



Outstanding people and comprehensive process technologies are our proudest assets. A collaborative team of colleagues, together with a solid portfolio of intellectual property is how we are able to provide leading process technologies and design solutions to ensure customer success in a complex and challenging market environment.

# OPERATIONAL HIGHLIGHTS

## 5.1 Business Activities

### 5.1.1 Business Scope

TSMC's business scope is semiconductor foundry and associated services. The Company excels in all aspects of its business, including semiconductor process technology research and development, wafer manufacturing, logistics management, capacity utilization, customer service, and associated services such as design services, mask manufacturing, wafer probing, in-house bumping and testing. TSMC strives to provide the best overall value to customers; the success of TSMC's business is manifested in the success of its customers.

### 5.1.2 Customer Applications

Over the past 21 years, more than 500 customers worldwide have relied on TSMC to manufacture chips that are used across the entire spectrum of electronic applications, including computers and peripherals, information appliances, wired and wireless communications systems, automotive and industrial equipment, consumer electronics such as DVDs, digital TVs, game consoles, digital still cameras (DSCs), and many other applications.

The rapid evolution of end products drives our customers to utilize TSMC's innovative technologies and services, while at the same time spurring TSMC's own development of technology. As always, success depends on leading rather than following industry trends.

### 5.1.3 Shipments and Gross Sales in 2008 and 2007

Unit: Shipments (8-inch equivalent wafers) / Gross Sales (NT\$ thousands)

|         |          | 2008      |             | 2007      |             |
|---------|----------|-----------|-------------|-----------|-------------|
|         |          | Shipments | Gross Sales | Shipments | Gross Sales |
| Wafer   | Domestic | 1,553,636 | 39,822,198  | 1,442,285 | 38,066,322  |
|         | Export   | 6,806,969 | 260,386,524 | 6,255,368 | 246,329,084 |
| Package | Domestic | 1         | 14          | 53        | 3,641       |
|         | Export   | 100,050   | 3,694,690   | 303,427   | 12,192,114  |
| Other   | Domestic | 19,518    | 3,884,590   | 15,945    | 3,471,751   |
|         | Export   | 49,512    | 22,440,011  | 43,148    | 19,104,387  |
| Total   | Domestic | 1,573,155 | 43,706,802  | 1,458,283 | 41,541,714  |
|         | Export   | 6,956,531 | 286,521,225 | 6,601,943 | 277,625,585 |

### 5.1.4 Production in 2008 and 2007

Unit: Capacity / Output (8-inch equivalent wafers) / Amount (NT\$ thousands)

|      |  | Wafers    |           |             |
|------|--|-----------|-----------|-------------|
| Year |  | Capacity  | Output    | Amount      |
| 2008 |  | 9,376,612 | 8,350,692 | 154,242,282 |
| 2007 |  | 8,289,788 | 7,861,951 | 164,625,063 |

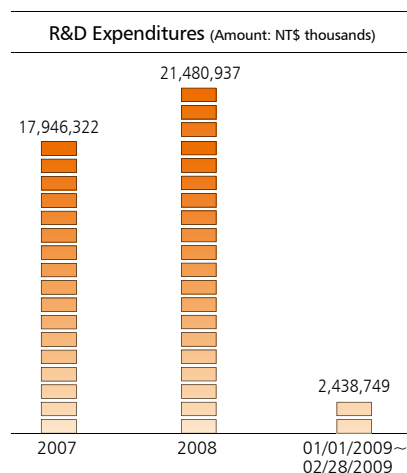
## 5.2 Technology Leadership

### 5.2.1 R&D Organization and Investment

In 2008, TSMC increased its research and development investments and strengthened its R&D organization both in advanced and mainstream technologies. Our goal is to provide best-in-class semiconductor processing technologies and design solutions to TSMC's customers. The Company also expanded its developments for system-on-chip (SoC) and system-in-package (SiP) applications. R&D expenditure reached NT\$21.5 billion, while R&D staff grew by 13.5% in 2008. The Company has committed to investing continuously in R&D irrespective of the business environment in 2009.

TSMC accelerated the development of advanced transistors, embedded memories, and Cu/low-K interconnect technologies. During 2008, the R&D organization once again proved its capabilities by offering a first-to-market 45/40nm foundry technology portfolio as well as establishing 32nm HKMG capability. TSMC also expanded its external R&D partnerships and alliances with world-class research institutions. For example, TSMC is a core partner of IMEC, the respected European R&D consortium. TSMC also has a partnership agreement with NXP, a semiconductor company with world-class technologies, to conduct exploratory researches in advanced CMOS, beyond CMOS, and special "more than Moore" technologies. In addition, TSMC strengthened its collaborations with key partners on design-process optimization. TSMC provides funding for nanotechnology researches at major universities worldwide to promote innovation and the advancement of technology.

These research efforts enable the Company to continuously offer its customers the industry-leading, first-to-market technology and design solutions that ensure their product success in the complex and challenging market environment.



### 5.2.2 R&D Accomplishments in 2008

#### R&D Highlights

##### • 40 and 45 Nanometer Technology

2008 was an outstanding year for TSMC's 40nm technology. Following the release of TSMC's 45nm low-power technology in the third quarter of 2007, we further extended our technology leadership in the foundry sector with qualification and delivery of both 40nm high-performance (N40G) and low-power (N40LP) technologies in the fourth quarter of 2008, using advanced 193nm immersion lithography, leading edge performance enhancing silicon strains, and extreme low-k inter-metal dielectric material.

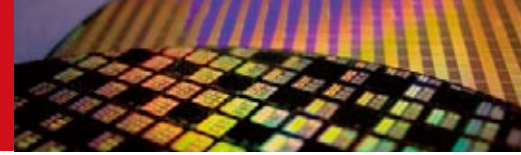
Both high-performance and low-power 40nm technologies have demonstrated best-in-class performance and density with excellent yield from internal SRAM vehicles and customers' products.

As a part of TSMC's shift towards building stronger and tighter foundry customer co-development relationships for advanced technologies, very intensive customer engagements and collaborations were involved throughout the development of both the 45nm and 40nm technologies. This win-win business model was successfully demonstrated as TSMC's new 45nm and 40nm technology enabled and accelerated customer success. For example, one key TSMC customer successfully placed phone calls using the world's first 45nm 3G cellular phone chip in 2007, and another key TSMC customer also demonstrated the world's first functional 40nm FPGA and high-speed Serdes chips in 2008. TSMC's co-development business model significantly improves both TSMC's and our customers' technology leadership and market shares.

TSMC's 45nm and 40nm technologies extended the Company's foundry segment leadership not only on technical metrics such as performance, power and density, but also in terms of development milestones and customer shuttle verifications. The Company provided its customers with the first-to-market cyber shuttle for both the 45nm and 40nm technologies starting from 2006.

##### • 32/28 Nanometer Technology

In 2008, TSMC continued to lead the foundry segment in demonstrating the first 32/28nm high-K/metal gate (HKMG) technology, which supported both analog and digital functionalities. This leading-edge technology was optimized for low power, high density and manufacturing margins with optimal process complexity. TSMC has proven fully functional 0.15 $\mu\text{m}^2$  high-density 64Mb SRAM at the 32nm node. The 64M SRAM yield has been demonstrated for a general-purpose technology for high-end ASIC and graphics applications.



TSMC is the first foundry to announce the 28nm process as a full node technology when the node enters initial production in the first quarter of 2010. The 28nm node will include a choice of silicon oxynitride (SiON) and high-K/metal gate (HKMG) transistor options. TSMC has demonstrated high performance and high yield 64Mb and fully functional 0.127 $\mu\text{m}^2$  high-density 16Mb SRAM (smallest bit-cell and highest density) at the 28nm node.

In addition, the Company has made excellent progress in 28nm high-K/metal gate technology for high performance applications. One high-K/metal gate paper was published by TSMC in the 2008 International Electron Device Meeting proceeding and featured as a conference highlight.

#### ● Immersion Lithography

Immersion lithography provides better depth of focus and enables the industry to continue scaling beyond the 65nm node, all the way to 22nm. TSMC was the first foundry to demonstrate 90nm SRAM using the immersion scanner in 2004. The Company was also the first foundry to achieve single-digit immersion-related defects on 300mm wafers in early 2006, demonstrating 65nm customer product chip yield in July 2006. The Company yielded 32Mb SRAM with 45nm process in December 2006, qualified 45nm at the end of 2007 and 40nm at the end of 2008.

TSMC led the industry in achieving manufacturing-ready immersion lithography for the 45/40/28nm generation. The Company developed proprietary techniques and resist systems to produce nearly defect-free immersion lithography patterning for volume production.

Overlay performance was also raised to a new level consistent with the requirements of our 40nm and 28nm volume productions, which had the tightest design rules in the industry.

#### ● Mask Technology

Mask technology is an integral part of advanced lithography. TSMC has developed proprietary resolution-enhancement techniques that are co-optimized with our in-house mask-making technology. They include optical proximity correction (OPC), sub-resolution-assist mask features, and phase-shifting masks. Fast Lithography Process Check (LPC) technology and Design For Manufacturing (DFM) have also been extended to the 45/40nm node. TSMC mask facilities feature state-of-the-art electron-beam mask writers, etchers, inspection, and repair tools for production at 45/40nm, and advanced stages of R&D at 28nm. In 2008, advances in mask making also contributed to the enablement of computational lithography techniques (CLT), which are under development for the 22nm technology node. TSMC's

strength in mask technology provides significant benefits to our customers in terms of technical excellence, quality, fast cycle time, and one-stop service.

#### ● Long-term Research

Excellent progress has been made in the area of advanced transistor research. The research team has made prototype transistors based on non-planar transistor architecture – FinFET. These FinFET transistors have been made into the smallest SRAM cell with competitive performance to its larger planar counterpart. For even longer-term, high mobility materials were also explored. We have formed a strong collaboration between internal and external research through joint research program with universities. These fundamental researches form important constituents for long-term technology leadership run up to year 2020, when we expect non-CMOS type logic switches will start to emerge.

#### Spectrum of Technology

Beyond the highlights above, TSMC continued to develop a broad mix of new technologies. The Company accelerated its SoC roadmap, including embedded DRAM (eDRAM) and RF with earlier availability, higher integration and more variants.

#### ● Embedded DRAM

Embedded DRAM is important for many applications, such as game consoles, digital TVs, networking, base stations, and hard-disk drives. TSMC's eDRAM is fully compatible with the Company's logic technology. In 2007, TSMC qualified 65nm embedded DRAM technologies for both high-speed and low-power applications. These technologies entered production in early 2008. Several customer products have already been successfully piloted. We also successfully demonstrated 45nm low-power (N45LP) eDRAM and made excellent progress in 40nm general-purpose eDRAM technology.

#### ● Silicon Germanium BiCMOS RF Technology

Having resolved thermal stress challenges, high resistive silicon-on-insulator (HR-SOI) substrate was successfully implemented into TSMC's 0.18 $\mu\text{m}$  CMOS and SiGe BiCMOS process flow. On this substrate, CMOS, NPN and PNP SiGe HBTs are all demonstrated successfully. Furthermore, inductors with 60% higher Q is achieved using this technology. For integration of power management unit into CMOS, a no-cost-adding 6V high drain voltage MOSFET is delivered in 2008 for 0.16 $\mu\text{m}$  CMOS. Similarly for handling high-voltage functionality, a 5V high-density (2.0fF/ $\mu\text{m}^2$ ) metal-insulator-metal (MiM) capacitor is qualified for 0.18 $\mu\text{m}$  CMOS. Lower density no-cost-adding metal-oxide-metal (MOM) capacitors will be developed in 2009 to accommodate >10V applications.

#### ● Mixed Signal/Radio Frequency (MS/RF) Technology

TSMC qualified 45 low-power RF technology in 2008, enabling early Wi-Fi SoC design evaluation in 4Q/2008. A 40nm low-power RF process design kit with silicon-validated model was delivered in the fourth quarter of 2008 to facilitate design launch for an advanced Blue-Tooth chip. Challenges in multi-finger RFMOSFET-related device drive current behavior is investigated and resolved by analyzing with distributing source/drain into multi-segments. To deliver accurate model for small unit metal-oxide-metal (MOM) capacitors for high frequency (67GHz, e.g.) applications, an innovated correlation methodology along with smart MOM modeling array is successfully implemented for 40nm, 45nm, 65nm and 90nm MOM modeling. Small capacitor with  $\sim 1$  fF unit could be predicted accurately and the total variation specification is thus tightened from 25% to 15% or even down to 12%. This enhances the precision level for analog and RF designs. For high-speed data link ( $\geq 10$ Gbits/s) needing inductor-based LC oscillators in most advanced CMOS technologies (28nm, e.g.), simulation-based RF design packages are under development and will be implemented in 2009 to greatly shorten design cycle.

#### ● Power IC/BCD Technology

TSMC has driven multiple power IC platforms into production, including  $0.35\mu\text{m}$  3.3/5/12 $\sim$ 40V BCD &  $0.25\mu\text{m}$  2.5/5/12 $\sim$ 40+60V BCD. Fruitful features were enabled in these platform solutions, such as world-leading Rdson performance, cost-effective modular flexibility & customized characterization reports for friendly power IC design.  $0.18\mu\text{m}$  BCD, for highly integrated SoC applications, has been officially released for 24/40V phase, while an extension phase offering more comprehensive components will be qualified in 2009. TSMC also dominated technology for CCD V-drivers with  $0.18\mu\text{m}$  1.8/3.3/32V technology, together with a cost-competitive shrinkage path to  $0.16\mu\text{m}$  1.8/3.3/24V technology. Furthermore, TSMC's offering of  $0.6\mu\text{m}$  60V BCD also achieved best-in-class Rdson, which is expected to enable competitive LED drivers for the customers.

#### ● Panel Driver Technology

TSMC has completed development of C013 32V technology for small panel driver IC applications. The technology has the smallest SRAM in the world.

TSMC has also provided three high-performance and cost-effective technologies for large panel driver applications. Following them, there are newly defined technologies in development to support customer demands. These technologies will enable SoC with power benefits for next generation products.

#### ● CMOS Image Sensor Technology

A high-performance,  $0.11\mu\text{m}$  4T CMOS image sensor (CIS) process with back side illumination (BSI) technology was successfully developed by TSMC in 2008. This new process aimed at high-end imaging applications with a small pixel size of  $1.4\mu\text{m}$  and high resolutions of greater than five megapixels. It is compatible with TSMC's  $0.13\mu\text{m}$  CMOS logic, which enables SoC platforms in mobile phones, digital cameras, security sensors, automotive applications and other image sensor markets. Color backside illumination image capability was also successfully demonstrated. This technology can extend to N90 CIS technology with smaller pixel sizes ( $1.1\mu\text{m}$ ) and ultra-high resolutions (larger than eight megapixels).

#### ● Flash/Embedded Flash Technology

In 2008, TSMC also completed the qualification of its automotive-grade application using embedded flash (embFlash™) processes at the  $0.18\mu\text{m}$  technology node. Production is well underway. In addition,  $0.13\mu\text{m}$  embFlash technology was also qualified for commercial embFlash prototype activities. For next-generation embFlash technology, a new cell with scaling capabilities of the 90nm and 65nm nodes was demonstrated. A test vehicle with 32Mb flash IP has been proven with good yield.

### 5.2.3 Intellectual Property

A strong portfolio of intellectual property strengthens TSMC's technology leadership. In 2008, TSMC received 365 U.S. patents, 224 Taiwanese patents, 231 PRC patents, and other patents issued in countries around the world. We continue to implement a unified model for TSMC's intellectual capital management. Strategic considerations and close alignment with business objectives now drive the creation, management and use of our intellectual property.

At TSMC, we have built a process to extract value from our intellectual property by aligning our intellectual property strategy with our R&D, marketing, and corporate development strategies. Intellectual property rights protect our freedom to operate, enhance our competitive position, and give us leverage to participate in many profit-generating activities.

We have worked continuously to improve the quality of our intellectual property portfolio and to reduce the cost of maintaining it. We expect to continue investing in our intellectual property portfolio and intellectual property management system to ensure that we receive maximum business value from our intellectual property rights.

## 5.2.4 Future R&D Plans

Following the significant successes of TSMC's advanced technologies in 2008, the Company plans to continue to grow the R&D organization. TSMC will further expand its 300mm R&D pilot line to speed up 28nm qualification with its early engagement customers and the 22nm path-finding programs with world-leading research institutions. We plan to reinforce our exploratory development work on new transistors and technologies such as 3D structures, strained-layer CMOS, high mobility materials, and novel 3D-IC devices with TSV. These studies of the fundamental physics of nanometer CMOS transistors are core aspects of our efforts to improve the understanding and guide the design of transistors at advanced nodes. The findings of these studies are being applied to ensure our continued industry leadership at the 28nm and 22nm nodes. One of TSMC's goals is to extend Moore's Law through innovative in-house work, as well as by collaborating with industry leaders and academia to push the envelope in finding cost-effective technologies and manufacturing solutions.

TSMC plans to continue working closely with international consortia and photolithography equipment suppliers to ensure the timely development of 193nm high-NA scanner technology, liquid immersion lithography, EUV lithography, and massively parallel E-Beam direct-write technologies. These technologies are now fundamental to our process development efforts at the 22nm and 15nm nodes and beyond.

TSMC plans to continue its collaboration with mask inspection equipment suppliers to develop viable inspection techniques. This collaborative partnership should help to ensure that we maintain our leadership position in mask quality and cycle time, and continue to meet aggressive R&D, prototyping and production requirements.

Overall, TSMC will continue to invest heavily to expand our R&D capabilities. With a highly competent and dedicated R&D team and unwavering commitment to innovation, we are confident of our ability to deliver the best and most cost-effective SoC technologies for our customers, and to support our business growth and profitability.

TSMC R&D future major project summary:

| Project Name                                                                       | Description                                                                       | Risk Production (Estimated Target Schedule) |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|---------------------------------------------|
| 28nm logic platform technology and applications                                    | 28nm technology for both digital and analog products                              | 2009-2010                                   |
| 22nm logic platform technology and applications                                    | Next-generation technology for both digital and analog products                   | 2011-2012                                   |
| 15nm logic platform technology and applications                                    | Exploratory technology for both digital and analog products                       | 2013-2014                                   |
| 3D-IC                                                                              | Low cost solution with better form factor and performance for SiP                 | 2011                                        |
| Next-generation lithography                                                        | EUV and multiple E-Beam to extend Moore's Law                                     | 2011-2012                                   |
| Long-term research                                                                 | Special SoC technology (including new NVM, MEMS, RF, analog) and 15nm transistors | 2012-2014                                   |
| The above plans account for roughly 70% of the total corporate R&D budget in 2009. |                                                                                   |                                             |

## 5.3 Manufacturing Excellence

### 5.3.1 Efficiency

#### Fast Yield Ramp

Fast yield ramp for new products is an important factor to help TSMC's customers shorten their time-to-market. TSMC has developed a comprehensive technology transfer methodology extending from R&D to production in order to shorten the yield learning curve of leading edge technologies. In 2008, the Company accelerated its 45nm ramp-up by shortening the yield learning curve by 14% in comparison with that of the previous generation, 65nm.

#### Accurate Delivery

TSMC has a proven record of providing customers with consistent on-time delivery. The Company has equipped a state-of-the-art supply chain management system in an effort try to improve customers' forecast processes, and delivery schedule accuracy. In 2008, the Company was able to make over 95 percent of deliveries within one day of the scheduled delivery date.

**Best-in-Class Cycle Time Management**

Fast manufacturing cycle time is another important factor behind TSMC's continued competitive success and that of our customers. Accordingly, TSMC has developed a sophisticated manufacturing scheduling and dispatching system, implemented industry-leading automated materials handling systems, and employed effective lean manufacturing approaches. In 2008, the Company unceasingly strived to optimize manufacturing processes and cycle time management techniques, and continued to break cycle time records.

**Flexible Manufacturing Management**

Flexible Manufacturing is a crucial element that addresses the fluctuations in demand forecast. In most cases, TSMC has the ability to meet unanticipated customer demand surges, thanks in large part to our cluster fab capability as well as to our extensive know-how in performance matching for both tools and fabs.

**Knowledge Management**

TSMC has built the industry's leading, state-of-the-art knowledge management, and Best Known Method (BKM) systems. TSMC maintains a vast repository system for retaining key TSMC knowledge. This database also features a sophisticated expert system that embeds the captured knowledge into TSMC's engineering system.

**Inventory Management**

As the semiconductor devices become more diverse, inventory management becomes more critical. TSMC has integrated supply and demand information into its inventory management system to improve the Company's responsiveness to wafer demand forecasts. The speed and accuracy of TSMC's response has been improved through real-time demand information sharing.

**5.3.2 GIGAFAB™ Fabrications**

TSMC's 12-inch fabs are a key part of its manufacturing strategy. TSMC currently operates two 12-inch GIGAFAB fabrications — Fab 12 and Fab 14. The combined capacity of the two GIGAFAB fabrications reached 457,000 12-inch wafers in the fourth quarter of 2008. Production within these two facilities supports 0.13μm, 90nm, 65nm and 40nm process technologies, and their sub-nodes. Part of the capacity is reserved for research and development work and currently supports 28nm, 22nm and beyond technology development.

These GIGAFAB fabrications are the center stones of TSMC's unceasing efforts to improve manufacturing excellence and to deliver manufacturing breakthroughs. GIGAFAB fabrications have the inherent scale advantages over smaller fabs and also enable greater flexibility to adapt to demand fluctuations, improve product quality and yields, accelerate yield learning and time to volume, shorten cycle times, and minimize costly product re-qualification.

**5.3.3 Raw Materials and Supply Chain Risk Management**

In 2008, TSMC brought together materials management, fab operations, risk management and quality system management in one project to continuously improve supply chain risk management. TSMC worked with suppliers to enhance the performance of quality, delivery, risk management, and to support Green procurement, protection of the environment and safety.

## Raw Materials Supply

| Major Materials   | Major Suppliers                                                    | Market Status                                                                                                                                                                                                            | Procurement Strategy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------|--------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Raw Wafers        | F.S.T.<br>MEMC<br>S.E.H.<br>Siltronic<br>SUMCO                     | These five suppliers together provide over 85% of the world's wafer supply.<br><br>Each supplier has multiple manufacturing sites in order to meet customer demand, including plants in North America, Asia, and Europe. | TSMC's suppliers of silicon wafers are required to pass stringent quality certification procedures.<br><br>TSMC procures wafers from multiple sources to ensure adequate supplies for volume manufacturing and to appropriately manage supply risk.<br><br>TSMC maintains competitive price and service agreements with its wafer suppliers, and when necessary enters into strategic and collaborative agreements with key suppliers.<br><br>TSMC regularly reviews the quality, delivery, cost and service performance of its wafer suppliers. The results of these reviews are incorporated into TSMC's subsequent purchasing decisions.<br><br>A periodic audit of each wafer supplier's quality assurance systems ensures that TSMC can maintain the highest quality in its own products. |
| Chemicals         | Air Products<br>ATMI<br>BASF<br>MGC<br>TYS                         | These five companies are the major suppliers for bulk and specialty chemicals.                                                                                                                                           | Most suppliers have relocated many of their operations closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics.<br><br>The suppliers' products are regularly reviewed to ensure that TSMC's specifications are met and product quality is satisfactory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Photoresist       | AZ<br>Nissan<br>Shin-Etsu Chemical<br>Sumitomo<br>T.O.K.           | These five companies are the major suppliers for photoresist.                                                                                                                                                            | TSMC works closely with its suppliers to ensure that they have adequate production lead time to supply the required products to TSMC.<br><br>TSMC conducts periodic audits of the suppliers' quality assurance systems to ensure that they meet TSMC's standards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Gases             | Air Liquide<br>Air Products<br>Linde<br>Taiyo Nippon Sanso         | These four companies are the major suppliers of specialty gases.<br><br>The products of these four suppliers are interchangeable.                                                                                        | The majority of the four suppliers are located in different geographic locations, minimizing supply risk to TSMC.<br><br>TSMC has long-term contracts with these suppliers to ensure supply stability and service quality. In addition, the availability of other domestic suppliers enables TSMC to secure better purchase terms for these gases.<br><br>TSMC conducts periodic audits of the suppliers' quality assurance systems to ensure that they meet TSMC's standards.                                                                                                                                                                                                                                                                                                                 |
| Slurry, Pad, Disk | 3M<br>Cabot<br>DA Nano<br>Kinik<br>Planar Solutions<br>Rohm & Haas | These six companies are the major suppliers for CMP materials.                                                                                                                                                           | Most suppliers have relocated many of their operations closer to TSMC's major manufacturing facilities, thereby improving procurement logistics and mitigating supply chain risk.<br><br>TSMC conducts periodic audits of the suppliers' quality assurance systems to ensure that they meet TSMC's standards.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

### 5.3.4 Quality and Reliability

TSMC is committed to providing customers with the best quality wafers for their products. Our Quality and Reliability (Q&R) services lead the partnership between customers and the entire TSMC organization to achieve "quality on demand". The goal of quality on demand is to fulfill customers' needs regarding time to market, reliable quality, and market competition over a broad range of products.

In the design stage, Q&R technical services assist customers to design-in their product reliability requirements. Q&R works with R&D to successfully establish and implement new qualification methodology for high-K/Metal Gate to ensure the robustness of advanced technology development in 2008. Q&R also works with Design Services on Embedded Memory IP development to expand TSMC's design portfolio. Q&R has deployed systems to ensure robust quality in managing production dynamics as the Company meets customers' business requirements. To sustain production quality and minimize risks to customers when deviations occur, manufacturing quality monitoring and event management span all critical stages, from raw material supply, mask making, and real-time in-process monitoring, to bumping, wafer sort and reliability

performance. Advanced failure and materials analysis techniques are also developed and effectively deployed in process development, customer new product development, and product manufacturing. In 2008, to enhance support of R&D for the 32 and 28nm technology nodes, newly developed X-ray based techniques and atomic level imaging methodologies were used to characterize new advanced materials and interfaces. To address our new emphasis in advanced packaging and assembly, a package materials laboratory was established to analyze mechanical and chemical properties of materials used in the packaging process.

TSMC Q&R is also responsible for leading the Company towards the ultimate goal of zero-defect production, using continuous improvement programs. Periodic customer feedback indicates that products shipped from TSMC have consistently met or exceeded their field quality and reliability requirements. In 2008, the effectiveness of TSMC quality management system was validated by the success of third-party audit activities, ISO/TS 16949 triennial recertification and IECQ QC080000 annual surveillance.

## 5.4 Customer Partnership

### 5.4.1 Customers

TSMC's global customers have diverse product specialties and excellent performance records in various segments of the semiconductor industry. Fabless customers include Altera Corporation, Advanced Micro Devices, Inc., Broadcom Corporation, Marvell Semiconductor Inc., NVIDIA Corporation, Qualcomm Inc. and MediaTek Inc. IDM customers include Analog Devices Inc., Freescale Semiconductor Inc., NXP Semiconductors (formerly Philips Semiconductors), and Texas Instruments Inc. In 2007 and 2008, there was only one customer from which sales accounted for more than 10% of TSMC's gross sales. For more information, please refer to the "Financial Information" on page 71 of Annual Report (II).

### Customer Service

TSMC is committed to providing the best services to our customers and believes that customer service is critical to enhancing customer loyalty. In turn, customer loyalty leads to higher levels of customer retention and to expansion of our business relationships. TSMC's goal is to maintain our position as the most advanced and largest provider of semiconductor manufacturing technologies and foundry services. TSMC believes that achieving this goal will help retain existing customers, attract new customers, and strengthen customer partnerships.

To facilitate customer interaction and information access on a real-time basis, TSMC has established a wide range of web-based services covering applications in design, engineering, and logistics collaborations. They are collectively branded as eFoundry™ lines.

### Customer Satisfaction

TSMC regularly conducts surveys and reviews to ensure that customers' needs and wants are being adequately understood and addressed. Continual improvement plans supplemented by customer feedback are an integral part of this business process.

### Market Expansion and Penetration

TSMC continues to diversify its customer base while supporting the growth of our existing customers. TSMC acquired more than 80 new customers in 2008.

### 5.4.2 Technology Platform and Design Enablement

In advanced technologies, design is becoming increasingly intertwined with manufacturing, and design solutions — from layout guidelines to design methodology — are often needed to alleviate the restrictions imposed by technology. TSMC design engineering team works closely with technology R&D for solutions that lower design barriers. In addition, TSMC and its alliance partners offer comprehensive design infrastructure to support our technology platform.

Early in 2008, the Company unveiled its Open Innovation Platform™ initiative. Hosted by TSMC, the TSMC Open Innovation Platform initiative promotes the speedy implementation of innovation amongst the semiconductor design community, its ecosystem partners and TSMC's IP, design methodology, design implementation and DFM capabilities, process technology and backend services. A key element of the Open Innovation Platform initiative is a set of ecosystem interfaces and collaborative components initiated and supported by TSMC that efficiently empowers innovation throughout the supply chain. TSMC's Active Accuracy Assurance (AAA) initiative is a key element of the Open Innovation Platform initiative, providing the accuracy and quality required by the ecosystem interfaces and collaborative components.

Another key collaborative component of the Open Innovation Platform initiative is Reference Flow 9.0. Announced in June 2008, Reference Flow 9.0 addressed new design challenges of TSMC's advanced technologies up to and including 40nm process technology, with features such as transparent half-node design, support for new low-power automation flow via Unified Power Format (UPF) in addition to Common Power Format (CPF) enabled flow, new statistical design features, and hierarchical DFM capability. The latest version of TSMC's industry-leading design methodology is aimed at lowering design obstacles, improving design margins, and increasing yields of TSMC 40nm process technology.

In 2008, the Company also extended its design support effort to mainstream technologies. In mainstream technologies, the design support on PDK, foundation libraries, and IP for derivative technologies such as BCD, HV, and Analog was strengthened. This trend will continue with the Company placing significantly more emphasis on mainstream technology business.

## 5.5 Employees

### 5.5.1 Human Capital

Human capital is one of the most important assets of TSMC. The Company is committed to create a corporate culture that embraces innovation and diversity. Believing that an inspiring work environment promotes innovation, TSMC strives to provide employees with a work environment that is challenging, enjoyable and rewarding. In 2008, TSMC was named the "Most Admired Company in Taiwan" by *Commonwealth Magazine* for the 12<sup>th</sup> consecutive year.

At the end of 2008, TSMC had 22,843 employees worldwide, among whom 2,618 were managers and 8,830 were professionals. Female managers comprised 11.2% of all managers and non-Taiwanese nationals comprised 11.6% of all TSMC managers and professionals. At the end of February 2009, TSMC's total workforce, managers and professionals were 21,973, 2,576 and 8,493 respectively. The following tables summarize TSMC's workforce structure:

### TSMC Workforce Structure

|                                  |            | 12/31/2007 | 12/31/2008 | 02/28/2009 |
|----------------------------------|------------|------------|------------|------------|
| Managers                         |            | 2,520      | 2,618      | 2,576      |
| Professionals                    |            | 8,814      | 8,830      | 8,493      |
| Assistant Engineer/Clerical      |            | 844        | 824        | 794        |
| Technician                       |            | 10,842     | 10,571     | 10,110     |
| Gender                           | Male (%)   | 47.9%      | 48.6%      | 48.7%      |
|                                  | Female (%) | 52.1%      | 51.4%      | 51.3%      |
| Average Age (years)              |            | 32.1       | 32.7       | 32.9       |
| Average Years of Service (years) |            | 5.8        | 6.5        | 6.7        |
| Total                            |            | 23,020     | 22,843     | 21,973     |

### TSMC Workforce Structure by Level of Education

|                        | 12/31/2007 | 12/31/2008 | 02/28/2009 |
|------------------------|------------|------------|------------|
| Ph.D.                  | 2.9%       | 3.1%       | 3.1%       |
| Master's               | 29.7%      | 30.6%      | 30.9%      |
| Bachelor's             | 19.9%      | 20.2%      | 20.2%      |
| Other Higher Education | 18.9%      | 18.2%      | 18.2%      |
| High School            | 28.6%      | 27.9%      | 27.6%      |

### 5.5.2 Recruitment

Attracting new employees and retaining and motivating the existing employees are key to the success of TSMC's human resources strategy. TSMC believes in equal opportunity employment. Recruitment is conducted via an open selection process and is based on the candidate's ability to fulfill the needs of each position, regardless of race, gender, age, religion, nationality, or political affiliation. In order to seek out the best talents around the world, TSMC employs a number of recruiting programs, including academic/corporate collaboration programs, Joint Development Program in Campus, summer internships, job fairs, and Technology Talents Career Symposium. During 2008, TSMC recruited 63 managers, 1,110 professionals and 458 technicians.

### 5.5.3 People Development

Continuous learning is the cornerstone of TSMC's employee development strategy. A tailor-made individual development plan is established for each employee appropriate to the employee's development needs. Employees are provided with a comprehensive network of resources, including on-the-job training, coaching, mentoring, job rotation, on-site courses, e-learning, and external learning opportunities.

TSMC provides employees with a wide range of on-site general, professional and management training programs. In addition to external experts engaged as trainers, hundreds of internal trainers are trained as instructors for training courses. During 2008, TSMC conducted 726 internal training sessions totaling 522,352 training hours in Taiwan. A total of 235,480 attendees participated in those trainings. The total training expenses were NT\$43,469,699. TSMC's training programs include:

- **Management Training:** Management training includes management development training programs tailored to the needs of managers at all levels. Management training programs include New Manager Program, Experienced Manager Program, and Senior Manager Program, as well as other elective courses.
- **General Training:** General training refers to training required by government regulations and company policies. Such training includes industry-specific safety, workplace health and safety, quality, fab emergency response team, languages, and personal effectiveness training.
- **Professional/Functional Training:** Professional/functional training provides technical and professional training required by various functions within the Company, offering training courses on equipment engineering, process engineering, accounting, and information technology, among others.
- **Direct Labor (DL) Training:** DL training enables production line employees to acquire the knowledge, skills and attitudes they need to perform their job well. It also helps employees pass required tests in order to be certified for operating equipments. DL training includes DL Skill Training, Technician "Train-the-Trainer" Training, and Manufacturing Leader Training.
- **New Employee Training:** New Employee training includes new employee orientation and pre-job training. The training consists of new employee basic training and job orientation.

TSMC has established "Procedure of Employee Training and Education", which not only enables the on-site training courses but also best suits company and individual development objectives through external training courses. Under the guideline, employees are encouraged to participate in various training programs and the subsidies are provided when taking short courses, credit courses, and degrees.

### 5.5.4 Employee Satisfaction

TSMC has continuously promoted programs devoted to employee benefits, employee care, employee rewards, and employee communication. TSMC works hard to provide a work environment that is challenging yet enjoyable.

#### Employee Benefits Programs

- TSMC Employee Welfare Committee plans and implements various welfare programs, including hobby clubs, art and cultural seminars, employee outings, TSMC Sports Day, and TSMC Family Day. In addition, TSMC provides holiday bonuses, wedding bonuses, funeral and emergency subsidies.
- To ensure that employees have all the conveniences they need while at work, TSMC provides on-site cafeteria, dry-cleaning, travel, banking, haircut services, housing, and commuting assistances.
- Health improvement programs and psychological consultation services are provided to employees to ensure the physical and psychological well being of all employees.
- In order to promote healthy living, TSMC Sports Center was established. It is open to all employees and their family members and provides a variety of workout facilities. TSMC provides Children Centers at Hsinchu and Tainan sites to meet employees' needs for childcare.

#### Employee Rewards

- Innovation and customer partnership are key elements of TSMC's core values. TSMC annual innovation awards and customer partnership awards were established to recognize and reward employees who contribute to TSMC in all aspects of success.

- In addition to the TSMC annual innovation awards and customer partnership awards, there are a number of other award programs to recognize employees' achievements, including the Outstanding Engineer Award for each fab and the Total Quality Excellence Conference Award. In 2008, TSMC employees were recognized nationally, including: the National Model Worker Award; the Top 10 National Outstanding Managers Award; the Outstanding Engineer Award; and the Outstanding Young Engineer Award.

### Employee Communication

TSMC is committed to keeping an open communication channel with its employees. Regular communication meetings are held for the various levels of managers and employees. Periodic employee satisfaction surveys are conducted. *eSilicon Garden*, a quarterly electronic TSMC internal publication, is issued covering things from work to fun. These all help maintain the free flow of information between TSMC and its employees.

In order to ensure that employees' opinions and voices can be heard, well responded, and resolved, impartial and smooth voice submission mechanisms have been established:

- Whistleblower channels for complaints related to major management, financial and auditing issues directed to:
  - 1) Independent Audit Committee Chairman
  - 2) "Ombudsman", headed by a vice president
- Suggestion Box managed by the Employee Relations department for employees to express their opinions regarding their work and the working environment in general.
- HR Call Center and employee care teams in each fab to deal with issues related to employees' work and personal life.

TSMC is committed to establishing and promoting policies and measures for ensuring gender equality in accordance with employment laws and sexual harassment prevention policies to create a fair working environment for employees of both sexes.

As a result of TSMC's annual (2008) human resources performance management and development appraisal, certain employees were terminated in accordance with applicable internal corporate policies and Taiwan law. But, some terminated ex-employees filed labor complaints with the Science Park Administration seeking mediation. The disputes are currently being mediated by the relevant parties. TSMC hopes to resolve these matters amicably and anticipates that

any monetary awards arising from settlement of such mediation would not have any material impact on TSMC's financial results and commercial operations. As of the date of this Annual Report, this matter is still ongoing and therefore it is not possible to estimate an exact monetary loss.

### 5.5.5 Retention

From employee's initial adjustment to professional and career development, TSMC works hard to retain outstanding employees through creating an innovative, challenging, and developmental environment. We are committed to:

- Setting up retention and counseling plans for different groups. For example, TSMC employs a "Buddy System" to help new employees to fit in quickly through assistance provided by senior employees.
- Enabling employees to enhance professional knowledge and to pursue further career development through numerous employee development programs.
- Establishing a synergized welfare services platform to all employees, and enhancing employees' loyalty and commitment through employee engagement programs such as employee activities, on-site recreational facilities and amenities and cooperate events. Aims to provide employees a work-life balance environment.

### 5.5.6 Compensation

TSMC's compensation program includes cash compensation and profit sharing. Cash compensation includes a monthly salary and a variable quarterly incentive bonus. The employee is entitled to a profit sharing of no less than one percent of TSMC's net income after deducting the losses of previous years and contributions to legal and special reserves. The purpose of this profit-sharing bonus is to reward employees' contributions appropriately, to encourage employees to work consistently to ensure the success of TSMC, and to link employees' interests with those of TSMC's shareholders. The amount and form of the distribution are determined by the Board of Directors based on the Compensation Committee's recommendation and are subject to shareholders' approval at the Annual General Meeting. The Company determines the amount of the profit-sharing bonus based on operating results and industry practice in the Republic of China. Individual awards are based on each employee's job responsibility, contribution and performance.

In addition to providing employees of TSMC's overseas subsidiaries with a locally competitive base salary, the Company grants short-term and long-term bonuses as a part of total compensation. The performance bonus is a short-term incentive and is granted in line with local regulations, market practices, and the overall operating performance of each subsidiary. The long-term incentive bonus is awarded based on TSMC's financial performance and is vested over the course of several years in order to encourage long-term employee commitment and development within the Company.

### 5.5.7 Retirement Policy

TSMC's retirement policy is in accordance with the provisions in the Labor Standards Law and Labor Pension Act of the Republic of China.

### 5.5.8 Ethics and Business Conduct

TSMC's corporate image and professional reputation are among the Company's most important intangible assets. Honorable, honest and legitimate business practices are one of the cornerstones of TSMC's long-term success. TSMC has established an Ethics Code (the "Code") to assist its employees in understanding the meaning of honorable and honest business practices, and to provide employees with guidelines to follow and implement.

This Code covers the behavioral norms for all employees in their dealings with each other as well as with the Company, customers, suppliers, investors and the general public. In case of violations of the Code, the individual faces appropriate disciplinary action.

This Code and the relevant procedures and rules apply not only to all Employees (including managerial personnel) but also to all non-employee directors of TSMC.

## 5.6 Material Contracts

### Technology Cooperation Agreement

**Term of Agreement:**

2004 - 2008

**Contracting Party:**

Koninklijke Philips Electronics N.V. (Philips)

(In September 2006, Philips assigned its rights and obligations under this agreement to Philips Semiconductors International B.V., which has now been renamed NXP B.V.)

**Summary:**

The parties cross license certain semiconductor patents under the agreement, and TSMC is obligated to pay Philips (now NXP B.V.) a fixed amount of license fees for patent license coverage obtained for TSMC's benefit.

### Shareholders Agreement

**Term of Agreement:**

Effective as of 03/30/1999 and may be terminated as provided in the agreement

**Contracting Parties:**

Koninklijke Philips Electronics N.V. (Philips) and EDB Investments Pte Ltd. (EDBI)

(In September 2006, Philips assigned its rights and obligations under this agreement to Philips Semiconductors International B.V. which has now been renamed NXP B.V. In November 2006, NXP B.V. and TSMC purchased all SSMC shares owned by EDBI; EDBI is no longer a contracting party to this agreement.)

**Summary:**

TSMC, Philips and EDBI had formed a Singapore joint venture "Systems on Silicon Manufacturing Company Pte Ltd." (SSMC) for providing IC foundry services. Philips Semiconductor (now NXP B.V.) and TSMC are committed to purchasing a certain percentage of SSMC's capacity.

### Technology Cooperation Agreement

**Term of Agreement:**

03/30/1999 - 03/29/2009

**Contracting Party:**

Systems on Silicon Manufacturing Company Pte Ltd. (SSMC)

**Summary:**

TSMC agreed to transfer certain process technologies to SSMC, and SSMC agreed to pay TSMC a certain percentage of the net selling price of SSMC products.

### **Patent License Agreement**

**Term of Agreement:**

12/20/2007 - 12/31/2017

**Contracting Party:**

A multinational company

**Summary:**

The parties entered into a cross licensing arrangement for certain semiconductor patents. TSMC pays license fees to the contracting company.

### **Manufacturing, License, and Technology Transfer Agreement**

**Term of Agreement:**

04/01/2004 - 03/31/2006, automatically renewable for successive one-year terms until and unless both parties decide otherwise by mutual consent in writing.

**Contracting Party:**

Vanguard International Semiconductor Corporation (VIS)

**Summary:**

VIS reserves certain capacity to manufacture TSMC products on mutually agreed terms. TSMC may also transfer certain technologies to VIS, for which it will in return receive royalties from VIS.

### **Patent License Agreement**

**Term of Agreement:**

11/01/2002 - 10/31/2012

**Contracting Party:**

A multinational company

**Summary:**

The parties entered into a cross licensing arrangement for certain semiconductor patents. TSMC pays license fees to the contracting party.

### **Patent License Agreement**

**Term of Agreement:**

07/01/2002 - 06/30/2009

**Contracting Party:**

A multinational company

**Summary:**

The parties entered into a cross licensing arrangement for certain semiconductor patents. TSMC pays license fees to the contracting party.

### **Patent License Agreement**

**Term of Agreement:**

01/01/2001 - 12/31/2011

**Contracting Party:**

A multinational company

**Summary:**

The parties entered into a cross licensing arrangement for certain semiconductor patents. TSMC pays license fees to the contracting party.

### **Settlement Agreement**

**Term of Agreement:**

01/30/2005 - 12/31/2010

**Contracting Parties:**

Semiconductor Manufacturing International Corp. (SMIC) and certain of its subsidiaries

**Summary:**

The parties settled their patent infringement and trade secret misappropriation disputes, whereby SMIC agrees to pay TSMC US\$175 million over six years.

### **Research and Development Collaboration Agreement**

**Term of Agreement:**

01/01/2007 - 12/31/2010

**Contracting Party:**

NXP B.V.

**Summary:**

The parties entered into research and development collaboration to develop advanced semiconductor technologies.

### **Asset Sale and Purchase Agreement**

**Effective Date of Agreement:**

10/08/2007

**Contracting Party:**

Atmel North Tyneside Limited, Atmel Corporation

**Summary:**

The parties entered into an asset sale and purchase agreement, whereby TSMC purchases Atmel North Tynesides' semiconductor production equipment and tools for US\$82 million. TSMC has performed its obligations pursuant to this agreement.

Note: TSMC is not currently party to any other material contract, other than contracts entered into in the ordinary course of our business. The Company's "Significant Commitments and Contingencies" are disclosed in the "Financial Information" of Annual Report (II), page 69-70.