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Most figures in this report are converted from KRW into USD based on yearly average exchange rates. But growth rates (e.g., CAGR and YoY growth rate) are calculated based on KRW to prevent any distortion caused by changes in exchange rates.
**Definition of the Industry**

**Definition**

"Display devices" refer to visual output devices for a wide range of electronic equipment that render various information visible to the human eye.

- As the emergence of various convergence devices ushers in a new era of visualization technology, display devices are playing a key role in bringing humans closer to machines.

While final products of the display industry are flat screens such as LCD and OLED panels, parts and materials used in manufacturing display panels are also included in the broader scope of the industry.

- Display products can be divided into liquid crystal display (LCD) panels, plasma display panels (PDPs), and organic light-emitting diode (OLED) panels.

**Display Panel Types and Features**

<table>
<thead>
<tr>
<th>Classification</th>
<th>TFT-LCD</th>
<th>PDP</th>
<th>OLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advantages</td>
<td>Light and slim, low power consumption</td>
<td>Slim</td>
<td>Light and slim, low power consumption, high definition, rapid response</td>
</tr>
<tr>
<td>Disadvantages</td>
<td>Viewing angle</td>
<td>Power consumption, lower efficiency, overheating</td>
<td>Limited lifespan</td>
</tr>
<tr>
<td>Maturity</td>
<td>Mature</td>
<td>Declining</td>
<td>Early stage of growth</td>
</tr>
</tbody>
</table>

Source: Korea Ratings Corporation (2014)

As is the case with other equipment industries, continuous investment in production-line facilities is needed to swiftly respond to the changing demand for product size.

- For instance, if the demand for 50-inch panels increase at a time when 40-inch panels are being produced on a 5G production line, it would be more profitable in terms of production costs to build a new 7G production line for larger panels.
Parts and Materials

Each pixel of a liquid crystal display (LCD) panel is composed of two polarizing filters and a thin layer of liquid crystal in between backlight units account for the bulk of an LCD panel’s production cost, as well as color filters for color LCD panels.

- Backlight units account for 30% of the total cost for producing LCD panels, followed by color filters (25%), glass substrate (17%), driver ICs (15%), and polarizing filters (11%).
- OLED screens do not require backlight units, and have simpler structures than LCD panels.

Raw Material Costs for LCD Production

![Pie chart showing raw material costs for LCD production](chart)

- Backlight: 31%
- Color Filter: 21%
- Other: 17%
- Driver IC: 3%
- Liquid crystal: 4%
- Glass: 11%
- Polarizer: 13%

Related Industries

As a typical form of intermediary goods, display devices are used in the manufacturing of finished products for other industries, such as TVs, PC monitors, laptop computers, tablets, and mobile phones.

Display Industry Value Chain

![Display Industry Value Chain](diagram)

The display industry has always been heavily dependent on demand from the growth of the television industry, the largest buyer of display panels, but recently, the rapidly expanding smartphone market is also rising in importance.

- As the rapid growth of the LCD markets in Korea and China was enabled by the stability of markets downstream the industry value chain, such as TV markets, the production of display devices increase in proportion to the growing TV market.
- Local brands account for at least 70% of China’s domestic TV market, and South Korea also held the largest share of the global TV market for a long time.

While the TV market, a core market of the display industry, had been stagnant for years due to the economic recession, the smartphone market grew by approximately 3% in 2016 from the previous year, with a total of 1.46 billion smartphones sold worldwide, and is projected to grow by 6% in 2017.

Global TV and Smartphone Market Trends and Outlook

![Graph showing global TV and smartphone market trends](chart)

Source: (TVs) IHS and Eugene Investment & Securities (Oct. 24, 2016); (Smartphones) SA and Hanwha Investment & Securities (Dec. 1, 2016)
Status of the Industry

Global markets

Global display markets rapidly developed until 2012 due to the growing demand for related products such as TVs.
- Global display markets contracted to USD 90 billion when Lehman Brothers filed for bankruptcy in 2009, but were able to quickly recover, reaching an all-time high of USD 129.5 billion in 2012.
- Global display markets grew at the highest rate between 2003 and 2012, the annual average growth rate reaching 15.8%.

Since then, however, the global economic recession caused display markets to shrink, at an annual average rate of 4.5% between 2012 and 2015.
- The decline in demand for IT products, such as TVs, laptop computers, and PC monitors, which are relatively sensitive to economic conditions, resulted in poor sales figures for display products.
- Prolonged economic stagnation in advanced countries has continued to stall global TV markets, while the increase in smartphone penetration has led to a decline in demand for laptop computers.

Global Display Market Trends

Until now, LCD products drove the growth of global display markets, while OLED panels, once thought of as the technology to replace LCD screens, failed to enter a full-scale growth mode, accounting for a mere 11% of all global display markets in 2015.

Since 2015, global display markets have suffered from an oversupply, a major cause being the expansion of production in China.
- The oversupply rate of large LCD screens stayed at 10% in 2015 and in 2016.
- Since the second half of 2016, the oversupply has been gradually mitigated by the decline in LCD production in Korea and Taiwan, increased government control over Chinese investment in LCD businesses, and demand recovery.

Global Oversupply of LCD Panels

Since the second half of 2016, the oversupply has been gradually mitigated by the decline in LCD production in Korea and Taiwan, increased government control over Chinese investment in LCD businesses, and demand recovery.

Korea’s Display Markets

With the world’s largest and second largest display manufacturers being based in Korea, the domestic display industry’s highly competitive structure has been the primary force that drove the development of the domestic display industry, and at the same time has contributed to the establishment of a favorable business environment.
- The competition between Samsung Display and LG Display accelerated investment in new product development, saving energy, and developing new technologies, such as for producing thinner films, thus contributing to the industry’s continuous growth.

The scale of the domestic display market is relatively small, with approximately 84% of all products manufactured in Korea being exported.
- Estimates for 2016 show that exports account for 91% of LCD and 70% of OLED products made in Korea.
Korea’s Display Industry Production Scales (USD million)

Source: IHS
Note: For PDPs, the data only covers PDPs produced until 2013. 2016 figures are based on an estimate

With exports surging in the 2000s, new exporters have emerged, further contributing to the country’s economic growth.

- Exports grew at an average annual rate of 27.7% from 2006 to 2010, indicating that the display industry grew exponentially during those few years.

Korea’s Industry Exports (USD million)

Source: Korea International Trade Association (KITA)

In 2013, however, the global economic downturn and oversupply pushed export growth into negative territory, and the trend has persisted until the present.


On the positive side, OLED product exports have grown rapidly, partially offsetting the sluggish performance of the LCD market.

- OLED exports grew at an average rate of 30% in 2015 and is estimated to grow by 31% in 2016.
- In 2017, OLED exports are projected to increase by approximately 20% from the previous year.

Status of FDI in the Display Industry

While foreign investment in the Korean display industry has decreased in number for the past several years due to the downturn in global display markets, it remains active in terms of the total amount invested.

- As Samsung and LG continue to make massive investments in OLED technology, investment by foreign companies are also expected to rise.

FDI Trends in the Korean Display Industry (USD millions, no. of cases)

Source: Foreign Direct Investment Statistics by the Ministry of Trade, Industry and Energy
Note: Based on Notification

Korea is considered an optimal global production base, as it is home to both Samsung Display and LG Display, the world’s largest and second largest display manufacturers in terms of global market sales.

- Industrial clusters have already formed in the industry to supply parts and materials to Samsung and LG, consisting of Korean parts and materials companies, as well as a number of influential foreign companies.
- Korean companies are already dominating markets for OLED panels, currently replacing LCD products at an alarming rate, accounting for 95% of all global markets. Demands for OLED parts and materials are also on the rise.
- Samsung and LG have expanded their OLED facilities in response to the increasing demand, and more foreign companies equipped with OLED technologies are likely to start new businesses in the industry.

Moreover, because Korea is also known for its smartphones, TVs, home appliances, semiconductors, and secondary batteries, which are all closely related to the display industry, it continues to have high business potential.

- Korea remains the largest producer of smartphones, digital TVs, semiconductor memories, and secondary batteries.

As Korean IT and electronics industries have long been competitive in world markets, their human resources are typically of the highest quality, either with professional on-site experience or advanced degrees in electronics or chemistry.
### Key Investments by Foreign Companies

<table>
<thead>
<tr>
<th>Company</th>
<th>Location</th>
<th>Type</th>
<th>Parts</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Corning Precision Glass</td>
<td>Cheonan, Gumi</td>
<td>Joint</td>
<td>Glass, ITO, and target</td>
<td>Jointly invested by Corning (U.S.), Bogwang and Samsung Electronics</td>
</tr>
<tr>
<td>Nippon Electric Glass (NEG)</td>
<td>Paju</td>
<td>Joint</td>
<td>Glass</td>
<td>Established joint venture Paju Electric Glass (PEG) with LG Display</td>
</tr>
<tr>
<td>Asahi Glass Corp. (AGC)</td>
<td>Gumi</td>
<td>Direct</td>
<td>Glass</td>
<td></td>
</tr>
<tr>
<td>AvanStrate Inc. (ASI)</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>Glass</td>
<td>Former NHT</td>
</tr>
<tr>
<td>Merck</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>LC (liquid crystal)</td>
<td></td>
</tr>
<tr>
<td>NCK</td>
<td>Pyeongtaek</td>
<td>Joint</td>
<td>Semiconductor/LCD materials (for anti-reflection, alignment layer)</td>
<td>Joint venture between Nissan Chemical (Japan) and AMC Semichem (Korea)</td>
</tr>
<tr>
<td>JNC Korea</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>Alignment layer, LC, and overcoat</td>
<td>Former Chisso Korea</td>
</tr>
<tr>
<td>Dongwoo Fine-Chem</td>
<td>Pyeongtaek, Iksan</td>
<td>Direct</td>
<td>Etchant, striper, and photoresist</td>
<td>Wholly owned by Sumitomo Chemical</td>
</tr>
<tr>
<td>AZEM Korea</td>
<td>Anseong</td>
<td>Direct</td>
<td>Developer, thinner, and photoresist</td>
<td>Merck subsidiary</td>
</tr>
<tr>
<td>Hantan Chemicals</td>
<td>Ulsan</td>
<td>Joint</td>
<td>Developer</td>
<td>Joint venture between Tokuyama Corp. (Japan) and Lette Fine Chemical (Korea)</td>
</tr>
<tr>
<td>Nikko</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>ITO target</td>
<td>Nikko Materials Korea</td>
</tr>
<tr>
<td>Mitsui Mining</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>Al target</td>
<td>Mitsui Kinzokuo Korea</td>
</tr>
<tr>
<td>Ulyvac Materials</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>Mo target</td>
<td>Ulyvac Korea</td>
</tr>
<tr>
<td>TDK</td>
<td>Paju</td>
<td>Joint</td>
<td>Resin BM</td>
<td>Joint venture with Cotem Co., Ltd.</td>
</tr>
<tr>
<td>Nissin Chemical</td>
<td>Pyeongtaek</td>
<td>Direct</td>
<td>Pi</td>
<td>NCK Corp</td>
</tr>
<tr>
<td>Air Products (AP)</td>
<td>Gumi, Ulsan</td>
<td>Direct</td>
<td>Gas</td>
<td>Air Products and Chemicals Korea Ltd.</td>
</tr>
<tr>
<td>Air Liquide</td>
<td>Yeosu</td>
<td>Direct</td>
<td>Gas</td>
<td>Air Liquide Korea</td>
</tr>
<tr>
<td>Fujifilm</td>
<td>Seoul</td>
<td>Direct</td>
<td>TAC</td>
<td>FUJIFILM Electronic Materials Korea Co., Ltd.</td>
</tr>
<tr>
<td>Toray Saehan</td>
<td>Gumi</td>
<td>Joint</td>
<td>Diffusion film</td>
<td>Joint venture between Toray (Japan) and Saehan (Korea)</td>
</tr>
<tr>
<td>3M</td>
<td>Naju</td>
<td>Direct</td>
<td>Prism film</td>
<td>Post-processing underway</td>
</tr>
<tr>
<td>Teijin DuPont</td>
<td>Seoul</td>
<td>Direct</td>
<td>Reflection film</td>
<td>Joint venture between Teijin Ltd. (Japan) and E. I. du Pont (U.S.)</td>
</tr>
<tr>
<td>LG MMA</td>
<td>Yeocheon</td>
<td>Joint</td>
<td>PMMA (for light guide plate)</td>
<td>Joint venture between LG, Nippon Shokubai, and Sumitomo Chemical</td>
</tr>
<tr>
<td>Mitsubishi Rayon</td>
<td>Daesan</td>
<td>Joint</td>
<td>PMMA</td>
<td>Joint project with Daesan MMA</td>
</tr>
<tr>
<td>Bayer Material Science Ltd.</td>
<td>Gimhae</td>
<td>Direct</td>
<td>Diffusion plate</td>
<td>Renamed from Bayer Sheet Korea</td>
</tr>
</tbody>
</table>

### Competitiveness of the Industry

The Korean display industry first emerged as the world’s largest display manufacturer in 2002, until which Japan held that title.

- Korea succeeded in taking No. 1 spot in the global flat panel display market within a short period of time because it was able to respond to the changing environment at a faster speed than its competitors, by accumulating technological know-how and making bold investments in facilities.
- Despite the recent slowdown in production and exports caused by the global economic recession and oversupply, Korea still holds the largest share of the global display market with overwhelming industrial competitiveness.

In particular, Korea accounts for over 95% of the emerging global OLED market, which is set to replace the LCD market.

- To maintain their competitive edge, Korean companies began shifting their strategic focus from LCD to OLED products, with plans to focus their investments in developing OLED technology.

### Changes in Global Display Market Composition

![Changes in Global Display Market Composition](image-url)

Source: IHS
However, Japan still occupies a larger share of small- and mid-sized LCD markets with superior technology and quality.

- Although the small-and mid-sized LCD panels account for 28.4% of the entire global display market, Japan is focusing its investment in specialized small- and mid-sized LCD products to make up for its smaller share of the global market for large-sized LCD products.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Korea</td>
<td>21.6</td>
<td>26.4</td>
<td>34.9</td>
<td>18.0</td>
<td>18.0</td>
<td>19.6</td>
</tr>
<tr>
<td>Japan</td>
<td>39.3</td>
<td>36.7</td>
<td>32.4</td>
<td>37.8</td>
<td>36.5</td>
<td>40.6</td>
</tr>
</tbody>
</table>

Source: IHS

Although Korea remains the world’s best in flat panel technology, it still lags behind Japan in terms of original technology for key parts, materials and equipment.

- Korea remains the most advanced country in panel technology, while Japan leads the world in terms of parts, materials, and equipment.

- Korea is the most vulnerable in display parts and materials. The country’s technology in the sector is still 90% or lower level than that of Japan, which continues to maintain the upper hand.

Technological Level of Key Countries by Major Display Sectors

<table>
<thead>
<tr>
<th>Division</th>
<th>Korea</th>
<th>China</th>
<th>Japan</th>
<th>US</th>
<th>Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panels</td>
<td>LCD</td>
<td>100</td>
<td>82</td>
<td>93</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>OLED</td>
<td>100</td>
<td>78</td>
<td>90</td>
<td>76</td>
</tr>
<tr>
<td>Parts/materials</td>
<td>LCD</td>
<td>83</td>
<td>73</td>
<td>100</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>OLED</td>
<td>87</td>
<td>72</td>
<td>100</td>
<td>93</td>
</tr>
<tr>
<td>Equipment</td>
<td>LCD</td>
<td>92</td>
<td>74</td>
<td>100</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>OLED</td>
<td>89</td>
<td>68</td>
<td>100</td>
<td>82</td>
</tr>
</tbody>
</table>

Source: Korea Evaluation Institute of Industrial Technology (KEIT), 2015

- While Korea’s technological prowess has improved for display parts and materials, but it still has to catch up with Japan and the U.S. in technologies for producing materials such as liquid crystals, TAC films, and compensation films.

* Use of domestic products (equipment): LCD: 71%, OLED: 56% / (materials/part): LCD: 65%, OLED: 57%.

Korea’s Major Parts Technology

<table>
<thead>
<tr>
<th>Classification</th>
<th>Advanced</th>
<th>Average</th>
<th>Nascent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major parts</td>
<td>Color film, driver IC, BLU, and CCFL</td>
<td>Glass substrate, polarizer, and prism sheet</td>
<td>Liquid crystal, TAC film, optical compensation film, and DBEF</td>
</tr>
</tbody>
</table>

Prospect for the Industry

Global Display Markets are Projected to Witness Modest Growth in the Coming Years.

Display markets across the world are expected to expand by an average of 4% each year from 2016 to 2020. In particular, OLED products are expected to drive growth in the entire industry due to the soaring demand for OLED screens for smartphones.

- The LCD market is projected to see zero growth during the same period, marking the beginning of its decline.

An annual average growth rate of 1.5% is expected from 2020 to 2023, which would be slightly lower than that of the late 2010s.

- From 2020 to 2023, the growth rate of the global LCD market is expected to decline by an annual average 1.2%, during which time OLED markets worldwide will grow by an average 8.1% each year.

Outlook for the Global Display Market

Source: IHS

China Expected to Enhance Production Capacity

China is expected to exceed Korea in LCD production capacity in the second quarter of 2018.

- Estimated LCD production capacity for Q2 2018: China: 34% > Korea: 32% > Taiwan: 27% > Japan: 7%
Currently, most OLED displays are used as smartphone and TV screens, but the market is expected to expand greatly as technology evolves to enable the production of flexible and transparent OLED displays.

As the demand for large display screens is expected to keep on growing, the average TV screen is expected to increase from 38.4 inches in 2015 to 42.4 inches in 2018.

- Growing demand for big screen TVs is expected to trigger new competition between TV makers, positively influencing the demand for display panels.

**Estimated Increase in Average TV Screen Size**

<table>
<thead>
<tr>
<th>Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>35.9”</td>
<td>37.3”</td>
<td>38.4”</td>
<td>39.3”</td>
<td>41.8”</td>
<td>42.4”</td>
</tr>
</tbody>
</table>

Source: IHS

**The Global Display Industry will Steadily Shift Its Focus from LCD to OLED Panels.**

As of 2015, OLED panels account for 10% of the global display market, but the figure is projected to reach 25% by 2022.

- Estimated rate of annual average market growth (2015–2020): OLED: 19.9%, LCD: –0.1%

**Estimated Share of OLED Products in the Global Display Market**

Source: IHS
LOCATIONAL COMPETITIVENESS

Display Clusters in Korea

From 1995 to 2004, display production facilities were concentrated in Giheung, Cheonan, and Gumi, but as production lines were expanded, the regional focus shifted to Tangjeong (Samsung) and Paju (LG).

LCD and OLED parts and materials companies formed display clusters in Paju, Gyeonggi-do and Tangjeong, Chungcheongnam-do as new production lines were opened in the cities by Samsung and LG, respectively.

Major Display Cluster Details

<table>
<thead>
<tr>
<th>Classification</th>
<th>Paju</th>
<th>Tangjeong</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from Incheon International Airport</td>
<td>50 km</td>
<td>164 km</td>
</tr>
<tr>
<td>Port</td>
<td>50 km (Incheon)</td>
<td>30 km (Pyeongtaek, Dangjin)</td>
</tr>
<tr>
<td>Distance from Seoul</td>
<td>35 km</td>
<td>85 km</td>
</tr>
<tr>
<td>From Seoul Station</td>
<td>60 min (car, train)</td>
<td>34 min (KTX), 90 min (car)</td>
</tr>
<tr>
<td>Water supply</td>
<td>Paldang Dam</td>
<td>Daechang Dam</td>
</tr>
<tr>
<td>Neighboring cities</td>
<td>Ilsan</td>
<td>Cheonan, Asan</td>
</tr>
</tbody>
</table>

* KTX (Korean Train eXpress): High-speed rail system in Korea
Paju Display Industrial Complex

Including LG Display, the world's second largest display manufacturer, some 80 display-related companies are situated in Paju, Gyeonggi-do.
- LG Display produces LCD and OLED panels for large-screen TVs and operates OLED production lines and module factories, including seventh and eighth-generation factories.
- Most resident companies of the LG display complex are LG affiliates specializing in high-tech parts and materials, such as LG Chem (glass substrate) and LG Innotek (LED, BLU).

The complex exports over 90% of its products through the harbors and airports nearby, and is also easily accessible by car from all across the country.
- Gimpo International Airport and Incheon Port are both located within a 50 km distance from the complex, and National Highway 1 is about a 5 minute drive away.
- Moreover, with the Uijeongbu Branch Office of the Korea Customs Services located inside the Paju LCD Industrial Complex, time can be saved as it only takes 30 minutes to pass through import/export clearance.

Proximity to Seoul secures the supply of high-quality human resources essential to the technology-intensive industry.
- The complex's proximity to Seoul ensure that it has a secure supply of high-quality human resources with degrees from the best universities in Korea, while agreements with local universities and specialized high schools also facilitate local employment.

All types of massive infrastructure for industrial use, such as an industrial water supply, have been established, capable of meeting the needs of resident companies, which also benefit from government policies that permit rapid development within the complex.

Ways to Access Paju LCD Industrial Complex

<table>
<thead>
<tr>
<th>By road</th>
<th>Expressways : Sinwol IC (31 km), Gyeongin Expressway (Goyang: 22 km, Seoul: 42 km)</th>
<th>National Highways : Route 1 (Tongil-ro), Route 23 (Jayuro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By train</td>
<td>Wollong Station, Gyeongui Line (2 km)</td>
<td></td>
</tr>
<tr>
<td>By air</td>
<td>Gimpo International Airport (35 km)</td>
<td></td>
</tr>
<tr>
<td>By sea</td>
<td>Incheon Port (30 km) : cargo-handling capacity of 39,081,000 tons, 58 berths</td>
<td></td>
</tr>
</tbody>
</table>

In particular, the Paju Dangdong Foreign Investment Zone, a high-tech industrial complex exclusively for foreigners, is also located in close distance to the Paju LCD Industrial Complex.

Ways to Access Paju Dangdong Foreign Investment Zone

<table>
<thead>
<tr>
<th>By road</th>
<th>Expressways : Sinwol IC (39 km), Gyeongin Expressway (Goyang: 28 km, Seoul: 48 km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By train</td>
<td>Munsan Station, Gyeongui Line (1.5 km)</td>
</tr>
<tr>
<td>By air</td>
<td>Gimpo International Airport (41 km)</td>
</tr>
<tr>
<td>By sea</td>
<td>Incheon Port (56 km) : cargo-handling capacity of 39,081,000 metric tons, 58 berths</td>
</tr>
</tbody>
</table>

Tangjeong Industrial Complex

Located in Chuncheongnam-do the Tangjeong Industrial Complex is a leading display manufacturing cluster responsible for 54% of display products made in Korea and approximately 27% of total global display production output.
- A mega cluster that encompasses the Asan-Tangjeong region and the Cheonan-Naepo region is currently being planned.

Local governments offer various forms of support, such as for the construction of the display support center, and some 35 universities have opened in the Asan-Tangjeong area since the 1980s, securing a firm foundations for research and development.

Ways to Access Tangjeong Industrial Complex

<table>
<thead>
<tr>
<th>By road</th>
<th>Expressways : Cheonan IC (10 km), Gyeongin Expressway (Seoul: 110 km, Daejeon: 80 km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>By train</td>
<td>Oryang Spa Station, Janghang Line (8 km), Cheonan Station, Gyeongbu Line (9 km)</td>
</tr>
<tr>
<td>By air</td>
<td>Cheongju International Airport (45 km), Incheon International Airport (105 km)</td>
</tr>
<tr>
<td>By sea</td>
<td>Asan Port (20 km) : for ships weighing 20,000 to 50,000 metric tons, cargo-handling capacity of 24.5 million tons/year, 17 berths</td>
</tr>
</tbody>
</table>

Source: Korea Industrial Complex Corporation (KICOX)
The complex receives focused investment through Samsung Electronics' global business strategy, as well as through central and the local government support programs.

- With Samsung Display at its center, the Asan–Tangjeong Industrial Complex is home to a total of 210 resident companies (4,282,000 ㎡; 15,000 employees).
- To nurture the Asan–Tangjeong display cluster, local governments have proceeded with diverse projects involved in developing technology and cultivating human resources and establishing cooperation network that connects industry with academy and research institutions.

**Cheonan Fifth General Industrial Complex: Complex-type Foreign Investment Zone**

Cheonan Fifth General Industrial Complex, home to enterprises specializing in new materials, high-tech parts and materials, fabricated metals, and chemical products, is located in close distance to the Tangjeong Industrial Complex.

- Major establishments nearby include the Samsung Display headquarters, the Samsung SDI Cheonan Factory (22 km) and the Samsung Display Asan Factory (26 km).

A semiconductor–display industrial belt has been established, connecting Cheonan Valley (semiconductor manufacturing equipment) with the second and third regional industrial complexes (semiconductor, display), Tangjeong Industrial Complex (display), Eumbong (semiconductor manufacturing equipment), and Baebang (semiconductor).

**Tangjeong Industrial Complex and Cheonan Fifth General Industrial Complex**

Samsung Display affiliates make up the majority of resident companies at Tangjeong Industrial Complex, which is located farther away from the capital area than the Paju Industrial Complex.

### Locational Conditions and Benefits

#### Paju LCD Industrial Complex and Dangdong Industrial Complex

Display-related businesses in Paju benefit from the city's close proximity to Seoul and the presence of a national industrial cluster led by LG Display.

**Move-in requirements for foreign companies:**

- Companies with foreign investment of 30 percent or higher, worth KRW 100 million or more.
- Foreign direct investment at least equal to the price (official land value) of the leased plant site (for five years).

#### Paju LCD Complex and Dangdong Industrial Complex Incentives

**Tax exemptions**

- Acquisition tax: 100%
- Property tax: 50% for 5 years (for 5 years from the first day of acquisition)

**Financial support**

- Gyeonggi-do SME support funds
  - Projects: automation, informatization, technological development, business conversion, transferal of large company businesses to SMEs, general startups, small company cultivation, promising new industries.
  - Qualifications: companies that operate registered factories and whose manufacturing sales account for a minimum 30% of total sales; persons who runs companies in a promising new industry.
  - Amount: KRW 200 million to KRW 1 billion per business, at an annual interest rate of 7.3%.
  - Loans are to be: repaid over five years, with a three-year grace period.

Source: Korea Industrial Complex Corporation (KICOX)
### Tangjeong Industrial Complex Incentives for Foreign Companies

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Fund Type</th>
<th>Qualifications</th>
<th>Maximum Amount of Incentives (KRW billion)</th>
<th>Deferment / Repayment Conditions</th>
<th>Interest Rate (Subsidized Amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial support</td>
<td>New business and Competitiveness enhancement fund</td>
<td>Installing facilities, such as plants, manufacturing, equipment, etc.</td>
<td>Total 1.5 (Facilities 1.2 + Operation 0.3)</td>
<td>Facilities: 3 years / 5 years Operation: 1 year / 2 years</td>
<td>2.9% (1.51%)</td>
</tr>
<tr>
<td></td>
<td>Innovation fund</td>
<td>Ventures, new technologies, commercialization of Inno-Biz developed technologies</td>
<td>0.5</td>
<td>2 years / 3 years</td>
<td>3.7-3.5% (2.51%)</td>
</tr>
<tr>
<td></td>
<td>Corporate rehabilitation fund</td>
<td>Businesses affected by natural disasters or large-scale accidents</td>
<td>0.5</td>
<td>1 year / 2 years</td>
<td>3.5% (2.51%)</td>
</tr>
<tr>
<td></td>
<td>Management stabilization fund</td>
<td>Businesses experiencing temporary difficulty in financing</td>
<td>0.3</td>
<td>2 years / lump sum</td>
<td>2.3% (2.3%)</td>
</tr>
<tr>
<td>Support for small businesses</td>
<td>Graduates of startup training or consulting programs</td>
<td>Startups: 0.3 Improvement: 0.5</td>
<td>2 years / lump sum</td>
<td>2.0% (2.0%)</td>
<td></td>
</tr>
</tbody>
</table>

#### Tax exemption
- Acquisition tax: 100%
- Property tax, composite land tax: 50% for 5 years (from the first day of acquisition)

### Cheonan Fifth General Industrial Complex Incentives for Foreign Companies

<table>
<thead>
<tr>
<th>Incentive Type</th>
<th>Fund Type</th>
<th>Qualifications</th>
<th>Maximum Amount of Incentives (KRW billion)</th>
<th>Deferment / Repayment Conditions</th>
<th>Interest Rate (Subsidized Amount)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial support</td>
<td>New business and Competitiveness enhancement fund</td>
<td>Installing facilities, such as plants, manufacturing, equipment, etc.</td>
<td>Total 1.5 (Facilities 1.2 + Operation 0.3)</td>
<td>Facilities: 3 years / 5 years Operation: 1 year / 2 years</td>
<td>4.4% (1.72%)</td>
</tr>
<tr>
<td></td>
<td>Innovation fund</td>
<td>Ventures, new technologies, commercialization of Inno-Biz developed technologies</td>
<td>0.5</td>
<td>2 years / 3 years</td>
<td>3.3-3.5% (2.62%)</td>
</tr>
<tr>
<td></td>
<td>Corporate rehabilitation fund</td>
<td>Businesses affected by natural disasters or large-scale accidents</td>
<td>0.5</td>
<td>1 year / 2 years</td>
<td>3.0% (2.51%)</td>
</tr>
<tr>
<td></td>
<td>Management stabilization fund</td>
<td>Businesses experiencing temporary difficulty in financing</td>
<td>0.3</td>
<td>2 years / lump sum</td>
<td>2.0-3.0% (2-3%)</td>
</tr>
<tr>
<td>Support for small businesses</td>
<td>Graduates of startup training or consulting programs</td>
<td>Startups: 0.3 Improvement: 0.5</td>
<td>2 years / lump sum</td>
<td>2.0% (1.75-2.0%)</td>
<td></td>
</tr>
</tbody>
</table>

#### Tax exemption
- Acquisition tax: 100%
- Property tax, composite land tax: 50% for 5 years (from the first day of acquisition)
Government Policies and Incentives

Support for Next-generation Display Technology Development and Investment

Support for the early construction of infrastructure such as power and water supplies for new OLED investment projects (KRW 10 trillion for LG and KRW 4 trillion for Samsung).

Support for the research and development of new products compatible with next-generation convergence display products such as wearable devices: KRW 30 billion for next-generation display technology development projects between 2017 and 2021.

Intensive support for local small- and medium-sized makers of materials and equipment.
- Top 10 World Premier Materials (WPM) project to develop plastic substrate materials for flexible displays as well as transparent barrier films from 2010 to 2017 (KRW 100 billion; 50% government funding, 50% private investment).

OLED Innovation Center project set to be launched in 2018 (KRW 280 billion).
- (1) Support for research and development for processing technology and commercialization, (2) operation of a trial laboratory that can respond to prototype development and small-scale productions.

Projects for Cultivating Human Resources and Supporting SMEs Specializing in Materials and Equipment

(Human resource cultivation) Helping small and medium equipment and parts companies hire high-quality human resources, which is currently concentrated in the panels industry, by cultivating professions in equipment and parts industries.
- Ongoing project aims to cultivate 155 professionals with master’s degrees in display equipment and parts from 2016 to 2020.
  * Universities: Six local universities involved in the display clusters: Sungkyunkwan University, Hongik University, Gachon University, Soonchunhyang University, Gyeonggi University, Hoseo University
  * Companies: 42 companies in need of high-quality R&D personnel such as SFA, LIG Invenia, AP System, Dongjin Semichem

(Materials & equipment) Focusing support on continued research and development for domestic small and medium-sized enterprises that manufacture materials and equipment.
- World Premier Materials (WPM) project to develop plastic substrate materials for flexible displays as well as transparent barrier films from 2010 to 2017 (KRW 100 billion; 50% government funding, 50% private investment).

Applicable Laws

Industrial Development Act: Policies Related to Attracting Investments

Since the Korean government enacted the Industrial Development Act to enhance the competitiveness of knowledge-based industries and achieve sustainable industrial development, diverse benefits, including support for funds, taxes, and sites, have been provided for state-of-the-art technologies and products.

State-of-the-art display industry technologies and products as defined in the Industrial Development Act are as follows.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Products and Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass Panel Module part Production</td>
<td>Technology for solidifying and casting ultrapure large targets to sputter thin films for displays.</td>
</tr>
<tr>
<td>Flexible Panel Module part Production</td>
<td>Technology for manufacturing functional thin films for flexible displays / coating technology to control water vapor permeability of polymer films.</td>
</tr>
<tr>
<td>Flexible Panel Module part Production</td>
<td>Technology for manufacturing wide-surface and thermal-spreading parts for radiation displays.</td>
</tr>
<tr>
<td>Flexible Panel Module part Production</td>
<td>Molding technology for LED molding packaging.</td>
</tr>
<tr>
<td>Flexible Panel Module part Production</td>
<td>Complex micro-pattern and large-sized roll molding technology.</td>
</tr>
<tr>
<td>Control Module Production</td>
<td>Highly integrated plating technology for ultrafine circuits in electronic boards.</td>
</tr>
<tr>
<td>Control Module Production</td>
<td>Ultraprecision bonding technology for flexible electronic parts.</td>
</tr>
<tr>
<td>Control Module Production</td>
<td>Ultraprecision press-molding system technology for flexible panels.</td>
</tr>
<tr>
<td>Control Module Production</td>
<td>EMI shielding ultraprecision mesh plating and manufacturing technology.</td>
</tr>
<tr>
<td>Control Module Production</td>
<td>Molding technology using an imprinting process for polymer optical parts.</td>
</tr>
</tbody>
</table>
Other Laws Governing Investment in the Display Industry

Act on Special Measures for the Promotion of Specialized Parts and Materials Enterprises, Etc.
- This Act aims to establish a foundation for the development of materials and parts as well as industries related to materials and parts manufacturing, as well as to foster enterprises that specialize in materials and parts.
- Under the above Act, companies that manufacture/produce display parts and materials are not subject to Article 168 of the Financial Investment Services and Capital Markets Act, which restricts the limit of acquisition, etc. of foreigners trading securities and exchange-traded derivatives, specifying that with trading and other transactions involving securities or exchange-traded derivatives by foreigners, foreign corporations, etc.

Industrial Innovation Promotion Act
- This Act aims to promote innovation in industrial technology and develop infrastructure for the innovation of industrial technology in order to strengthen industrial competitiveness.
- Under the above Act, the Ministry of Trade, Industry and Energy provides the following support for profit and nonprofit R&D centers employing at least five regular researchers who hold a master’s or a doctoral degree, or hold a bachelor’s degree in a related field and have at least three years of research experience.
  * Support for overseas research centers stationed in Korea to participate in industrial technology innovation projects
  * Support for overseas research centers to train and employ researchers
  * Support for overseas research centers to establish a foothold in Korea

Tax benefits for AMOLED R&D
- Currently, investments in R&D for 9-inch or larger AMOLED products are eligible for tax deductions.
- The system is currently being actively reviewed so that AMOLED products smaller than 9 inches and AMOLED equipment and materials can also be eligible for tax deductions.
Cost and Labor

With respect to the semiconductor and electronic parts manufacturing sector, which includes display-related materials and part industries, materials take up the largest share of total costs (54.81%), followed by manufacturing overhead (35.69%), and labor (9.5%).

Breakdown of Semiconductor and Electronic Parts Manufacturing Costs

<table>
<thead>
<tr>
<th>Material cost (54.81%)</th>
<th>Manufacturing overhead (35.69%)</th>
<th>Labor Cost (9.50%)</th>
</tr>
</thead>
</table>

The supply and demand of human resources in the display industry is generally carried out with little difficulty at the display cluster in Paju and Tangjeong.

- Number of employees (as of late 2015): 24,985 at Samsung Display, 32,603 at LG Display.
- Average length of employment (as of late 2015): 9.1 years at Samsung Display, 7.4 years at LG Display.

High school graduates account for 55.4% of the total workforce, while employees with master’s or doctoral degrees account for 7.5%.

Composition of Human Resources by Education Level (no. of people)

<table>
<thead>
<tr>
<th>Total</th>
<th>High School</th>
<th>2-year College</th>
<th>University</th>
<th>Masters’</th>
<th>Doctoral</th>
</tr>
</thead>
<tbody>
<tr>
<td>48,228</td>
<td>26,698</td>
<td>15,209</td>
<td>10,455</td>
<td>2,412</td>
<td>1,228</td>
</tr>
</tbody>
</table>

Source: Survey on the current demand and supply of industrial technology labor force by the Korean Statistical Information Service (KOSIS)

In total, some 270 display industry companies employs approximately 95,000.

Display Companies and Employees by Year (no of people, no. of companies)

Source: Survey on mining and manufacturing by the Korean Statistical Information Service (KOSIS)

Return on Expenses

The profitability of domestic panel companies is estimated to have remained stable until 2015.

- Samsung Display recorded an operating profit of 7% in 2014 and in 2015.
- LG Display recorded a minimum operating profit of 5% in 2014 and 2015.

Operating Profits at the Two Major Korean Display Companies (USD million, %)

<table>
<thead>
<tr>
<th>Company</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Display</td>
<td>563.29 (2.3)</td>
<td>1,989.6 (8.0)</td>
<td>845.63 (7.4)</td>
</tr>
<tr>
<td>LG Display</td>
<td>1,102 (4.3)</td>
<td>1,234 (5.1)</td>
<td>1,386.8 (5.7)</td>
</tr>
</tbody>
</table>

Source: Samsung and LG Business Reports. The numbers in parentheses indicate the rate of operating profits.

Note: () refers the operating profit rates.

Companies specializing in parts, materials, and equipment in the display industry generally maintained positive levels of profitability, while key parts and equipment companies managed to achieve profitability levels of greater stability.

Operating Profit Rates at Display Parts and Materials Companies (%)

<table>
<thead>
<tr>
<th>Company</th>
<th>Key products</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFA</td>
<td>Preprocessing equipment</td>
<td>13.5</td>
<td>11.0</td>
<td>10.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(15.1)</td>
<td>(8.8)</td>
<td>(7.4)</td>
</tr>
<tr>
<td>AP System</td>
<td>Equipment</td>
<td>6.3</td>
<td>2.1</td>
<td>4.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(16.4)</td>
<td>(1.0)</td>
<td>(7.6)</td>
</tr>
<tr>
<td>Shinhwa Intertek</td>
<td>Materials (optical sheet)</td>
<td>4.4</td>
<td>1.9</td>
<td>2.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.8)</td>
<td>(9.7)</td>
<td>(-4.5)</td>
</tr>
<tr>
<td>Dongjin Semichem</td>
<td>Materials (washing, etching)</td>
<td>3.6</td>
<td>5.6</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.6)</td>
<td>(7.7)</td>
<td>(13.3)</td>
</tr>
<tr>
<td>Silicon Works</td>
<td>Parts (driver IC)</td>
<td>8.3</td>
<td>9.1</td>
<td>10.4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(12.1)</td>
<td>(11.2)</td>
<td>(15.0)</td>
</tr>
<tr>
<td>Advanced Nano Products</td>
<td>Materials (ITO target)</td>
<td>5.2</td>
<td>13.3</td>
<td>21.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(2.8)</td>
<td>(6.4)</td>
<td>(11.3)</td>
</tr>
<tr>
<td>INNOX</td>
<td>Materials (OLED film)</td>
<td>18.3</td>
<td>14.3</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(27.5)</td>
<td>(12.0)</td>
<td>(7.4)</td>
</tr>
</tbody>
</table>

Source: Annual Report by Korea Listed Companies Association

Note: () refers to the “return on equity (ROE),” an indicator of how efficiently a company uses investments: the higher the value, the more efficient a company is in making profits.
Due to the prolonged recession in the global LCD market and the increase in production by Chinese companies, however, TV panels have stopped turning out relatively good profits in 2016, with the rate of return falling to negative territory.

**Large LCD Panel Profitability Levels (%)**

![Graph showing the profitability levels of large LCD panels from Q1'10 to Q4'16.](image-url)
AvanStrate Inc.

Overview

<table>
<thead>
<tr>
<th>Parent Company</th>
<th>AvanStrate Inc.</th>
<th>Korean subsidiary</th>
<th>AvanStrate Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters</td>
<td>Yokohama, Kanagawa Prefecture, Japan</td>
<td>No. of Korean Employees</td>
<td>214 (as of March 2016)</td>
</tr>
<tr>
<td>Date of Foundation</td>
<td>November 2002</td>
<td>Business type</td>
<td>Manufacturing glass substrates</td>
</tr>
</tbody>
</table>

History

- June 2005: Begins construction of factory in Korea.
- July 2005: Relocates headquarters to Pyeongtaek, Gyeonggi-do.
- October 2007: Begins mass production of 7G glass substrates.
- December 2008: Changes name to AvanStrate.

Among AvanStrate’s three overseas subsidiaries (Taiwan, Singapore, Korea), the Korean subsidiary makes the largest contribution in sales.

AvanStrate’s main line of products focuses on glass substrates for liquid crystal panels.
- AvanStrate retains the technology for mass producing eighth-generation glass substrates (2,200×2,500 mm), and produces fifth- to eighth-generation glass substrates for liquid crystal panels.
- Currently, four global companies—Corning, Asahi Glass Corp., Nippon Electric Glass, and AvanStrate—monopolize the supply of LCD glass substrates.
- Glass substrate production is subjected to strict global standards, and therefore requires advanced manufacturing and processing technologies. Moreover, as facilities require large-scale investments, companies must overcome a very high barrier to enter the market.

As the production of LCD panels continues to increase in Korea, the current supply of glass substrates is failing to meet demands, creating a gap which is expected to be filled by AvanStrate as it expands its business in the country.
- As the world’s biggest maker of LCD panels, Korea, home to the largest and second largest panel makers, is and will continue to be the biggest consumer of glass substrates.
- In response to the growing demand for large-screen televisions, companies are trying to increase the size of glass substrates to lower costs.
- All glass substrates produced are supplied to Samsung Display.

AvanStrate won the Foreign Investment Awards in 2010 and the 300 Million Dollar Export Tower in 2011.

Corning Precision Materials

Overview

- Founded as a joint venture with Samsung in 1995 when the display industry just began in Korea.
- Changes name from “Samsung Corning Precision Glass” to “Samsung Corning Precision Materials” in 2010.
- Changes name to “Corning Precision Materials” in January 2014, after Samsung sells all of its shares to Corning.

<table>
<thead>
<tr>
<th>Parent Company</th>
<th>Corning</th>
<th>Korean Subsidiary</th>
<th>Corning Precision Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters</td>
<td>US</td>
<td>No. of Korean Employees</td>
<td>2,981 (as of late 2015)</td>
</tr>
<tr>
<td>Date of Foundation</td>
<td>May 1995</td>
<td>Business Type</td>
<td>Glass for LCD substrates and electronic materials</td>
</tr>
</tbody>
</table>

Corning’s main line of products focuses on glass for LCD substrates, an essential material for the display industry.
- Glass for substrates are an essential material to LCD products such as LCD TVs, monitors, and laptop computers.
- After changing its name, Corning Precision Materials also started producing Gorilla Glass, which had until then been manufactured in the Corning factory in Japan.

Recognized as the top manufacturer of glass for substrates, Corning is enjoying its position as an oligopolistic supplier in the global display market, and maintains a very high rate of operating profit.
- The operating profit rate for 2010 was approximately 65%.
- Despite a recent downturn in the rate of return caused by market saturation, the operating profit rate for 2015 still recorded a relatively high level of 27.3%.

An essential material, glass for substrates have significantly contributed to the development of the Korean display industry, and enhanced its competitiveness.
- 1996: Begins operating its very first production line at the Gumi factory.
- 2002: Completes construction of the Cheonan factory.
- 2005: Becomes first in the world to produce glass for 7G substrates.
- 2007: Produces glass for world’s largest 8G substrates.
- 2007: Merges with Samsung Corning; receives 2 Billion Dollar Export Tower award.
Ulvac

Overview

<table>
<thead>
<tr>
<th>Parent Company</th>
<th>Ulvac</th>
<th>Korean subsidiary</th>
<th>Ulvac Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headquarters</td>
<td>Chigasaki, Kanagawa Prefecture, Japan</td>
<td>No. of Korean Employees</td>
<td>409 (as of June 2016)</td>
</tr>
<tr>
<td>Date of Foundation</td>
<td>July 1995</td>
<td>Business type</td>
<td>Vacuum equipment for semiconductors and LCDs</td>
</tr>
</tbody>
</table>

Ulvac’s main line of products focuses on vacuum deposition systems for manufacturing LCDs, such as sputtering systems, vacuum evaporation systems, etc.

- After opening its first factory in Pyeongtaek in 2000, second third factories were subsequently built by 2003.

The fourth factory in Hyeongok was built in 2005 to expand the domestic business, along with the fifth Hyeongok factory, which opened in 2006.

Ulvac Materials Korea was established as its subsidiary in 2008 (with 100% equity from Ulvac).

- Ulvac Materials Korea’s main line of products focuses on vacuum-related materials and products, equipment, and parts.

Over the course of the company’s growth since its foundation, Ulvac Materials Korea was able to strengthen its ties with partner companies by providing them with support to raise competitiveness.

- 2010: Receives the Prime Minister’s award at the Large Enterprise–SME Cooperation Awards organized by the Federation of Korean Industries.
- 2013: Receives award for successful EESH management by LG Electronics.
- Selected as one of top 1,000 Korean companies since 2007 (Maeil Business Newspaper).
- 2014: Selected as an Innovative and Outstanding Partner by Samsung Display.

Ulvac Korea’s contribution to exports increased annually, in proportion to the rapid growth of the Korean display industry.

- 2005: Receives 10 Million Dollar Export Tower award.
- 2012: Receives 70 Million Dollar Export Tower award.
- 2015: Receives 100 Million Dollar Export Tower award.
- The accumulated amount of exports for the last 20 years reached USD 500 million since its entry into the Korean market.
List of Related Companies and Associations

**Related Companies**

<table>
<thead>
<tr>
<th>Company</th>
<th>Major Items</th>
<th>Website</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Samsung Display</td>
<td>LCD, OLED</td>
<td><a href="http://www.samsung.com">www.samsung.com</a></td>
<td>Tangjeong, Chungcheongnam-do</td>
</tr>
<tr>
<td>LG Display</td>
<td>LCD, OLED</td>
<td><a href="http://www.lgdisplay.com">www.lgdisplay.com</a></td>
<td>Paju, Gyeonggi-do</td>
</tr>
<tr>
<td>Dongjin Semichem</td>
<td>Stripper (stripping process), etchant (etching process), and thinner (washing process)</td>
<td><a href="http://www.dongjin.com">www.dongjin.com</a></td>
<td>Seoul</td>
</tr>
<tr>
<td>ENF Technology</td>
<td>Developer (exposure process), stripper (stripping process), and etchant (etching process)</td>
<td><a href="http://www.enftech.com">www.enftech.com</a></td>
<td>Yongin, Gyeonggi-do</td>
</tr>
<tr>
<td>Soullbrain</td>
<td>Etchant (etching process)</td>
<td><a href="http://www.soullbrain.co.kr">www.soullbrain.co.kr</a></td>
<td>Cheongan, Gyeonggi-do</td>
</tr>
<tr>
<td>Wonik Materials</td>
<td>NH3 gas, N2O gas, and laser mix</td>
<td><a href="http://www.womco.kr">www.womco.kr</a></td>
<td>Cheongju, Chungcheongbuk-do</td>
</tr>
<tr>
<td>DS Neolux</td>
<td>RGB light-emitting materials</td>
<td><a href="http://www.dsneolux.co.kr">www.dsneolux.co.kr</a></td>
<td>Cheonan, Chungcheongnam-do</td>
</tr>
<tr>
<td>INNOX</td>
<td>OLED encapsulation film</td>
<td><a href="http://www.innovxcorp.com">www.innovxcorp.com</a></td>
<td>Ansan, Chungcheongnam-do</td>
</tr>
<tr>
<td>SKC Kolon Pi</td>
<td>Pi film</td>
<td><a href="http://www.skckolonpi.co.kr">www.skckolonpi.co.kr</a></td>
<td>Anyang, Gyeonggi-do</td>
</tr>
<tr>
<td>Silicon Works</td>
<td>Driver IC/T-Con module</td>
<td><a href="http://www.siliconworks.co.kr">www.siliconworks.co.kr</a></td>
<td>Daejeon</td>
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<tr>
<td>Giga Lane</td>
<td>OLED pitch probe unit</td>
<td><a href="http://www.gigalane.com">www.gigalane.com</a></td>
<td>Hwaseong, Gyeonggi-do</td>
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<tr>
<td>LG Chem</td>
<td>Polaroid film</td>
<td><a href="http://www.lgechem.com">www.lgechem.com</a></td>
<td>Seoul</td>
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<tr>
<td>Nepes</td>
<td>Developer (exposure process)</td>
<td><a href="http://www.nepes.co.kr">www.nepes.co.kr</a></td>
<td>Seoul</td>
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<tr>
<td>Advanced Nano Products</td>
<td>IGZO target</td>
<td><a href="http://www.anapro.com">www.anapro.com</a></td>
<td>Sejong</td>
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<td>TLI</td>
<td>Driver IC/T-Con module</td>
<td><a href="http://www.tli.co.kr">www.tli.co.kr</a></td>
<td>Seongnam, Gyeonggi-do</td>
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<td>Sangbo</td>
<td>Optical sheet</td>
<td><a href="http://www.sangbogroup.com">www.sangbogroup.com</a></td>
<td>Seoul</td>
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<tr>
<td>LG Innnotek</td>
<td>Photo mask, LED chips</td>
<td><a href="http://www.lginnotek.co.kr">www.lginnotek.co.kr</a></td>
<td>Seoul</td>
</tr>
<tr>
<td>Duksun</td>
<td>Developer (exposure process), stripper (stripping process)</td>
<td><a href="http://www.duksun21.com">www.duksun21.com</a></td>
<td>Suwon, Gyeonggi-do</td>
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<tr>
<td>S&amp;S Tech</td>
<td>Blank mask (exposure process)</td>
<td><a href="http://www.snstech.co.kr">www.snstech.co.kr</a></td>
<td>Daeju</td>
</tr>
<tr>
<td>SK Materials</td>
<td>NF3 gas, SiH4 gas</td>
<td><a href="http://www.sk-materials.com">www.sk-materials.com</a></td>
<td>Yeongju, Gyeongjangbuk-do</td>
</tr>
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**Related Associations**

<table>
<thead>
<tr>
<th>Association</th>
<th>Website</th>
<th>Details</th>
</tr>
</thead>
</table>
| Korea Display Industry Association    | www.kdia.org     | • Studies the current status of and problems faced by the Korean display industry.  
• Understands market trends for panels, parts, materials, and equipment.  
• Provides Korean companies with information to enter overseas markets. |
| Chungnam Technopark Display Center    | www.displaycenter.or.kr | • Assists SMEs’ investing in the display industry in Chungcheongnam-do.  
• Cultivates professional human resources and provides education.  
• Provides assistance in measurement, analysis, pilot production, standardization, and reliability assessment for display products.  
• Helps SMEs use and rent equipment. |
| Korea Core Industrial Technology Investment Association | www.kitia.or.kr | • Established according to the Act on Special Measures for the Promotion of Specialized Enterprises, etc. for Materials and parts enacted in April 2001.  
• Registers and manages Parts and Materials Specialized Investment Cooperatives.  
• Supports commercialization: provides assistance in attracting foreign funds, operating a Global M&A Desk, marketing activities, etc.  
• Proposes ideas related to the government’s policy for cultivating parts and materials industries.  
• Operates the Japan Desk: lists and manages Japanese parts and materials companies to attract investment; conducts other activities to attract investment.  
• Provides financial support and follow-up management for companies that have received institutional investment: holds briefing sessions on investment, negotiates investment deals, and selects businesses eligible for investment. |
| Korea Electronics Association (TV- and smartphone-related industry association) | www.gokea.org | • Establishes foreign cooperation networks and provides membership services.  
• Provides assistance in developing electronics and IT industries.  
• Provides assistance in holding exhibitions.  
• Provides support for industrial development policies. |
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