

PROMISING INVESTMENT OPPORTUNITIES



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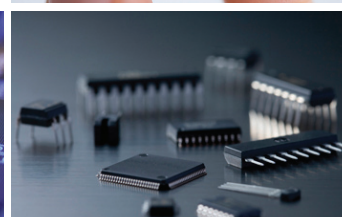
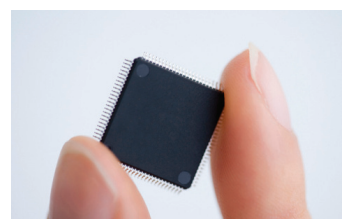
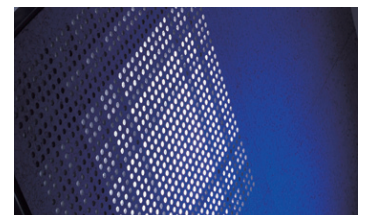
1. Industry Status and Prospects

Structure of the Korean Semiconductor Industry

- Korea's semiconductor industry consists of more than 330 design, device, equipment, and materials companies from home and abroad. There is a good balance of large companies and small- and medium-sized enterprises. (Korea Semiconductor Industry Association).
- The semiconductor industry consists of device companies (including memory, system semiconductor, and discrete device), fabless companies, and equipment / materials companies.
- Fabless industry: The industry is growing every year, with about 90 fabless companies in Korea including Silicon Works and Fidelix. Their key items, largely tailored to demand in Korea, include timing controllers (Silicon Works, Anapass), CMOS image sensors (Siliconfile, STI) and mobile APs (Telechips, Core Logic).
- Companies that have been in the foundry industry for a long time, including Samsung Electronics, Dongbu HiTek and Magnachip, and memory companies such as SK Hynix are in fierce competition. Foreign companies (Amkor, Stats ChipPac, ASE) are main players in the packaging industry, and the leading companies are increasing production through steady investment.

Supply and Demand of the Korean Semiconductor Industry

- The domestic semiconductor industry centered on memory semiconductors, contributing to economic and export growth, but since the third quarter of 2011, the exports of system semiconductors have exceeded that of memory semiconductors. The export increase is attributable to the supply expansion of foundry and packaging industries including mobile AP and CIS.



Korea's Yearly Exports of Semiconductors

(USD 100 million, %: year-on-year)

Classifi- cation	Semiconductor		Memory				System semiconductor			
					DRAM	NAND				
	USD 100 million	%	USD 100 million	%	USD 100 million	%	USD 100 million	%	USD 100 million	%
2010 Q1	106.9	120.4	61.7	159.2	41.9	203.6	6.6	94.1	33.0	62.1
Q2	129.5	84.5	76.0	125.5	50.3	171.9	7.3	55.3	38.4	26.8
Q3	141.3	60.8	80.9	83.9	54.1	107.3	7.1	24.6	43.6	21.9
Q4	129.4	24.8	66.2	15.7	41.7	13.6	6.8	9.7	46.1	25.9
2011 Q1	122.1	14.2	64.0	3.7	35.3	△15.8	7.4	12.1	41.1	24.5
Apr	41.6	△0.4	22.2	△9.6	12.5	△22.2	2.9	13.9	13.7	11.5
May	41.8	△4.7	22.1	△15.3	12.5	△28.7	3.2	34.7	14.3	10.8
June	42.1	△3.9	21.3	△15.8	12.2	△27.0	2.4	1.1	15.2	14.8
Q2	125.5	△3.1	65.6	△13.7	37.2	△26.0	8.5	16.4	43.2	12.5
Jul	40.4	△12.5	18.2	△31.1	10.1	△43.3	2.6	8.4	15.9	12.8
Aug	41.1	△13.3	17.5	△37.4	9.8	△48.1	2.7	9.4	17.4	22.1
Sep	45.9	△3.8	18.6	△30.0	9.5	△45.5	2.9	28.2	21.3	39.1
Q3	127.4	△9.8	54.3	△32.9	29.4	△45.7	8.2	15.5	54.6	25.2
Oct	43.5	△4.5	18.1	△26.0	8.9	△45.4	2.9	35.9	20.3	34.8
Nov	40.8	△1.3	17.3	△14.4	8.5	△33.1	2.7	18.6	18.9	21.2
Dec	42.8	△0.7	16.1	△24.9	8.7	△30.4	2.5	0.6	21.4	39.1
Q4	127.1	△1.8	51.1	△22.2	26.1	△37.4	8.1	19.1	60.6	31.5

Source: Ministry of Knowledge Economy
 Note: Memory MCP is included in memory semiconductor.

- The demand for memory semiconductors started decreasing in 2008, even before the global financial crisis, so companies carried out a so-called chicken game by cutting prices. In the end, Korean businesses prevailed. The non-memory sector is seeing a growing need for change as the market for smart devices expands.

Prospects of Supply and Demand in Korea's Semiconductor Industry

[KRW billion, USD million, %]

	2010	2011	2012
Production	61,251 (48.6)	61,447 (0.3)	60,140 (-2.1)
Imports	31,137 (17.0)	32,340 (3.9)	33,830 (4.6)
Domestic Demand	38,628 (8.6)	37,191 (-3.7)	39,321 (5.7)
Exports	50,707 (63.4)	49,930 (-1.5)	48,960 (-1.9)

Source: KEA (production), KOTIS (exports/imports), KIET (prospects).

Note: 1) KRW billion for production and domestic demand USD million for exports and imports.

2) (): year-on-year growth

NAND Flash Memory Market

- Currently, the NAND flash memory market is led by Samsung Electronics (37% of total revenues in 2011) and Toshiba (31.6%). As the third largest company, SK Hynix (11.9%) is aggressively acquiring foreign companies including LAMD of the United States. Competition is intensifying in the global NAND flash industry.
- Amid growing market competition, Samsung Electronics developed the 10nm NAND flash in 2011 and announced its plan to start mass production in 2012. The competition is expected to increase as Samsung Electronics starts operating a NAND flash factory, under construction in China, in 2013.
- In particular, the price of solid state drive (SSD) is continuously falling due to the adoption of micro-fabrication. The market is expected to grow from the end of 2012 thanks to performance verification based on 20nm NAND flash memory. But the dramatic market expansion will be possible only after solving problems related to limited performance and short lifespans due to the limitations of SATA Interface.

Status of Korea's Fabless Industry

- Korean-style fabless companies are appearing and rapidly growing along with the paradigm shift. Those companies include Telechips (low-end smartphones, APs for tablet computers), MtekVision (joint development of APs for low-end smartphones with LG Electronics), and Silicon Works (sole supplier of panel parts to LG Display, a supplier of iPad).
- The average sales revenue of the top 10 fabless companies as of the third quarter of 2011 recorded USD 26.09 billion, increasing 25% from USD 20.87 billion the previous year. (Korea Semiconductor Industry Association, 2011 3Q Industry Report).

Sales Revenues of Korea's Top 10 Fabless Companies in 2011

[USD million]

	Company Name	2011	2010	Growth (%)
01	Silicon Works	301,227	257,030	17.2
02	Silicon Mitus	106,049	52,000	103.9
03	AnaPass	100,723	93,817	7.4
04	Fidelix	84,354	41,610	102.7
05	EMLSI	82,169	54,214	51.6
06	Siliconfile	77,790	72,416	7.4
07	Telechips	72,006	73,785	-2.4
08	FCI	62,625	28,700	118.2
09	Dawin Tech	56,718	44,419	27.7
10	SETI	55,796	63,260	-11.8
	Total	999,507	781,250	27.9

Source: Korea Semiconductor Industry Association.

Technological Innovation

- In 2011, Samsung Electronics started to mass produce 20nm-class DDR3, which requires cutting-edge processing technologies, for the first time globally. This created a huge technological gap in nano-processing between Korea and its rivals.
- With the developments of advanced technologies in manufacturing 20nm-class semiconductors, the function of semiconductors has been strengthened; working speed has increased, electricity consumption has decreased to the lowest, and capacity has gained high density.
- Generally, a 10 nm-class upgrade leads to a 50-60% increase in the production of semiconductor chips. Innovative miniaturization technologies result in lower costs and contribute to the wider use of semiconductors.

Korea's Semiconductor Equipment Market

- Timely entry is critical in the semiconductor equipment industry, as rapid technological innovation results in shorter replacement cycles. In particular, research and development is more important than any other industry.
- Due to the economic downturn and excessive supply, the market shrank significantly in 2009, but it has been expanding since 2010 thanks to aggressive investments by Korean companies in facilities.
- The Korean semiconductor equipment market (USD 7.99 billion) was smaller than the North American or Taiwanese markets in 2011, but it is expected to become the world's largest market, estimated at USD 8.9 billion in 2012.

Status of Korea's Semiconductor Equipment Market

[USD million, %]

Classification	2009	2010	2011	2012 (E)	2013 (E)	2014 (E)
Size of domestic market	2,845.1	8,796.2	7,948.2	8,966.4	9,248.9	9,581.4
Share in global market	17.0	21.7	17.7	21.5	20.3	19.6

Source: Gartner, Semiconductor Manufacturing Equipment Forecast by Region, Including Test (June 2012).

Korea's Semiconductor Material Market

- The size of Korea's semiconductor material market stood at USD 715 million, or 13% of the global market, in 2011. The largest proportion of the market was taken by fab materials.

2010-2011 Semiconductor Material Market by Region

[USD billion, %: year-on-year]

Region	2010	2011	% Change
Taiwan	9.40	10.04	7
Japan	9.39	9.34	-1
Rest of world	7.59	8.19	8
South Korea	6.35	7.15	13
North America	4.59	4.92	7
China	4.31	4.86	13
Europe	3.22	3.38	5
Total	44.84	47.86	7

Source: SEMI April 2012

Supply and Demand of the Domestic Semiconductor Material Industry

[USD billion, %]

Classification	2008	2009	2010	2011	2012 (E)	2013 (E)	
Size of the Domestic Market		5.4	4.4	6.6	10.0	11.0	12.2
	Imports	2.7	1.9	3.3	4.9	5.6	6.3
	Domestic Demand	2.7	2.5	3.3	5.1	5.4	5.9
Market Share (%)		12.7	12.7	16.6	23.5	23.9	24.6

Source: KISA 2012. 4, SEMI 2010. 2

- The localization rate of semiconductor materials is higher in pre-processing materials than in post-processing materials.

Localization of Korea's Semiconductor Materials

(USD million, %)

Classification	2010	2011	2012(E)	2013(E)
Whole	3,322(50.1%)	4,900(48.9%)	5,349(48.5%)	5,912(48.5%)
Pre-Processing Materials	1,690(50.4%)	2,280(53.5%)	2,519(53.8%)	2,789(54.0%)
Post-Processing Materials	1,631(49.8%)	2,619(45.5%)	2,830(44.6%)	3,123(44.5%)

Source: KISA 2012. 4

Vision of System Semiconductors

- Korea has a competitive edge in the memory industry, but is weak in system semiconductors. So the government is pursuing measures to nurture the industry. At the end of 2010, the Ministry of Knowledge Economy announced the Development Strategy for the System Semiconductor Industry, a plan in which the government and private sector will provide KRW 2 trillion to raise the revenue of the system semiconductor industry to USD 33 billion.
- Samsung Electronics has committed KRW 4.2 trillion to the system semiconductor industry, the largest amount ever, and is expanding its influence in the AP sector through stronger cooperation with ARM.

System Semiconductor Market Size in 4 Major Sectors (Optimistic Outlook)

Classification	2011	2012	2012	2014	2015	2016	2017	2018	2019	2020	CAGR
Automobile	723	922	1,094	1,349	1,612	1,898	2,955	4,351	5,505	6,800	28.28%
Mobile	7,014	8,424	9,546	11,092	12,883	15,372	17,545	21,183	25,221	29,696	17.39%
Smart Home Appliances	5,998	7,127	8,007	9,088	10,415	11,944	14,795	17,816	21,017	23,728	16.51%
Energy	1,372	1,552	1,682	1,886	2,173	2,509	2,875	3,354	3,878	4,449	13.96%
Total	15,107	18,024	20,330	23,415	27,083	31,723	38,170	46,704	55,620	64,672	17.54%

Source: National IT Industry Promotion Agency

2. Competition Status

Status of the Semiconductor Industry

- Samsung Electronics and SK Hynix account for more than 60% of global DRAM production, and revenues from system semiconductors are also increasing. Samsung's revenue of system semiconductors accounts for 27.2% of the company's entire semiconductor revenues as of 2011, increasing from 18.4% in 2010.
- The domestic semiconductor industry consists of various companies ranging from designing, devices, and assembly to equipment and materials. In terms of revenues, most device companies are large, while assembly, equipment, materials, and designing companies are usually SMEs.

Korea's Status in the Global Semiconductor Market

- Korea ranks 3rd for semiconductors and 1st for memories.
- Korea accounted for 11.3% of the global semiconductor market in 2011, but ranked first in DRAM and NAND flash, accounting for 65.3% and 48.9%, respectively.
- Korean semiconductor companies have grown into key players in the fluctuating global market.
- Samsung Electronics ranked 4th in semiconductor market share at 4.1% in 2001, but from 2002(4.1%) to 2011(9.3%) held second place.
- SK Hynix ranked 19th(1.5%) in market share in 2001, 7th(3.0%) in 2006, 6th(3.3%) in 2007, 9th(2.3%) in 2008, 7th(2.7%) in 2009, 6th(3.4%) in 2010, 8th(3.0%) in 2011. Its performance has been unstable, but since being acquired by SK, it has been pursuing business diversification such as active mergers and acquisitions.

Total Semiconductor Market Share (by Country)

(USD million, %)

Total Semiconductor	2009 Revenue	2010 Revenue	Revenue Percent Change	Revenue Percent Worldwide
Worldwide	230,194	304,075	15.1	100
Americas	110,733	146,707	17.6	48.2
EMEA	24,149	28,017	-11.1	9.2
Japan	49,904	63,250	7.3	20.8
Asia-Pacific	45,408	66,101	35.0	21.7
Korea	26,006	41,029	38.1	13.5
China/Hong Kong	2,286	3,261	64.3	1.1
Taiwan	16,137	20,517	25.0	6.7

Source: iSuppli, March 2011

Total Semiconductor Market Share (by Company)

2010 Rank	2011 Rank	Company Name	2010 Revenue	2011 Revenue	Percent Change	Percent of Total	Cumulative Percent
01	01	Intel	40,394	48,721	20.6	15.6	15.6
02	02	Samsung Electronics	28,380	28,563	0.6	9.2	24.8
04	03	Texas Instruments	12,994	13,967	7.5	4.5	29.3
03	04	Toshiba	13,010	12,729	-2.2	4.1	33.4
05	05	Renesas Electronics Corporation	11,893	10,648	-10.5	3.4	36.8
09	06	Qualcomm	7,204	10,198	41.6	3.3	40.1
07	07	STMicroelectronics	10,346	9,735	-5.9	3.1	43.2
06	08	Hynix	10,380	9,293	-10.5	3.0	46.2
08	09	MicronTechnology	8,876	7,365	-17.0	2.4	48.6
10	10	Broadcom	6,682	7,160	7.2	2.3	50.9
12	11	Advanced Micro Devices (AMD)	6,345	6,436	1.4	2.1	52.9
13	12	Infineon Technologies	6,319	5,312	-15.9	1.7	54.6
14	13	Sony	5,224	5,015	-4.0	1.6	56.3
16	14	Freescale Semiconductor	4,357	4,408	1.2	1.4	57.7
11	15	Elpida Memory	6,446	3,887	-39.7	1.2	58.9
17	16	NXP	4,028	3,831	-4.9	1.2	60.1
20	17	nVidia	3,196	3,608	12.9	1.2	61.3
26	18	ON Semiconductor	2,291	3,428	49.6	1.1	62.4
18	19	Marvell Technology Groupe	3,606	3,393	-5.9	1.1	63.5
15	20	Panasonic Corporation	4,946	3,390	-31.5	1.1	64.6
21	21	ROHM Semiconductor	3,118	3,187	2.2	1.0	65.6
19	22	MediaTek	3,553	2,952	-16.9	0.9	66.6
28	23	Nichia	2,190	2,936	34.1	0.9	67.5
22	24	Analog Devices	2,862	2,846	-0.6	0.9	68.4
23	25	Fujitsu Semiconductor Limited	2,757	2,742	-0.5	0.9	69.3
All Others			96,073	95,610	-0.5	30.7	
Total Semiconductor			307,470	311,360	1.3	100.0	

Source: Gartner, Dec 2011

- The largest revenue in DRAM and NAND flash memories is created by Samsung Electronics, whose market share is incomparable with its rivals. Samsung Electronics is competing with Hynix, the runner-up.

3Q11 Revenue Ranking for Branded DRAM Manufacturers

(Unit: USD Million)

Ranking	Company	Revenue			Market Share	
		3Q11	2Q11	QoQ	3Q11	2Q11
01	Samsung	2,941	3,373	-12.8%	44.8%	41.4%
02	Hynix	1,415	1,860	-23.9%	21.6%	22.8%
03	Elpida	825	1,174	-29.7%	12.6%	14.4%
04	Micron	778	883	-11.9%	11.8%	10.8%
05	Nanya	243	386	-36.9%	3.7%	4.7%
06	Winbond	142	162	-12.2%	2.2%	2.0%
07	ProMOS	61	103	-41.3%	0.9%	1.3%
08	Powerchip	9	21	-58.2%	0.1%	0.3%
09	Others	151	185	-18.6%	2.3%	2.3%
Total		6,566	8,147	-19.4%	100.0%	100.0%

Note: Company revenue figures include outsourced portions but excludes sub-manufacturing revenue
Source: DRAMeXchange, Nov 2011

NAND Flash Market Share (by company)

Worldwide Data Flash Market Share by Branded Revenue.

(Unit: USD Million)

Q4 '11 Rank	Company	Q1 '10 Revenue	Q3 '11 Revenue	Q3 '11 Share	Q4 '11 Revenue	Q4 '11 Share	Q4 '11 Sequential Growth	Q4 '11 Annual Growth
01	Samsung	\$1,680	\$2,028	39.1%	\$1,934	38.3%	-4.6%	15.1%
02	Toshiba	\$1,475	\$1,632	31.4%	\$1,432	28.4%	-12.3%	-2.9%
03	Micron	\$526	\$884	17.0%	\$987	19.6%	11.7%	87.6%
04	Hynix	\$396	\$635	12.2%	\$669	13.3%	5.4%	68.9%
05	Powerchip	\$6	\$12	0.2%	\$26	0.5%	116.7%	333.3%
Other		\$276	\$0	0.0%	\$0	0.0%	NA	NA
Total Revenue		\$4,359	\$5,191	100.0%	\$5,048	100.0%	-2.8%	15.8%

Source: IHS iSuppli, April 2012

- Korea has secured strong price competitiveness based on its strengths in the memory industry, but it is still at a disadvantage in the system semiconductor and foundry industries. So there are many opportunities for foreign companies to penetrate the market, which is why Korea should make an effort to attract foreign players.

Competitiveness of Semiconductor Equipment and Materials

- Dependency on foreign materials is still high, with a localization rate of 53.5% for pre-processing materials and 45.5% for post-processing materials.
- The equipment market largely depends on imports from the United States and Japan, as there is a large technological gap in pre-processing equipment that accounts for 80% of the entire equipment market. The level of localization is very different by sector, as Korean companies have focused on developing equipment for assembly due to easy access to technologies.
- Korea's semiconductor equipment companies are having difficulty developing key equipment due to limitations in capital and original patents. In particular, it is not easy to establish a virtuous circle of early recovery of initial capital and additional investment in development due to a lack of funds, manpower, and technologies, and entry barriers.

Competitiveness of Semiconductor Equipment Industry by Country

Industry	Japan	USA	EU	Korea
Industrial competitiveness	100%	93%	91%	63%
Photo-lithography	85	60	100	10
PR processing equipment	100	70	85	80
Etcher	90	100	80	60
Cleaning and drying equipment	100	70	85	80
Heat treatment equipment	100	95	90	80
CVD	95	100	85	80
PVD (including sputter)	95	100	85	80
Ion implanter	90	100	90	-
CMP	85	100	90	65
Cu deposition	90	100	90	80
Wafer testing and measuring equipment	90	100	70	20
Tester	100	90	90	60
Handler	90	-	-	100
Prober	100	100	80	80
Packaging equipment	100	90	80	80
Bonding equipment	100	100	90	80

Source: KSIA

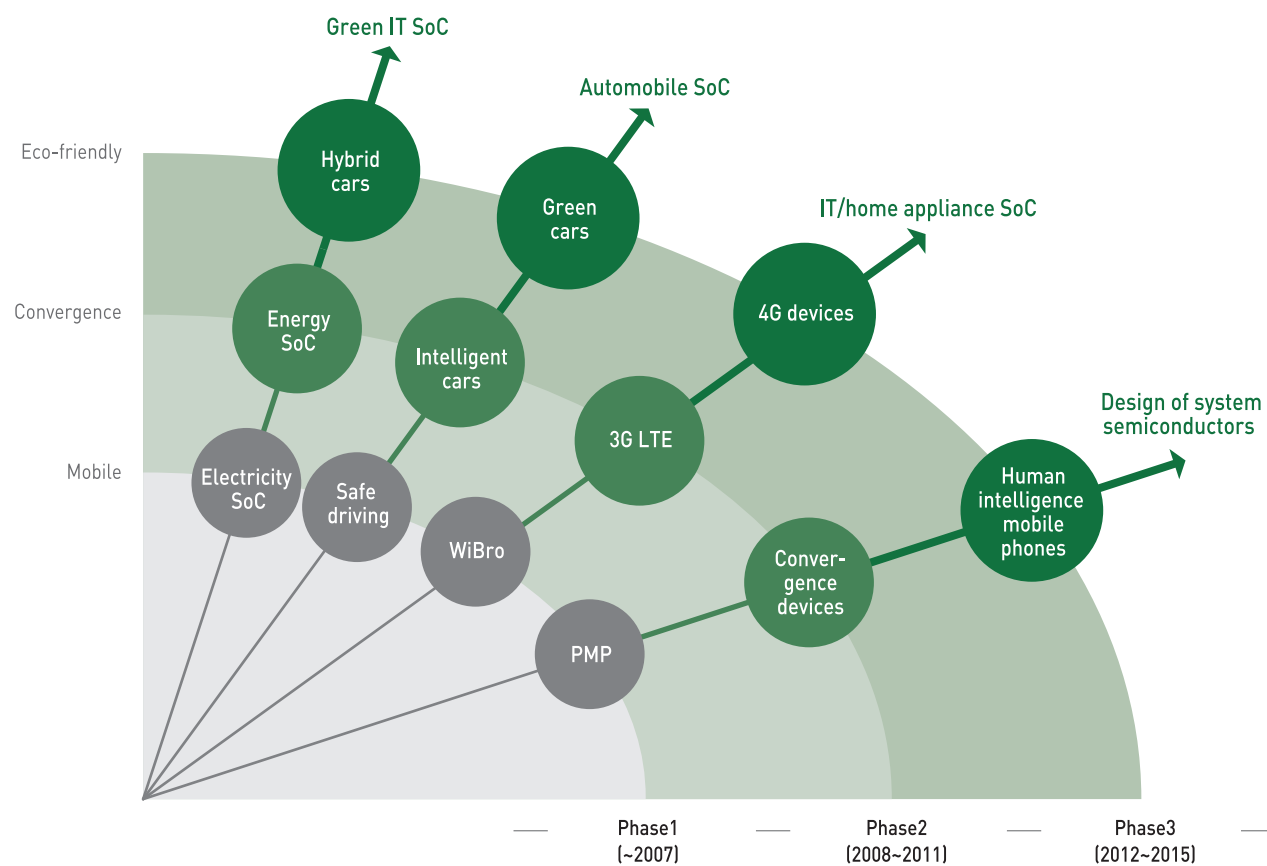
Note: A 100 for industrial competitiveness means the country has the most competitive products.

3. Promising Business and Investment Opportunities

Rapid Expansion of Semiconductor Application Markets

- Technological advances in semiconductors not only create new products or services, but also affect social systems and lifestyles.
- This means the semiconductor industry provides opportunities for boundless development.
- Based on innovation in convergence technologies, rapid growth is seen in power semiconductors, energy-related semiconductors including low-power semiconductors, and convergence products with new items such as green cars, medical devices, or robots.

New and Growing Application of System Semiconductors



Source: Ministry of Knowledge Economy, KEIT.

13 3. Promising Business and Investment Opportunities

- Korea's electronic industry, one of the application sectors of semiconductors, has dramatically strengthened its competitiveness since 2000, raising its share in the global market. The technology gap of Korea's semiconductor industry with the United States is less than two years, similar to the gap between Japan and the EU.

Level of Semiconductor Technologies

Classification	Korea	USA	Japan	EU	China
	87.9	100	96.9	91.6	73.9
Semiconductors	Less than 2 years	0	Less than 2 years	Less than 2 years	Less than 5 years

Source: KEIT, 2011

Paradigm Shift in Semiconductors

- The main driver of the semiconductor paradigm shift is the demand pull. Through technological innovation not only in the semiconductor industry, but also in the comprehensive solution industry, the paradigm is shifting from personal computers to smart devices. With the rapid expansion of smart devices, system semiconductor companies are engaged in cooperation or competition with each other, launching their own platform solutions.
- Another driver is the technology push. Thanks to the mass production of advanced 20nm-class semiconductors, the function of semiconductors has been strengthened; working speed has increased, electricity consumption has decreased to the lowest, and capacity has gained high density.
- Semiconductor technology innovation is contributing largely to the advancement of other industries including automobiles and IT, creating various high added values.

Paradigm Shift in the Semiconductor Industry

	1990s	2000s	2010s
Keywords	Moore's Law	Digital convergence	Mobile, Smart, Cloud
Semiconductor paradigm	<ul style="list-style-type: none"> · Personal computer-centered · Price and cost competitiveness of discrete semiconductors. 	<ul style="list-style-type: none"> · Rapid digitalization · Convergence semiconductors for mobile uses. 	<ul style="list-style-type: none"> · Convergence semiconductors for mobile, smart and cloud services. · Beyond CMOSB
Promising semiconductors	CPU, chipset, memory, CIS	PRAM, fusion memories, One DRAM, One NAND	Mobile, cloud, smart, digital-television, digital home appliances, healthcare, entertainment, home network, information security.

Source: KIET

Promising Investment Opportunities in the Semiconductor Industry

- The focus of the memory chip market is expected to shift from cash memory to large storage. In terms of technologies, the limitations of the manufacturing technologies of DRAM and flash memory will intensify competition for the development of next-generation devices. The SSD market will rapidly expand and the research to develop next generation memories including MRAM, PoRAM, and FRAM will be accelerated.
- The system semiconductor industry is expected to see the active development of technologies for smaller products such as MCP and SiP and smaller chips due to the expansion of smart device markets. In particular, because of the diversification of application products, suppliers should be more focused on early domination of the market through product support and customer support.

Most Promising Next-Generation Semiconductors

Green IT	PM (Power Management) SoC, EM (Energy Management) SoC, BM (Battery Management) SoC, Micro Energy SoC, AMI (Advanced Metering Infrastructure) SoC
Automobile SoC	Safety & Security SoC, Virtual Qualification technology, ESD/Latch-Up Test, Infotainment, AMS Platform SoC, Multi-Modal User Interface Platform SoC, Flexray-Can Gateway SoC, Flexray Controller & Transceiver IC, Power train IC
Communication/ Consumer SoC	Wireless Communication SoC, Mm-Wave CMOS RF Technology, Wire Communication SoC, DTV SoC, 3DTV SoC, Multimedia SoC
Emerging Memory	NFGM (Nano Floating Gate Memory), TBM (Tunneling Gate Memory), PoRAM (Polymer RAM), FFM (Ferroelectric Field Memory), ReRAM (Resistive Change RAM), PCRAM (Phase Change RAM), STTMRAM (Spin Transfer Torque Magnetic RAM)
Power Device	Trench Field Stop IGBT, Super Junction IGBT, Trench Power MOSFET, Super Junction Power MOSFET, SiC MOSFET, GaN HEMT, Cascode Hybrid Device (SiC MOSFET + Si MOSFET), High Holding Voltage, Advanced ggNMOS, Advanced SCR (Silicon Controlled Rectifier), Advanced LIGBT, LDMOSFET, TDMOSFET

Active Joint Research for New Semiconductors

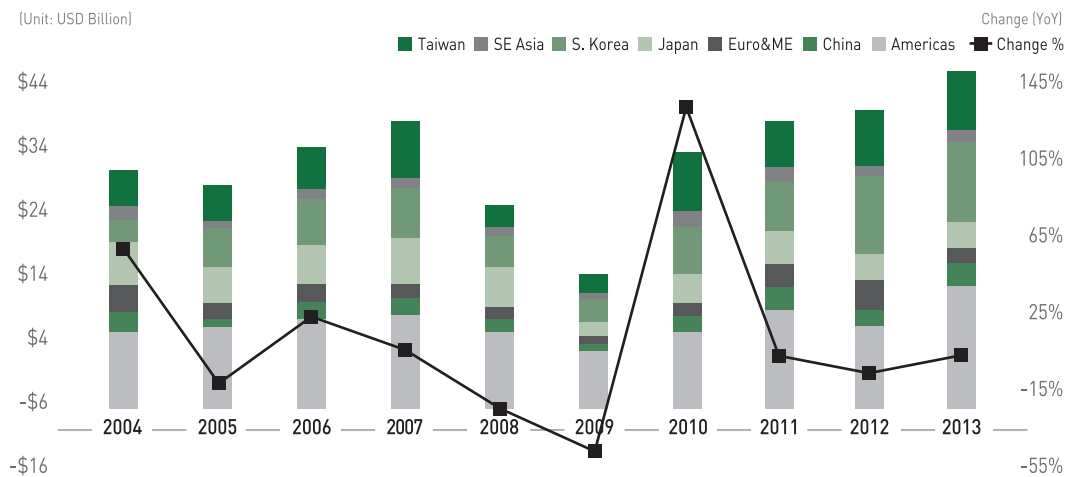
- Samsung Electronics is conducting joint research with IBM and Chartered for the next generation manufacturing process of system semiconductors. The results will be technologies for under-20nm that will be widely used in smartphones, tablet computers, consumer electronics, and cloud computing.
- SK Hynix and IBM announced that they signed a contract on joint development and a technology license of PRAM (Phase-change RAM) in June 2012. The PRAM developed through this partnership is expected to drive new application sectors of PRAM through commercialization as storage class memory (SCM) for higher-performing enterprise servers and lower consumption of electricity.

Korea Expands Market for Semiconductor Equipment

- The market is continuously growing. Korea's investment in semiconductor equipment ranked 3rd in 2008 and 2009 but jumped to second place in 2010, outperforming Japan and North America, with the amount standing at USD 8.03 billion.
- With strong domestic demand for semiconductor equipment, the market is expected to grow continuously. Recently, Korea's device companies have been determined to localize equipment production and minimize dependence on foreign equipment in order to secure stable supply.

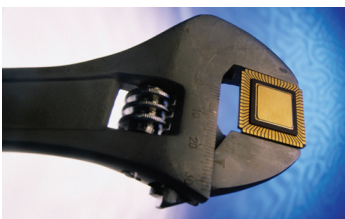
Prospects of Investment in Semiconductors by Country

Fab Equipment Spending (Front End)



Source: SEMI, World Fab Forecast reports, May 29, 2012

- In 2012, Korea's investment in pre-processing equipment (over USD 11 billion) is expected to be the largest in the world, followed by Taiwan (USD 8.5 billion) and the United States (USD 8.3 billion). Korea will remain the largest investor in the semiconductor equipment industry, with investment amounting to USD 12.5 billion in 2013.



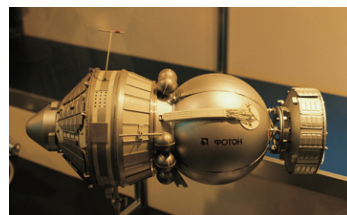
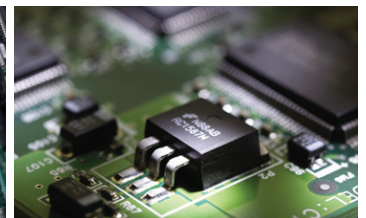
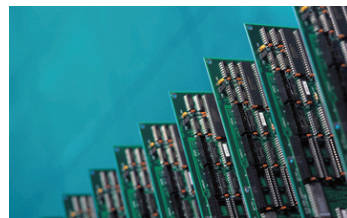
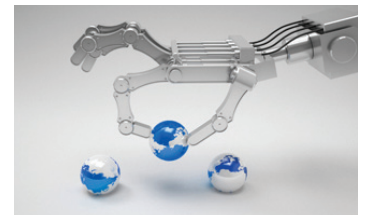
Strengths and Opportunities of Korea's Semiconductor Industry

• Strengths

- Leader of the global memory market.
- Strongest cost and price competitiveness in the world.
- World-class companies using semiconductor technologies including Samsung Electronics, LG Electronics and Hyundai Motor Company.
- Government determination to nurture it as a key strategic industry.
- Large domestic market for new technologies including 3G/4G mobile communication, IPTV, DMB and 4G.

• Opportunities

- Test-bed for cutting-edge products based on world-class IT infrastructure.
- Many early-adopters of high-end products.
- Source of competition shifting to mega-fab.
- Application industries with large growth potential including mobile, DTV and green cars.
- Rapid expansion of environment-friendly, low power consuming semiconductors to respond to global warming.

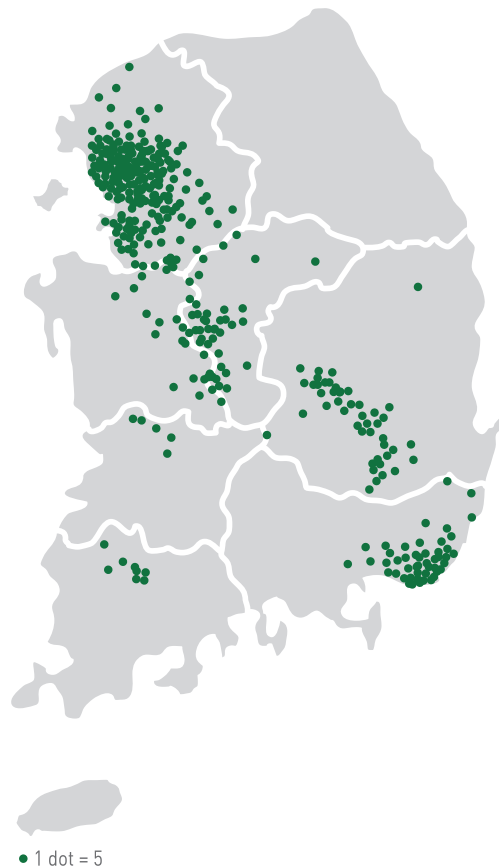


4. Information Customized by Region

Regional Distribution of Semiconductor-Related Industries

- Equipment and materials companies are generally located in the Seoul metropolitan area and Chungcheong-do for easier access to semiconductor chip manufacturers.

Distribution of Semiconductor-Related Companies



- More than 10,000 companies, or 70% of all the semiconductor-related businesses in Korea, are located in the Seoul metropolitan area. 3,400 companies, or 23%, are in Gyeongsang-do.
- Semiconductor clusters have formed in Gyeonggi-do and Chungcheong-do, accommodating global companies including Samsung Electronics and SK Hynix.
- Forming strategic foreign investment zones (FIZs) in Ochang, Cheonan, and Asan can maximize the synergy effects of R&D.

Regional Distribution of Semiconductor Clusters and Companies

(■ : Korean companies, ■ : Available FIZ)

Gyeonggi-do		Chungcheongnam-do		Chungcheongbuk-do	
Jangan	TEL, 3M	Cheonan	Advantest, MEMC, Rohm&Haas, ASM, Photonics, Kokusai Electric Korea	Ochang	LG Chemicals
Dangdong	TOK, Ulvac			JSR, Lintec, Toray	
Hyeongok	Ulvac, Hoya	Asan	Samsung Electronics (LCD) Alcatel, Sony(S-LCD)	Cheongju	Hynix, Magnachip, LG Electronics
Eoyeong Hansan	Hitachi Metals, Shibaura, Nanometrics				
Others	Samsung Electronics (Semiconductors), LG Display, Dongbu Hitek, Hynix	Others	Samsung SDI, Technosemichem	Others	Dongbu Hightek, Hyundai Heavy Industries
	Amkor, ASE, Fairchild, Honeywell, Sumitomo, Cabot		Mitsubishi Chemical, Air Liquide, Praxair		Honeywell
Jangan 2, Dangdong, Hyeongok, Oseong		Asan		Ochang, Cheongju, Chungju	

Promising Investment Destinations

- Name of Industrial Complex
 - Oseong Industrial Park
- Location
 - Yanggyo-ri, Cheongbuk-myeon, Pyeongtaek-si, Gyeonggi-do.
- Relevant Universities
 - Electronic engineering department, physics department, and IT-related departments at Ajou University, Chung-Ang University, Dankook University, and Pyeongtaek University.
- Major Semiconductor Companies
 - Strong competitiveness from global companies including Samsung Electronics (Giheung, Hwaseong), Cabot and Toyo Tanso.
- Incentives
 - Providing tax breaks and other incentives as a complex-type FIZ.

5. Government Policies and Incentives

- Next-Generation Semiconductors
- With the goal of developing Korea to be the second largest semiconductor powerhouse by 2015, the government plans to achieve USD 21 billion of system semiconductor production (market share: 7.5%) and USD 5.6 billion of semiconductor equipment production (13%) by carrying out detailed projects such as developing technologies, nurturing human resources, and fostering system semiconductors, equipment, and materials industries.

Vision and Goal for Next-Generation Semiconductors

Goal To become the second largest semiconductor powerhouse by 2015

Vision To achieve full-fledged entry into the system semiconductors and semiconductor equipment industries

- System semiconductors: Market share 7.5%, localization 50%
- Semiconductor equipment: Market share 13%, localization 35%
- Number of jobs: 35,000 to 57,000 in the two industries combined
- Nurture 30 world-class small- and medium-sized system semiconductors and equipment companies

Classification		2009	2015	2020
Domestic production	System semiconductors	USD 5.6 billion	USD 21 billion	USD 39 billion
	Semiconductor equipment	USD 1.36 billion	USD 5.6 billion	USD 14.2 billion
Global market share	System semiconductors	3.0%	7.5%	10%
	Semiconductor equipment	8.2%	13%	18%
Employment	System semiconductors	25,000	40,000	55,000
	Semiconductor equipment	10,000	17,000	25,000

- System IC 2015
- The project, aimed at nurturing medium-sized semiconductor exporters, will focus on fabless companies. To maintain and strengthen the competitiveness of major industries, it emphasizes the development of commercialization technologies for system semiconductors for mobile phones, digital appliances, and automobiles, all of which have large markets.

System IC 2010 vs System IC 2015

Classification	System IC 2010 (1998-2010)	System IC 2015 (2011-2015)
Goal	Establishment of foundation (securing basic technologies)	
Scale	Small-scale R&D (40 projects, KRW 500 million on average)	Large-scale R&D (KRW 2-4 billion on average per project)
	KRW 246.7 billion in total	KRW 109.2 billion in total
Tools for support	Focused on R&D	R&D + cluster + larger fund for each project
Direction of research	Technology development	Market demand
Target technology	Peripheral chips	Core chips
Target products	All products	Convergence chips in 3 sectors (mobile phone, D-TV, automobile)
Method	Separately by companies, universities, and research institutions	Value chain joint R&D Consortium of demand companies-design-foundry

Semiconductor R&D Strategy

Top Brand	2008 Technology Level (%)	2013 Goal (%)	Major Strategies
Next-generation memory semiconductors	96.9	100	<ul style="list-style-type: none"> - Securing core technologies and pursuing standardization for next-generation memory devices. - Developing technologies to design and manufacture highly dense 3D memories.
Convergence system semiconductors	83.7	95	<ul style="list-style-type: none"> - Strategic partnership of system-fabless-foundry industries. - Securing technologies to design platform-based semiconductors for each strategic system. - Concentration on products with possibilities of import substitution and market expansion.
Next-generation equipment, materials	88.2	98	<ul style="list-style-type: none"> - Planning to achieve self-sufficiency by developing innovative equipment. - Promoting international standardization of 450mm wafer to lead the next-generation equipment and materials market.

Semiconductor Equipment Commercialization Project

- This project boosts the competitiveness of the Korean semiconductor equipment industry by encouraging Samsung Electronics and SK Hynix to forge partnerships with small- and medium-sized equipment companies to develop major equipment on the condition of purchase. So far, equipment has been entirely imported.
- The Ministry of Knowledge Economy plans to pour KRW 60 billion in nurturing semiconductor equipment companies for three years from December 2009 to November 2012 by connecting corporate demand and technology development.

Establishment of Joint Research Center Linking Industry-Universities-Research Institutes for Next-Generation Memories

- This is the first case of an R&D partnership between the two largest companies in the Korean semiconductor industry, based on a joint investment of the Ministry of Knowledge Economy, Samsung Electronics, and Hynix. The research center will focus on developing spin transfer torque-magnetic random access memory (STT-MRAM), which is attracting attention as a promising next-generation memory product.
- STT-MRAM uses the gap in electric resistance by changing the direction of the electronic magnetization of magnetic materials for information storage.

Outline of Joint Research Center for Next-Generation Memory

Cost	KRW 24 billion in total for 4 years (2009-2012); KRW 12 billion from the government, KRW 12 billion from the private sector.
Location	Clean room (576m ²) in Hanyang University FTC.
Equipment	8 including evaporator for 300mm magnetic thin-film, sputter, annealer and CMP.
Number of dispatched researchers	3 from Samsung Electronics, 4 from SK Hynix, 4 from Ulvac Korea.

Tax Breaks for R&D

- Tax deduction is provided for the research and development of semiconductors, so the practical benefit is considerable.
- Large companies/companies of middle standing: 40% of the amount of the aggregate expenses that exceed the average research and development expenses of the four preceding years is deducted. (Article 10, Special Tax Treatment Control Act)
- Small or medium enterprises: Where expenses for research and human resource development incurred for the relevant taxable year exceed the annual average of such expenses paid during the four preceding years, an amount equivalent to 50/100 of such excessive amount is deducted. Or, an amount computed by multiplying the expenses for research and human resource development incurred for the relevant taxable year by 25/100 is deducted. (Article 10, Special Tax Treatment Control Act)

Grounds for Semiconductor-Related Policy Fund

Sectors	Ground for Policy Fund	
Policy Fund	Industrial Technology Development Fund Science and Technology Promotion Fund Information Promotion Fund Defense Industry Promotion Fund Long-term usance loans	Loans for exporting industry equipment Special accounting for energy Short-term export finance Export credit Fund for promotion of locally produced equipment
R&D	Customs refund system, export insurance, discount on electricity bill, R&D programs	
Taxation	Contingency reserve of export loss Overseas market development reserve Reserve for research and development Tax deduction for research and human resource development Tax deduction for productivity enhancement Deduction for temporary investment tax Tax reduction related to the Foreign Investment Promotion Act	



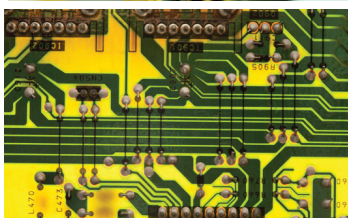
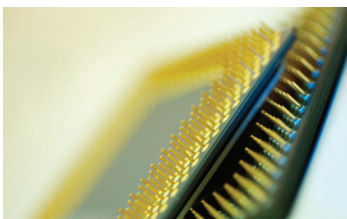
6. Case Study: Infineon Technologies AG

Company Outline

- Based on its key technologies, including the analog/mixed signal, RF, and power and embedded control technologies, the company is focused on six application fields: automotive, industrial electronics, chip card & security, mobile phone platforms, RF solutions, and broadband access.
- Market share by product (2009): Automobile 1st (9%), power 1st (12%), chip card 1st (26%), wireless 3rd (14%).
- It restructured business units, focusing on energy efficiency, communications and security in 2010, but the company is in the process of selling the wireless communications unit. Samsung Electronics and Intel are in the bid to buy it.

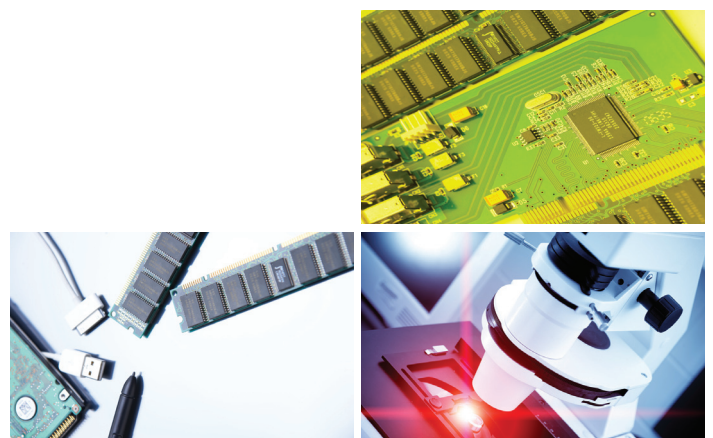
Infineon R&D Center

- On April 23rd of 2007, the Infineon Technologies Asia Pacific Pte., Ltd. made an additional investment of KRW 2.5 billion in Infineon Technologies Korea.
- Hyundai Motor Group and Infineon established the Hyundai Infineon Innovation Center in the Hyundai Motor Research Center, developing semiconductors tailored to the specifications of vehicles produced by Hyundai. This is the first such case in Korea. It plans for mass production within a few years.
- The center is fostering a close partnership in next-generation mobile communications, focusing on key customers. It is targeting a wide range of markets, from GSM/GPRS, WCDMA, and VDS to Bluetooth.



Project Details

- Hyundai – Infineon Innovation Center
 - Joint research center aimed at developing automobile semiconductors tailored to the needs of Hyundai Kia Motor Group, from the design stage.
 - The greatest difficulty of Korean companies in developing future vehicles or hybrid vehicles is power semiconductor technology that works stably at high voltage. The center is expected to play a leading role in localizing the production of power semiconductors for vehicles in the long term.
- Research Center for Semiconductors for Wireless Communications
 - The center is continuously providing solutions for global mobile phone companies including Nokia, Motorola, Samsung, LG, and Panasonic. This is the first case, with the exception of Qualcomm, which is maintaining market monopoly, of solutions being provided to all of the major players in the Korean CDMA market - Samsung, LG and Pantech.



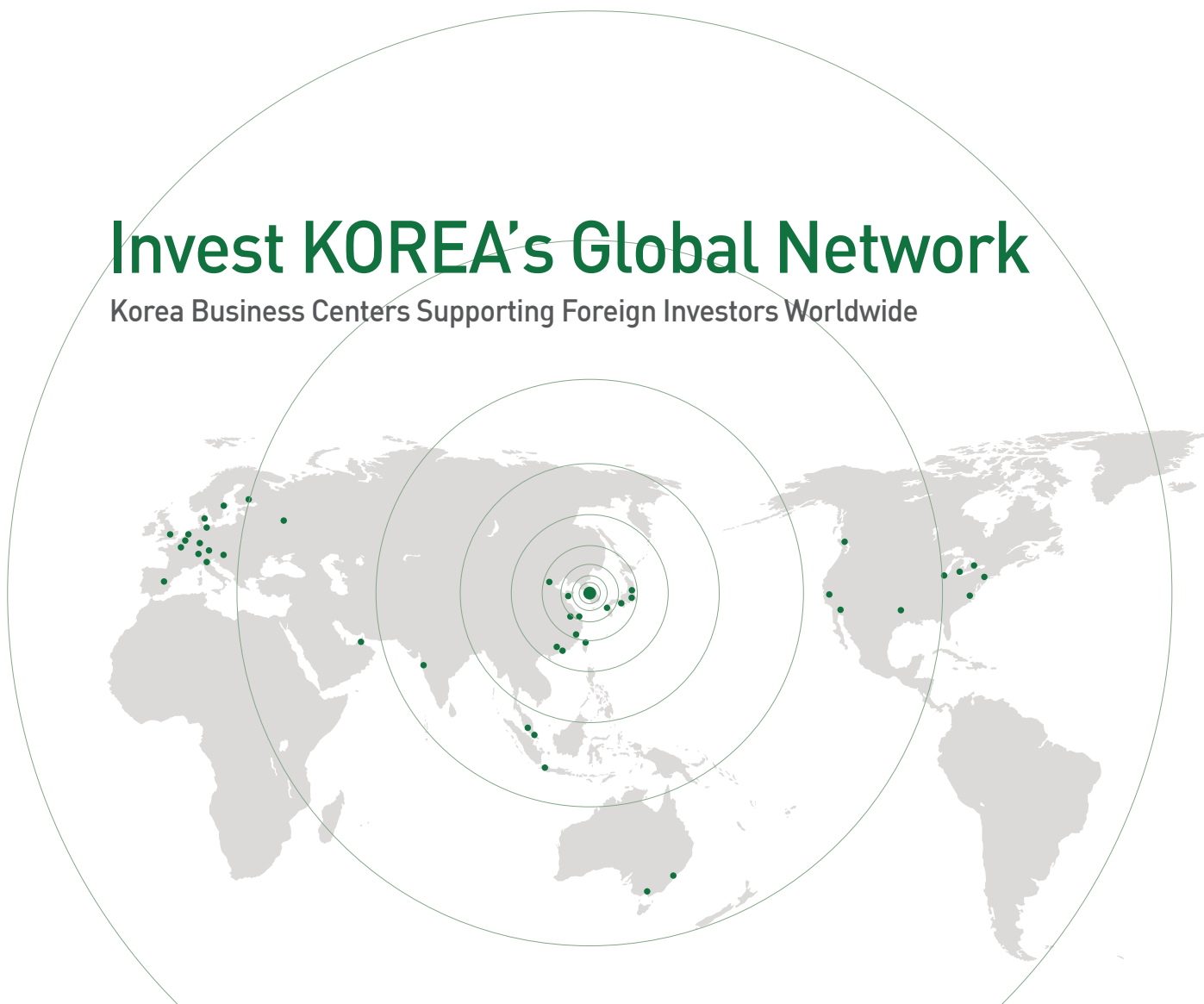
7. Relevant Organizations

Research centers for next-generation technologies are located nationwide, and major universities have education centers to nurture workers with advanced technologies.

	Name	Location	Technologies
Research centers for fundamental technologies	National Center for Nanomaterials Technology (www.nano.or.kr/index.php)	Pohang	Development of semiconductor materials
	KAIST National NanoFab Center (www.nnfc.re.kr)	Daejeon	Nano processing(foundry)
	Korea Electronics Technology Institute (www.keti.re.kr)	Gyeonggi-do	Research on system semiconductors
	Korea Advanced Nano Fab Center (www.kanc.re.kr)	Suwon	Compound semiconductor
Local centers	Chungbuk Technopark Semiconductor Center (www.cbtp.or.kr/semicon)	Ochang	Semiconductor test
University research centers	Inter-university Semiconductor Research Center (www.isrc.snu.ac.kr)	Seoul	Semiconductor design, education of semiconductor technologies
	Semiconductor Physics Research Center of Chonbuk National University (http://sprc.chonbuk.ac.kr)	Jeonju	Compound semiconductor
	Semiconductor Equipment Technology Education Center of the Korea University of Technology & Education (http://setec.kut.ac.kr)	Cheonan	Semiconductor equipment
	National Education Center for Semiconductor Technology of Kyungpook National University (www.necst.or.kr)	Daegu	Semiconductor fabrication process
	IC Design Education Center (http://idc.kaist.ac.kr)	Daejeon	Semiconductor design
	Korea Semiconductor Industry Association (www.ksia.or.kr) Consortium of Semiconductor Advanced Research (www.cosar.kr)	Suwon	Semiconductor packaging

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