



Electronics Industry in Singapore

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Summary

Since gaining independence in 1965, Singapore has emerged as a regional economic powerhouse. One of the key reasons for this is its strong diverse manufacturing sector, which has been the cornerstone of Singapore's thriving economy. For many years, manufacturing has contributed at least 25 percent to the Gross Domestic Product (GDP) of which the electronics industry plays a significant role in terms of foreign investments as well as value-added output and employment.

Electronics Industry in Singapore is divided into three categories, which are also its best prospects:

- Semiconductors and Disk Drives
- Electronic Modules and Components
- Electronic Manufacturing Services and Peripherals

Data from Singapore's Economic Development Board (EDB) shows growth of over one percent for the semiconductor category, computer peripherals experienced more than 22 percent growth, five percent for data storage and also five percent for other electronic modules & components respectively as of June 2008. Overall, electronic products for the first half of the year grew 2.5 percent compared to the same period last year.

Singapore is a key player for infocomms products. It is a major supply chain hub for the PC industry with top players like HP, Dell, Lenovo and Apple having a strong supply chain management presence here. More than 50% of the world's point-of-sale (POS) products are designed or made here. Singapore is also a major manufacturing site for HP's enterprise storage, inkjet cartridges and networking products.

In 2007, Singapore's electronics products contributed 45 percent of the country's total exports. After Hong Kong and the European Union, the United States is Singapore's third biggest electronics market. For Singapore, a country of slightly less than five million people, it is the U.S.'s 15th largest trading partner and 11th largest export market in Asia for 2007.

Market Demand

Singapore's achievements in the Electronics industry, according to the Singapore Economic Development Board (EDB), include the following:

- 10 percent global market share for semiconductor wafer foundry output
- Home to the world's top three wafer foundry companies
- Home to four of the world's top five sub-contract assembly-and-test companies
- Home to four of the world's top 10 fabless IC design companies
- 25 percent global market share for printers

Singapore's importance in the electronics industry is evident in the quantity and scope of facilities currently located in the country. The country is home to over 14 Semiconductor wafer fabrication plants (including three 12-inch fabrication plants), 20 assembly and test operations, and 40 IC design centers.

Over the years, Singapore's hard disk industry has been moving from the lower end of the value chain of mass-producing simple drives to the higher end. It now churns out cutting-edge hard disks such as those that are used in servers to store massive amounts of data amounting to thousands of gigabytes. The industry has also diversified into making a key component within hard disk drives known as disk media or magnetic disks that hold media. However, this industry has been shrinking. Seagate, the world's largest manufacturer of hard disk drives, is embarking on a new S\$200 million media plant to design, develop and manufacture its 1-inch drive for global consumption; as the plant will create 2,000 jobs over the next few years as it reaches full capacity. In addition to this facility, the company also operates a factory that develops small portable storage devices and produces the company's enterprise and mobile storage products. Apart from Seagate, the only other remaining hard disk manufacturer in Singapore is Hitachi, which currently employs more than 4300 workers.

The Singapore Government plans to double manufacturing output by 2020 with the following targets:

- to double the current total manufacturing output to S\$300 billion (US\$220 billion)
- to double the current total manufacturing value-added to S\$80 billion (US\$58 billion)
- to raise the current skill profile of manufacturing workers to 50 percent

As a result of this projected growth, over 90,000 workers were employed in the electronics industry in 2007, generating some S\$73 billion (US\$53 billion) in output. It appears that the targets are well on their way to being met as many MNCs have recently announced expansion plans in Singapore.

In 2006, Micron Technology began begun test and assembly operations at its Singapore facility following a major investment of US\$250 million the previous year. The facility takes silicon wafers and processes them into flash memory chips, which are used to store data such as digital cameras and MP3 players.

Both Samsung-Siltronic (Korean-German joint venture) and Soitec (French) also announced in 2006 that they would build a US\$1 billion and a US\$450 million wafer fabrication plants respectively in Singapore. It is Singapore's first 300mm wafer substrate and ingot pulling facility. The Samsung-Siltronic plant will be able to produce approximately 250,000 300mm wafers a month when in operation while the Soitec plant will produce less.

Marvell Technology which designs / develops chips for iPods and wireless devices announced two years ago that they will invest S\$100 million or US\$63.29 million over five years to expand its operation in Singapore which will include a design center. This center will be the company's largest outside the U.S. and is part of a facility that will also have sales and technical support. Similarly, NEC Electronics is upgrading its Singapore plant. The company closed its plant in Ireland and relocated to Singapore where current output is 15 million chips per month. When the upgrade is completed end of this decade, it will be able to produce around 20 million chips monthly and Singapore will serve as the company's assembly and testing hub for the Asia-Pacific region.

IM Flash Singapore was formed in February 2007 as a joint venture between Micron and Intel where the manufacturing facility being built, will be operational within the next 9-12 months. This facility will primarily manufacture NAND Flash memory chips to be used in consumer electronics, removable storage and handheld communication devices. In May 2008, Intel, Samsung and TSMC announced that they hope to create a 450 mm wafer by 2012 since by working together, these companies can save money, reduce risk and share ideas. This larger wafer would lower costs per chip, as well as other resources, like energy and water; which was seen some years ago with the conversion from 200mm to 300mm wafers resulting in reduced aggregate emissions.

In July 2008, the ground was broken for a new operations center for Applied Material which is expected to be completed in late 2009. The 32,000 square meter facility will serve as a hub for Applied's business activities such as global purchasing, sales, manufacturing, engineering and financial activities throughout Asia. They will support customers in the Asian chip industry, as well as the rapidly growing solar markets in India and China.

Singapore recognizes the importance of wafer fabrication; in fact, to help increase talent, the EDB plans to invest up to US\$6 million to train wafer fabrication engineers over three years. This new program, co-sponsored by semiconductor companies here, is to encourage undergraduate students in electrical, electronics, mechanical, materials and chemical engineering to specialize in wafer fabrication and work in the semiconductor industry.

Market Data

Global sales of electronic equipment have continued to chalk healthy gains. After 7.7 percent increase in 2007, it is expected that growth of electronic equipment, including personal computers (PCs) and mobile phones will rise by at least 6.6 percent to US\$1.6 trillion in 2008. The Asian region, particularly China and India with their rising middle class, also demonstrated increasing demand for digital and consumer electronics goods. In Singapore, the electronics industry has benefited including market demand for semiconductors with an estimated growth of 50 percent for 300mm wafers in 2008 and sustained growth in the coming years.

According to the Semiconductor Industry Association (www.sia-online.org) based in California, the forecast projected global chip sales of US\$277 billion for 2008 rising to more than US\$300 billion by the end of the decade. SIA, in its mid-year forecast, stated that it expects chip sales will rise at least six percent on a compounded annual growth rate basis from 2008 for the next three years. The forecast also predicted that the industry would grow at a compound annual growth rate of at least seven percent over the next two years. In 2010, the Asia-Pacific region will account for nearly half the global market, which will make it the fastest growing region. The industry association believes that over the next two to three years:

- microprocessor sales for personal computers will grow by an average of ten percent
- flash memory sales for digital cameras will grow by an average of nine percent
- memory chip sales for DRAMs will grow by an average of eight percent

It is no secret that the disk drive industry in Singapore is competing against lower-cost countries such as China and Thailand, therefore the cost efficiencies per output cannot match. Coupled with cyclical demand in the industry, manufacturers are always concerned of having excess inventory and not wanting to over commit on their resources especially during certain times of the year. Moreover, there is also a slowing global demand from the United States, Europe and Japan for electronics components. In particular, output for semiconductor chips continued to thrive on rising demand of consumer electronic products that use these chips. This has offset a slump in disk drive production caused by companies consolidating and relocating to lower cost countries.

Manufacturing makes up a quarter of Singapore's economy and electronics output, which accounts for slightly more than a third of the manufacturing sector's contribution to the gross domestic product, rose by 10.3 percent from a year earlier. Domestic exports of electronic goods, which have been on the descent since early 2007, continued to drop by 15 percent in June 2008. The contraction in electronic domestic exports was largely because of weaker domestic exports of ICs, parts of PCs and telecom equipments.

Best Prospects

Semiconductors and Disk Drives

Demand for hard disk drives (HDDs) is powering ahead as HDDs are found in every conceivable electronic device, from personal computers to digital video recorders, music players, cameras, mobile phones, video game consoles and car navigation systems. Forecasts for the HDD sector will top US\$50

billion in 3-4 years time. Following the new investments by Hoya, Seagate and Showa Denko over the past two years, Singapore produces 40% of the world's hard disk media –magnetic disks that hold data today. Singapore is also a major base for the final assembly of high-end enterprise HDDs, accounting for 80% of the global enterprise HDD shipments. Singapore is home to some of the world's largest hard disk media manufacturers, accounting for 25 per cent of worldwide shipment.

Flash memory chips, which are the latest technology chips, have a current market worth of US\$13 billion globally. These chips are electrically erasable and programmable that can be erased and reprogrammed in blocks instead of one byte at a time. Since these chips are non-volatile, they do not require a constant power supply to retain their data. Flash memory chips offer extremely fast access times, low power consumption, and relative immunity to severe shock or vibration. Typically, they are used in portable or compact devices such as digital cameras, cell phones, pagers, and scanners. These chips are also used as solid-state disks in laptops and as memory cards for video game consoles.

The first semiconductor organic substrate facility was opened in Singapore by a local company, AEM-Evertch to manufacture the substrate which is a key component used in portable digital devices. They are expected to invest more than US\$30 million over the next four years to triple capacity since there is a demand for such products. These substrates form the interconnecting layer between the semiconductor dies and the chips embedded into them. Beyond mainstream industries, Singapore is also trying to develop potential high growth areas such as photonics, nanotechnology and micro-electrical-mechanical systems or MEMS.

Electronic Modules and Components

As the principal driver of Singapore's manufacturing sector, electronics is the sector's largest contributor of value-added (VA) per annum, fixed asset investment, and job creation from new investment. Growth has been driven primarily by the expansion of the semiconductor, data storage and electronic modules, advanced displays, and components (such as capacitors, diodes and integrated circuits) industries. The production of computer equipment accounts for about half of the total electronics output in Singapore and it is a major factor in the country as this accounts for nearly 10 percent of the global electronics output

One of the most popular items for electronic modules is the sale of flat screen monitors for liquid crystal display (LCD) televisions and personal computers. In this display segment, Singapore is home to AFPD, which owns one of the biggest Low Temperature Poly-Silicon (LTPS) Thin Film Transistor (TFT) LCD plants in the world. Jointly owned by Toshiba and Matsushita Electric, it specializes in the production of LCDs using advanced LTPS process technology. Built at the cost of S\$1.8 billion or US\$1.3 billion, the 92,700-square meter facility produced its 5 millionth LCD panel in March 2005 and its 10 millionth panel two years later. It is expected that the market for such panels may reach US\$5 billion in five years time.

Electronic Manufacturing Services and Peripherals

The electronics and precision engineering sector is the main driver of Singapore's manufacturing industry but growth has fluctuated somewhat due to inconsistent global demand. Production of computer related equipment in Singapore accounts for more than 30 percent of total electronics output and close to 10 percent of global electronics output. The outlook for the electronic manufacturing services (EMS) sector remains good, underpinned by the computer, communication, medical devices, aerospace and automotive sectors.

One bright spot is in medical device and aerospace outsourcing as EMS companies rise to the challenges of long 12 product development cycles coupled with strict quality standards and complex documentation requirements. Yet another bright spot is the increasing electronics content in the automotive sector. As such, several of the world's top 10 EMS companies have significant presence here. Their operations range from design, high-value manufacturing and supply chain management to regional management. Among the key players are Flextronics, Sanmina-SCI, Celestica, Venture, Jurong High-Tech and Beyonics some of whom have headquarters operations as well as regional functions.

Prospective Buyers / End Users

The manufacturing sector of which the electronics industry has been a significant component for many years, powers the Singapore economy. It has diversified the economic base, thereby increasing the country's resilience against cyclical fluctuations in the global economy. The electronic industry also fuels the growth of the services sector by creating jobs at all skill levels and creates a robust platform for the development of technology and innovation. In 2007, nearly 400 projects were garnered according to press reports. When fully implemented, they will create 28,600 new jobs and add S\$11.6 billion (US\$8.5 billion) per year to Singapore's gross domestic product (GDP).

Even homegrown Chartered Semiconductor Manufacturing (CSM) is doing well after years of being in the red. For example in early 2008, CSM entered into an agreement with Hitachi to purchase all of the shares in Hitachi Semiconductor Singapore, which owns and operates an 8-inch wafer fab, for US\$170 million in cash as well as a manufacturing agreement with Renesas, which calls for up to US\$200 million worth of future wafer fabrication services. This fab will be CSM's fifth 8-inch facility and located on a 90,000 square meter campus, the investment translates to approximately US\$5 million per out of 1,000 wafers per monthly capacity.

Two major tie-ups have helped CSM to become profitable. The first is with IBM in 2002 that licensed its advanced processes to jointly develop 90 nanometer and 65 nanometer technologies. The second is with Advanced Micro Devices, in 2005, to make 90nm chips. These two tie-ups have resulted in CSM using these newly acquired technologies in winning key contracts to produce higher-margin chips such as those for Microsoft's video-game console. With CSM planning to improve on its 300mm silicon wafer fabrication capabilities, there could be opportunities for U.S. companies to supply plant equipment.

Many IC design centers, in addition to test and assembly facilities, have also been set up in Singapore in recent years by MNCs from Japan, Europe and the U.S. as well as by local companies. These design centers focus on the analog and digital design of various broadband communications, micro controller and power supply products plus R&D work such as developing system solutions in digital convergence products. Some of the world's top fables IC design companies are located in Singapore and there will be more to come such as JAM Technologies from Texas who will conduct design work in digital audio amplification in Singapore.

For the test and assembly applications, companies such as Linear Technology, Micron Technology, Xilinx, UTAC and STATS ChipPAC have been operating in Singapore for many years and together, they have announced US\$500 million worth of investment to upgrade their facilities. All of these hi-tech systems and facilities present numerous opportunities. Apart from the above technology related sectors, another area that is likely to see a great deal of demand for electronics is entertainment and tourism. Singapore is planning to build two integrated resorts cum casinos with a combined worth of US\$5 billion by end of the decade. Both contracts have already been awarded and these two resorts will generate demand for various electronic products.

Market Entry

Price, quality and service are the three main selling factors in Singapore, but it is equally important for U.S. companies to build a long-term relationship first with potential partners. These partners could be in the form of agent or distributors who can serve Singapore and the Southeast Asia region such as Malaysia, Indonesia and Thailand. Singapore companies are known to be aggressive when it comes to representing new products and are also open to joint ventures or manufacturing under license. Among the top 50 growing local companies in Singapore, there are half a dozen that are from the electronics sector. These companies are involved in the manufacturing and distribution of electronic components that are essential to all communication, computing and consumer electronic products.

The ease of doing business in Singapore is something the government has geared towards higher long-term profit potential. It is also important to participate in trade shows in Singapore, as they are more regional in nature. These trade shows provide a very good perspective as to who are the major players in the industry and also serve as a venue to meet many trade visitors (both local and foreign) including government officials. The meetings, incentives, conventions and exhibitions business is expanding very fast and is expected to make up 35 percent of the total tourism receipts of around US\$20 billion in less than 10 years time.

With its excellent business and physical infrastructure, skilled workforce and strong IP protection regime, Singapore offers U.S. companies a base to export their products and conduct research and development. Singapore is also an ideal location for U.S. companies to establish a regional headquarters for Asia.

Market Issues & Obstacles

Not many barriers or tariffs exist in Singapore making the country virtually a free port. Moreover, the corporate tax rate has recently been reduced to 20 percent, which is good news for U.S. companies. However, competition from many foreign suppliers is strong. As one U.S. electronics company commented, Singapore has the best infrastructure, talent pool, incentive schemes, transparency and Intellectual Property protection in the region. For example, more than 10,000 fresh engineering graduates / technicians join the Singapore workforce every year and more than 70,000 workers can be found working in the electronics industry.

The mix within the electronics cluster is continuing to evolve as Singapore anchors more high value-added activities. A more diversified trade basket has also reduced Singapore's reliance on electronics exports. Furthermore, the dependence on traditional export markets for Singapore's electronics products has diminished as new markets emerged. However, sitting at a virtual crossroads between India and China, Singapore has proven to be a great place to do business with its strong transportation and logistics network, extensive supplier base and talented workforce.

The U.S.-Singapore Free Trade Agreement came into effect on January 1 - 2004, which makes it easier for U.S. companies to do business in Singapore. The FTA provides increased protection and enforcement of Intellectual Property making Singapore one of the strongest regimes outside of the United States. It is the first bilateral trade agreement between the United States and an Asian country. Between 2004-2006, bilateral trade has increased by 40 percent while Singapore's exports had increased by 28 percent.

Trade Events

Semicon Singapore
May 20-22, 2009

http://wps2a.semi.org/wps/portal/_pagr/132/_pa.132/576

GlobalTRONICS 2008
September 9-12, 2008

<http://www.globaltronics.com.sg/>

Resources & Key Contacts

Singapore Government Offices

Singapore Economic Development Board
<http://www.sedb.com.sg>

Industry Organizations

Association of Electronics Industries in Singapore
<http://www.aeis.org.sg>

Singapore Manufacturing Federation
<http://www.smafederation.org.sg>

Singapore Precision Engineering & Tooling Association
<http://www.speta.org>

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