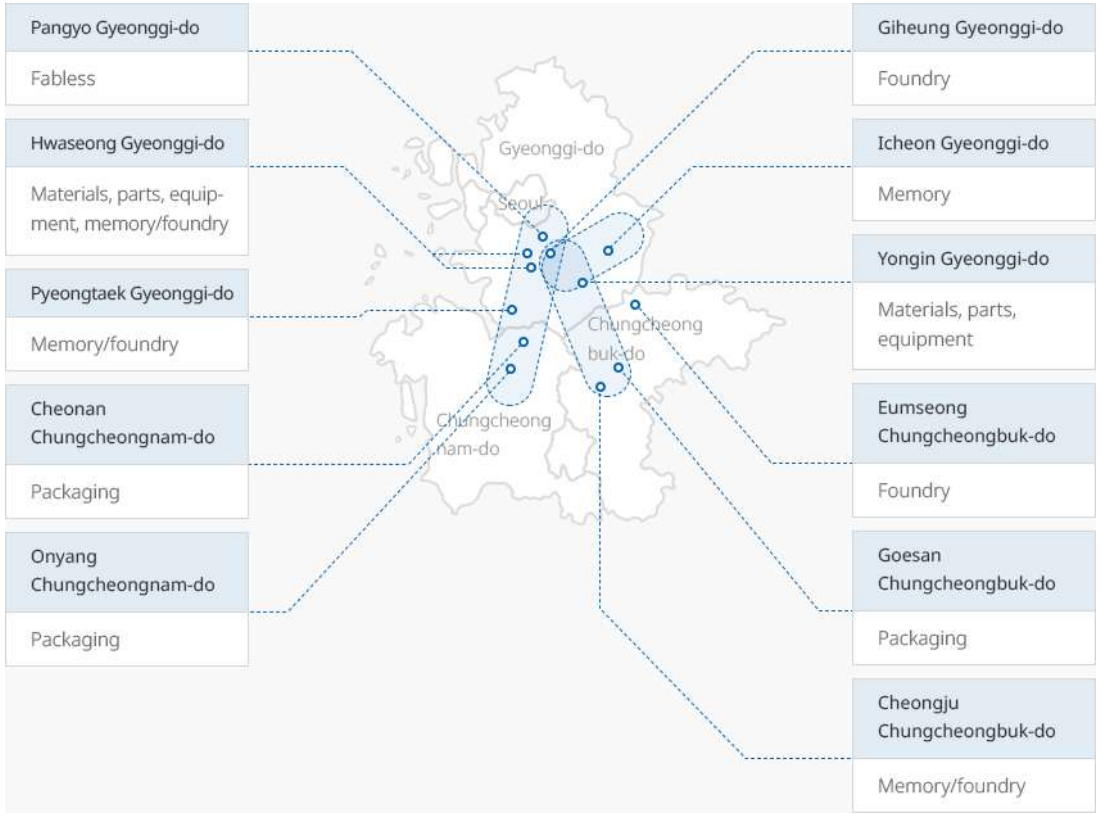
Semiconductor Industry Supports

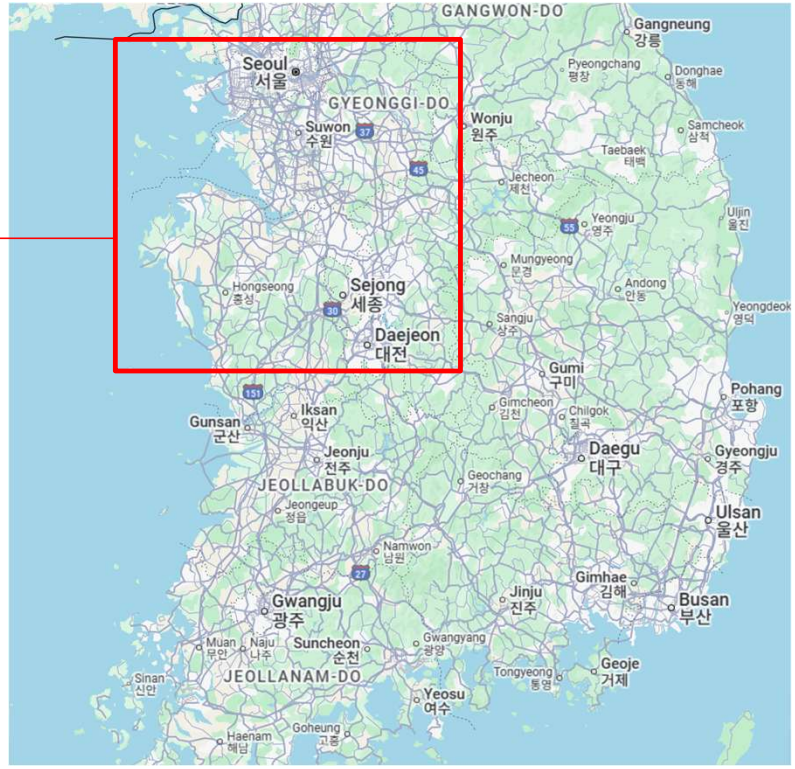
Country	Policy / Act	Investment & Support
United States	CHIPS for America Act (2022)	$52 billion over 5 years
European Union	European CHIPS Act	€43 billion (~$56B) by 2030
Japan	Economic Security Promotion Act & Advanced Semiconductor Strategy	¥774 billion (~$7.4B) supplemental budget (2021)
China	National 'Semiconductor Rise' Initiative	$24B (1st IC Fund), $28B (2nd IC Fund)
Taiwan	Advanced Semiconductor Plants Initiative	N/A (government-backed)

K-Semiconductor Belt (2022)

- **Objective:**
  - To establish the **world's largest semiconductor supply chain** in South Korea by 2030
- **Major Investments:**
  - **₩510 trillion (approx. $385B) for 10 years**
- **Government Support:**
  - **Tax credits:**
    - Up to **50%** for R&D expenses/**10–20%** for facility investments
  - **Human Resource Development:**
    - **36,000 semiconductor professionals** to be trained over 10 years

K-Semiconductor Belt (2022)





Employment in Korean Semiconductor Industry

- Employments
  - Total Employees of Major Semiconductor Companies in Korea ~110,000
  - Average Working Period < 11 years
  - Newly Employment yearly (Expected) 6,000~10,000
  - Source: https://dart.fss.or.kr

- Students in the related field in Korea

Majoring Students/year	
Electrical Engineering	6,131
Semiconductor Engineering	1,445
Material Science	2,320
Physics	664
Total	10,560

- Shortage in Semiconductor Engineers in Korea

International Cooperation

- EU Semiconductor
  - Strong in fundamental research & IPs
  - Strong in Equipment (ASML)
- International Programs
  - Cf. Sogang U. – AMSL program
- Research funds
  - Cf. International Technology Development in Semiconductor/Display (www.iris.go.kr)
    - 4 years (0.9billion KRW, 0.7M USD) due Jun 10, 2025

- Korean Organizations
  - Institute of Semiconductor Engineering
    - http://www.theise.org
  - IEEE Circuits and Systems Society
  - IEEE Solid-State Circuits Society
  - IEEE Electron Device Society
  - E-mail : burm@sogang.ac.kr

This project has received funding from the European Union's Horizon Europe research and innovation programme under GA N° 101092562