5. Operational Highlights

5.1 Business Activities

5.1.1 Business Scope

As the founder and leader of the dedicated semiconductor foundry segment, TSMC provides a full range of integrated semiconductor foundry services, including the most advanced process technologies, leading specialty technologies, the most comprehensive design ecosystem support, excellent manufacturing productivity and product quality, advanced mask and packaging services, and so on, to fulfill an increasing variety of customer needs. The Company strives to provide the best overall value to its customers and TSMC believes its customers' success is TSMC's success. As a result, TSMC has won customer trust from around the world and has experienced strong growth and success.

In May 2009, TSMC established the New Businesses organization to explore non-foundry related business opportunities. In 2011, the New Businesses organization was formally separated from the main TSMC organization as two wholly owned subsidiaries, TSMC Solid State Lighting Ltd. (TSMC SSL) and TSMC Solar Ltd., responsible for solid state lighting and solar business activities, respectively. In January 2015, TSMC's board of directors approved the sale of TSMC Solid State Lighting to Epistar. Upon the closing of the sale, TSMC completely exited the LED industry. In August 2015, TSMC announced that TSMC Solar would cease manufacturing operations by end of that month, as we believed that our solar business was no longer economically sustainable. All outstanding warranties to existing customers will be honored.

5.1.2 Customer Applications

TSMC manufactured 8,941 different products for 470 different customers in 2015. These chips were 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 customers to use 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 Consolidated Shipments and Net Revenue in 2015 and 2014

Unit: Shipments (thousand 12-inch equivalent wafers) / Net Revenue (NT$ thousands)

		2015		2014	
		Shipments	Net Revenue	Shipments	Net Revenue
Wafer	Domestic (Note 1)	1,588	100,189,156	1,738	112,726,728
	Export	7,175	702,748,813	6,525	611,020,808
Others (Note 2)	Domestic (Note 1)	N/A	5,535,154	N/A	5,766,553
	Export	N/A	35,024,245	N/A	33,292,376
Total	Domestic (Note 1)	1,588	105,724,310	1,738	118,493,281
	Export	7,175	737,773,058	6,525	644,313,184

Note 1: Domestic means sales to Taiwan.
Note 2: Others majorly include revenue associated with mask making, design services, and royalties.

5.1.4 Production in 2015 and 2014

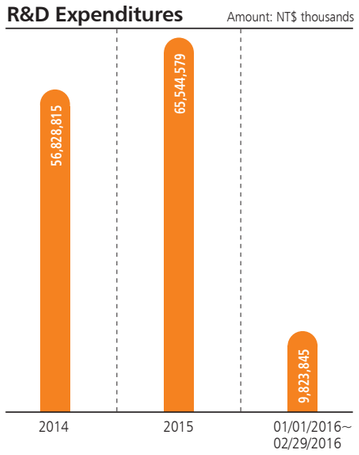
Unit: Capacity / Output (million 12-inch equivalent wafers) / Amount (NT$ millions)

Wafers			
Year	Capacity	Output	Amount
2015	9-10	8-9	378,871
2014	8-9	8-9	426,707

5.2 Technology Leadership

5.2.1 R&D Organization and Investment

In 2015, TSMC continued to invest in research and development, with total R&D expenditure amounting to 8% of revenue, a level that equals or exceeds the R&D investment of many other high-tech leaders.



TSMC recognizes that the technology challenge of continuing to extend Moore's Law, the doubling of semiconductor computing power every two years, is becoming increasingly complex. The efforts of the R&D organization are focused on enabling the Company to continuously offer its customers first-to-market, leading-edge technologies and design solutions that contribute to their product success in today's challenging market environment. In 2015 the R&D organization met these challenges by completing transfer to manufacturing of the industry leading 16FF+ technology, the first integrated technology platform to make use of 3D FinFET transistors. The R&D organization continues to fuel the pipeline of technological innovation needed to maintain leadership. TSMC's 10nm technology development is on track to meet the goal of production start-up in 2016. TSMC 7nm technology is now in the full development stage, while the 5nm node is under definition and subject to intensive early development efforts.

In addition to CMOS logic, TSMC conducts R&D on a wide range of other semiconductor technologies that provide the functionality customers require for mobile SoC and other applications. Highlights achieved in 2015 include: Chip-On-Wafer-On-Substrate (CoWoS®) technology enhancement to include areas exceeding 1000mm^2 in size; full qualification of 3D InFO technology qualification and transfer to manufacturing; Through-Silicon Via (TSV) packaging ramp-up to high volume; development of 0.13μm Bipolar-CMOS-DMOS (BCD) technology for manufacture on 12-inch wafers; the addition of RF capability for 55nm e-Flash technology aimed at IoT applications; qualification for manufacture of a 650V GaN High-Electron-Mobility Transistor (HEMT); and qualification of the 55nm high-voltage process for display drivers

TSMC maintains a network of important external R&D partnerships and alliances with world-class research institutions, such as IMEC, the well-respected European R&D consortium, where TSMC is a core partner. TSMC also provides funding for nanotechnology research at leading universities worldwide to promote innovation and the advancement of nano-electronic technology. TSMC has established four joint research centers within Taiwan to include National Taiwan University, National Chao Tung University, National Tsing Hua University, and National Cheng Kung University. The goal of these centers is to develop greater understanding of the devices and materials used in the manufacture of advanced Si technologies.

5.2.2 R&D Accomplishments in 2015

Highlights

• 10nm Technology

10nm technology will offer substantial power reduction for the same chip performance compared to earlier technology generations. Development activities in 2015 focused on manufacturing baseline process setup, design rule fix, yield learning, transistor performance improvement, and process/product reliability evaluation. Key customers and IP vendors have verified their IP with 10nm technology. 10nm technology began customer product tape-out in the first quarter of 2016.

• 7nm Technology

7nm technology offers substantial density improvement and power reduction with the same chip performance as 10nm technology. Development activities in 2015 focused on manufacturing baseline process setup, yield learning, transistor and interconnect R/C performance improvement and reliability evaluation. TSMC plans to continue 7nm full development in 2016 for risk production in 2017.

• Lithography

The main focus for RD lithography in 2015 is 10nm and 7nm development. For 10nm development, the primarily focus is on continuous improvement of overlay control and patterning robustness in preparation for 10nm qualification. As for the 7nm development, new resist material and advanced mask technology were optimized to provide additional patterning enhancement and design rule shrinkage with immersion process. Furthermore, TSMC will take the delivery of newest generation of immersion scanner to meet the tighten overlay control and imaging requirement for 7nm and beyond.

In 2015, the EUV program has made significant improvement in laser power and its stability. The stability and improvement in source power has enabled faster learning rate and process development for advanced nodes. In addition, EUV resist process, pellicle, and related mask blank have all made significant progress. The EUV technology is stepping closer to full scale RD and manufacturing readiness for advanced nodes.

• Mask Technology

Mask technology is an integral part of our advanced lithography. In 2015, R&D successfully completed the development of mask technology for the 10nm node. This technology is being transferred to the mask production organization. During the same period, solid progress was made on the development of mask technology for EUV lithography, including the reduction of native defects on mask blanks and the fabrication of EUV masks for lithographic processing of sub-10nm nodes.

Integrated Interconnect and Packaging

• 3D IC

In 2015, TSMC successfully qualified InFO PoP advanced packaging technology, with a non-TSV, low-cost solution for mobile customers. High Volume Manufacturing (HVM) production ramp is expected in 2016. The CoWoS® technology continues to expand its application from Field-Programmable Gate Array (FPGA) to network and to high-performance computing; the interposer size also expands to larger than reticle dimension by CoWoS-XL technology.

• Advanced Package Development

TSMC offers a wide variety of lead-free packaging solutions for mobile/handheld devices. In 2015, 10nm FinFET Si with ultra-fine pitch copper bump Bump-on-Trace (BoT) packaging was under development. It is expected to complete the package qualification in the second quarter of 2016. In 2015, a low-cost, innovative and highly reliable 2-mask UBM-Free Integration (UFI) fan-in WLCSP technology is in mass production for die size 5x5mm^2, and passed qualification for larger die sizes up to 7x7mm^2.

• Advanced Interconnect

Development of low-resistance Cu and low-capacitance dielectric continued to be the primary focus in 2015. At the 7nm node, a new patterning process and a novel dielectric scheme have been developed to shrink line width/space and reduce the capacitance between copper lines. A low damage low-k was delivered to reduce capacitance impact. For the 5nm node and beyond, TSMC developed a design-friendly advanced line patterning scheme and processes that allow copper line width and spacing to be further reduced. A new multi-via patterning process was employed to further improve CD uniformity. A low-resistivity metal scheme with ultra-thin barrier was demonstrated with excellent reliability performance.

Advanced Transistor Research
Innovation in transistor architectures and materials has enabled increased speed and reduction of power consumption in advanced logic technologies. TSMC is at the fore-front of transistor research with a focus on devices with high mobility channel materials, such as germanium and III-V compound semiconductors. The Company's track record in both p- and n- channel germanium transistors, including record-breaking device performance, was highlighted at the 2015 International Electron Device Meeting (IEDM).

Specialty Technologies
TSMC offers a broad mix of technologies to address a wide range of applications:

• Mixed Signal/Radio Frequency (MS/RF) Technology
In 2015, TSMC developed a 10nm silicon and EM simulation-based LC-tank design solution to facilitate high-speed SerDes circuit design with various options of metal scheme and layout specifications to shorten design turnaround time. TSMC also offered the IPD-II solution for high-Q (Q>30 @700MHz) inductor and high-precision thin-film resistor for 4G LTE application. In order to achieve better performance in insertion loss and isolation, TSMC further reduced the key parameter Ron-Coff to ~130 fs in 0.18μm SOI process to enable cellar/Wi-Fi RF switch applications as lower-cost alternatives replacing traditional compound semiconductor-based solutions.

• Power IC/BCD Technology
The third generation of 0.18μm BCD technology adopted TSMC proprietary device structure, which increased world-leading performance with an even lower cost. With this technology, mobile power management ICs can meet the increasing power demand of mobile devices with higher-power efficiency.

• Panel Drivers
40nm high-voltage low-power process technology was readied for production with plans to complete qualification by the first quarter of 2016. This technology supports Super Retina display driver IC and touch-display driver integration IC for high-end mobile phones. This process was made available for customer tape-outs also in the first quarter of 2016.

• Micro-electromechanical Systems (MEMS) Technology
In 2015, TSMC's modular MEMS technology was qualified for mass production of accelerometers and a pilot run of high-resolution pressure sensors. Future plans include development of next-generation high-sensitivity thin microphone, MEMS Si-pillar TSV technology, and BioMEMS applications.

• GaN Technology
TSMC is the first and only company to offer both 100V and 650V GaN foundry service in a 6-inch fab. In 2015, the R&D team completed 650V E-HEMT development and qualified for manufacture a high electron mobility transistor configuration for high-power, high-frequency applications with low Ron (resistance when on) and high-breakdown voltage.

• Flash/Embedded Flash Technology
TSMC achieved several important milestones in embedded flash technologies in 2015. At the more mature 65nm/55nm node, NOR-based cell technologies, including 1-T cell and Split-Gate cell, were successfully put in production. At the 40nm node, split-gate cell technology completed qualification for consumer electronics applications such as IoT and smartcards and is now undergoing customer product qualification. Embedded flash development on the 28nm low-power and 28nm high-performance mobile computing platforms is underway for low-leakage applications in areas such as automobile electronics and micro controller units (MCU).

5.2.3 Technology Platform

TSMC provides customers with advanced technology platforms that include the comprehensive design infrastructure required to optimize design productivity and cycle time. These include: design flows for electronic design automation (EDA); silicon-proven IP building blocks, such as libraries; and simulation and verification design kits, i.e., process design kits (PDK) and technology files.

The availability of 10FF saw improvements in design infrastructure using an advanced CPU core as the vehicle to support customers' adoption of 10nm FinFET (EDA tool certification results can be found on TSMC-Online.). TSMC also extended its IP quality program (TSMC9000) to allow IP audits to be performed either at TSMC or at TSMC-certified laboratories. To help customers plan new product tape-outs incorporating IP/Library from TSMC Open Innovation Platform® (OIP) ecosystem, the OIP ecosystem added a portal to connect customers to an ecosystem of 43 solution providers.

5.2.4 Design Enablement

TSMC's technology platforms provide a solid foundation for design enablement. Customers can design directly using the Company's internally developed IP and tools or using those that are available via our OIP partners.

Tech Files and PDKs
TSMC provides a broad range of process design kits (PDKs) for digital logic, mixed-signal, radio frequency (RF), high-voltage driver, CMOS Image Sensor (CIS) and embedded flash technologies across a range of technology nodes from 0.5μm to 10nm. In addition, the Company provides technology files for DRC, LVS, RC extraction, automatic place and route, and a layout editor to ensure process technology information is accurately represented in EDA tools. By 2015, TSMC had provided more than 7,500 technology files and more than 200 PDKs via TSMC-Online. There are more than 100,000 customer downloads of these files every year.

Library and IP
TSMC and its alliance partners offer our customers a rich portfolio of reusable IP, which are essential building blocks for many circuit designs. In 2015, over 60% of new tape-outs at TSMC adopted one or more libraries or IP from TSMC and/or our IP partners, as the Company expanded its library and silicon IP portfolio to contain more than 10,000 items, an 18% increase over 2014.

Design Methodology and Flow
In 2015, TSMC addressed critical design challenges associated with the new 10nm FinFET technology for digital and SoC applications by announcing the readiness of reference flows through OIP collaboration that feature FinFET-specific design solutions and methodologies for performance, power and area optimization.

5.2.5 Intellectual Property

A strong portfolio of intellectual property rights strengthens TSMC's technology leadership and protects our advanced and leading edge technologies. In 2015, TSMC received a record breaking 1,768 U.S. patents, as well as 779 issued patents in Taiwan and the PRC, and other patents issued in various other countries. In 2015, TSMC ranked #23 in the "Top 50" U.S. patent grants. TSMC's patent portfolio now reaches almost 30,000 patents worldwide (including patent applications in queue). We continue to implement a unified strategic plan for TSMC's intellectual capital management. Strategic considerations and close alignment with the business objectives drive the timely 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, operations, business objectives, 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 costs of maintaining it. We plan to continue investing in our intellectual property portfolio and intellectual property management system to ensure that we protect our technology leadership and receive maximum business value from our intellectual property rights.

5.2.6 TSMC University Collaboration Programs

In recent years, TSMC has significantly expanded its interaction with universities in Taiwan with the establishment of four research centers located at the nation's most prestigious universities. The mission of these centers is twofold: to increase the number of highly qualified students suitable for employment in semiconductor industry, and to inspire university professors to initiate research programs that focus on the frontiers of semiconductor science, including device, process and materials technology, semiconductor manufacturing and engineering science, and specialty technologies for electronic applications. TSMC continues to expand and enhance the research portfolio at the four research centers at National Taiwan University, National Chiao Tung University, National Cheng Kung University and National Tsing Hua University. In 2015, several hundred more high-caliber students joined the research centers with backgrounds representing the disciplines of electronics, physics, materials engineering, chemistry, chemical engineering and mechanical engineering.

In addition, TSMC also conducts strategic research projects at top overseas universities, such as Stanford, MIT, UC Berkeley, etc. The focus is on disruptive capabilities in transistors, interconnect, patterning, modeling and special technologies.

TSMC University Shuttle Program
The TSMC University Shuttle Program was established to provide professors at leading research universities worldwide with access to the advanced silicon process technologies needed to research and develop innovative circuit design concepts. This program links motivated professors and graduate students to enthusiastic managers at TSMC with the goals of promoting excellence in the development of advanced silicon design technologies and nurturing new generations of engineering talent in the semiconductor field.

The program provides access to TSMC silicon process technologies for digital, analog/mixed-signal circuits, RF designs and micro-electromechanical system designs. Participants in the TSMC University Shuttle Program include major university research groups worldwide. TSMC and the University Shuttle Program participants achieve "win-win" collaboration through the program, which allows graduate students to implement exciting designs and achieve silicon proof points for innovations in various end-applications.

5.2.7 Future R&D Plans

To maintain and strengthen TSMC's technology leadership, the Company plans to continue investing heavily in R&D. In addition to 10nm and 7nm CMOS nodes in the pipeline, the Company's reinforced exploratory R&D work is on track to establish a solid foundation to feed into technology platforms beyond the 7nm node. The Company's exploratory work focuses on new transistors and technologies, such as 3D structures, strained-layer CMOS, high-mobility materials and novel 3D IC devices. These studies emphasize innovation and are guided by deep understanding of fundamental physics of nanometer CMOS transistors and related technologies. The Company also continues to collaborate with external research bodies from academia and industry consortia alike with the goal of extending Moore's Law and paving the road to future cost-effective technologies and manufacturing solutions for its customers.

With a highly competent and dedicated R&D team and its unwavering commitment to innovation, TSMC is confident in its ability to deliver the best and most cost-effective SoC technologies to its customers and to drive future business growth and profitability for years to come.

Summary of TSMC's Major Future R&D Projects

Project Name	Description	Risk Production (Estimated Target Schedule)
10nm logic platform technology and applications	3rd generation FinFET CMOS platform technology for SoC	2016
7nm logic platform technology and applications	4th generation FinFET CMOS platform technology for SoC	2017
3D IC	Cost-effective solution with better form factor and performance for SiP	2016 ~ 2017
Next-generation lithography	EUV and multiple e-beam to extend Moore's Law	2016 ~ 2019
Long-term research	Specialty SoC technology (including new NVM, MEMS, RF, analog) and transistors for 5nm node and beyond	2015 ~ 2019

The projects above accounted for roughly 70% of the total R&D budget in 2016, estimated to be around 8% of 2016 revenue.

5.3 Manufacturing Excellence

5.3.1 GIGAFAB® Facilities

Maintaining dependable capacity is a key part of TSMC's manufacturing strategy. The Company currently operates three 12-inch GIGAFAB® facilities – Fab 12, Fab 14, and Fab 15. The combined capacity of the three facilities exceeded six million 12-inch wafers in 2015. Production within these three facilities supports 0.13μm, 90nm, 65nm, 40nm, 28nm, 20nm, and 16nm process technologies, including each technology's sub-nodes. An additional portion of the capacity is reserved for R&D work on leading-edge manufacturing technologies, which currently supports the technology development of the 10nm node and beyond.

TSMC has developed a centralized fab manufacturing management system (Super Manufacturing Platform, SMP) to provide customers with greater benefits in the form of more consistent quality and reliability, improved flexibility to cope with demand fluctuations, faster yield learning and time-to-volume, and lower-cost product requalification.

5.3.2 Engineering Performance Optimization

As a professional semiconductor manufacturing and service company with a diversified product portfolio, TSMC's unique manufacturing system is tailored to achieve production of high complexity with precise control and optimized efficiency. To achieve overall optimization of equipment, process and yield, TSMC has introduced engineering big data analysis and machine learning techniques and has applied statistical process control, advanced equipment control, advanced process control and circuit probing. To satisfy advanced and accurate process control and ensure stable production of high efficiency and effectiveness, the Company employs systems of engineering big data mining and analysis, intelligent tool tuning, and equipment chamber matching. Engineering analysis platform for decision making, integrated with intelligent operating systems to achieve self-diagnosis and self-reactive actions, has produced remarkable results in yield enhancement, workflow improvement, fault detection, cost reduction and R&D cycle decrement.

TSMC has further analyzed the correlation between physical measurement, Wafer Acceptance Test (WAT), defect test, Certificate of Assurance (CoA), circuit probe and production-related parameters, aiming to identify critical variables influencing product quality to optimize yield management and fulfill customers' special process requirements as well as diversified product demand simultaneously.

5.3.3 Lean and Intelligent Operations

TSMC continues to drive manufacturing excellence through lean and intelligent operations. The Company has developed a lean work in process (WIP) line management system to control WIP levels precisely and equip a flexible demand/capacity modeling system to agilely support customers' urgent demands and provide customers with accurate on-time delivery and best-in-class cycle time.

To continuously improve fab operating efficiency, TSMC has introduced Internet of Things (IoT) and intelligent mobile devices. The new applications help to improve data collecting, yield traceability, material transportation and workflow efficiency, especially at mature fabs.

Following its commitment to manufacturing excellence, TSMC has integrated the technology of advanced data analysis, smart diagnostic, self-reactive engine and operation knowledge to revolutionize the fab operation mode from "Auto" to "Intelligent," optimizing operating efficiency and quality, maximizing cost effectiveness and accelerating overall innovation.

5.3.4 Raw Materials and Supply Chain Risk Management

In 2015, TSMC continued to hold review meetings periodically with teams from operations, quality control and business to proactively identify and manage the risks of insufficient supply capacity, quality issues and supply chain interruption. TSMC also worked with its suppliers to enhance performance, quality, delivery and sustainability, as well as to support green procurement, environmental protection and safety.

Raw Materials Supply

Major Materials	Major Suppliers	Market Status	Procurement Strategy
Raw Wafers	F.S.T. S.E.H. Siltronic SUMCO SunEdison	These five suppliers together provide over 90% of the world's raw wafer supply. 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. •TSMC procures wafers from multiple sources to ensure adequate supplies for volume manufacturing and to appropriately manage supply risk. •Raw wafer quality enhancement programs are in place to meet TSMC's technology advancement. •TSMC regularly reviews the quality, delivery, cost, sustainability and service performance of its wafer suppliers. The results of these reviews are incorporated into TSMC's subsequent purchasing decisions. •A periodic audit of each wafer supplier's quality assurance system ensures that TSMC can maintain the highest quality in its own products.
Chemicals	Air Products Ampoe Avantor BASF Entegris Hong-Kuang Kanto PPC SAFC Wah Lee	These nine companies are the major worldwide suppliers of chemicals.	•Most suppliers have relocated some of their operations closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics. •Each supplier's products are regularly reviewed to ensure that TSMC's specifications are met and product quality is satisfactory.
Lithographic Materials	Dow JSR Merck Nissan Shin-Etsu Chemical Sumitomo T.O.K.	These seven companies are the major worldwide suppliers of lithographic materials.	•TSMC works closely with its suppliers to develop materials that meet all application and cost requirements. •TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. •Some major suppliers have relocated or plan to duplicate their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.
Gases	Air Liquide Air Products Entegris Linde LienHwa OCI Materials Taiyo Nippon Sanso	These six companies are the major worldwide suppliers of specialty gases.	•The majority of the six suppliers are located in different geographic locations, which minimizes supply risk for TSMC. •TSMC conducts periodic audits to ensure that they meet TSMC's standards.
Slurry, Pad, Disk	3M Air Products Asahi Glass Cabot Microelectronics Dow Chemical Fujifilm Planar Solutions Fujimi Kinik Sumitomo	These nine companies are the major worldwide suppliers of CMP (Chemical Mechanical Polishing) materials.	•TSMC works closely with its suppliers to develop materials that meet all application and cost requirements. •TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. •Most suppliers have relocated or duplicated their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.

Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement

Unit: NT$ thousands

Supplier	2015			2014		
	Procurement Amount	As % of 2015 Total Net Procurement	Relation to TSMC	Procurement Amount	As % of 2014 Total Net Procurement	Relation to TSMC
Company A	7,981,126	15%	None	8,496,410	17%	None
VIS	7,148,777	13%	Investee accounted for using equity method	7,424,566	14%	Investee accounted for using equity method
Company B	6,452,073	12%	None	6,147,991	12%	None
Company C	5,457,120	10%	None	4,598,275	9%	None
Company D	4,336,724	8%	None	5,471,062	11%	None
Others	22,323,841	42%		18,889,285	37%	
Total Net Procurement	53,699,661	100%		51,027,589	100%	

5.3.5 Quality and Reliability

TSMC's strong industry reputation stems from its commitment to provide customers with the highest-quality wafers and best service for their products. Quality and Reliability (Q&R) services aim to achieve "quality on demand" to fulfill customers' needs for time-to-market delivery, reliable quality, and market competitiveness over a broad range of products.

Q&R technical services assist customers in the technology developmental stages to design in superior product reliability. Since 2008, Q&R has worked with R&D to successfully establish and implement new qualification methodologies for High-k/Metal Gate (HKMG), and since 2013, for FinFET structures. In May 2012, Q&R began collaborating with Semiconductor Equipment and Material International (SEMI) through a joint IC Quality Committee to enhance product quality of the semiconductor supply chain. Recently, Q&R started working with R&D and the Backend Technology and Service Division to complete the Package-on-Package (PoP) technology development and in 2014 began outsourced production at major assembly and testing houses for mobile product applications. Since then, over-200 million PoP devices have been shipped to customers without major quality issues.

In 2014, Q&R conducted a deep-dive audit on new material suppliers for 20nm/16nm advanced technology and announced the incoming material quality requests to enhance the suppliers' delivery quality. In 2015, Q&R extended the audit scope to include 10nm advanced technology suppliers and encouraged these suppliers to join the National Quality Control Circle Competition for self-initiative quality improvement. Most advanced technology material suppliers have achieved the goal of three sigma process control. Q&R also implemented innovative statistical matching methodologies to enlarge the manufacturing window with better quality control. The scope of the methodology includes raw materials, facilities, metrology and process tools, wafer acceptance test (WAT) data and reliability performance. Since 2011, Q&R tightened the post-fab outgoing visual inspection criteria for wafer quality improvement to Acceptable Quality Level (AQL) 0.4% from AQL 0.65%.

To sustain production quality and minimize risk to customers when deviations occur, manufacturing quality monitoring and event management span all critical stages – from raw material supplies, mask making, and real-time in-process monitoring, to bumping, wafer sort and reliability performance. Failure analysis and material and chemical studies play important roles in maintaining TSMC quality. These capabilities are applied from the early stages of process development through assembly and packaging, including analysis of incoming materials, airborne molecular contaminants, in-depth materials characterization for process development and failure analysis of customer returns. In 2015, TSMC continued to invest aggressively in state-of-the-art technology for materials analysis including electron and ion microscopes and surface analysis equipment. This resulted in further improvement in TSMC world-class cycle times and capacity in the area of transmission electron microscopy (TEM). Given the changing needs of our customers and the importance of ensuring the quality of incoming chemicals and materials, TSMC has implemented technologies to improve detection of metal impurities with a stronger emphasis on dynamic fault isolation and design debugging capabilities including the successful launch of our first focused ion beam (FIB) system dedicated to circuit editing. As a result, the Company has improved its ability to detect metal contaminants in incoming chemicals down to the parts-per-trillion level in 2014. Furthermore, in collaboration with customers and suppliers, significant progress has been made in dynamic fault isolation, traditionally a domain of integrated device manufacturers and fabless companies. TSMC improved the efficiency of these types of analyses through automation in 2015. With the growing presence of TSMC in the integrated circuit packaging area, the Company also bolstered failure analysis capabilities for multichip packages. These efforts, including the addition of new capabilities, will continue into 2016.

By facilitating fine bump pitch lead-free backend solutions for customer products, TSMC helped achieve compliance with the electronic industry's lead-free and green IC package policies. By collaborating with the major outsource assembly and testing subcontractors, Q&R qualified and released Cu bump with elongated shape lead-free bumping and Cu bumping. This made possible lead-free Cu bump packages for 16nm FinFET technology products. It also enabled TSMC customers to introduce lead-free 16nm FinFET products with excellent assembly quality, and over 40 million units were delivered without major quality issues in 2015. Q&R also worked with R&D and qualified InFO technology through both component level and board level reliability validation to allow customer product implementation beginning in the fourth quarter of 2015. For mainstream technologies, Q&R qualified extreme low-leakage and high-endurance embedded Flash IP, Integrated Passive Device (IPD), and a hybrid of copper and copper-aluminum technology. Q&R continues to build reliability testing and monitoring to ensure excellent manufacturing quality of specialty technologies on automotive, high-voltage products, CMOS image sensors, embedded-Flash memory and micro-electro-mechanical system products.

Q&R is also responsible for leading the Company towards the ultimate goal of zero-defect production through the use of continuous improvement programs. Periodic customer feedback indicates that products shipped from TSMC have consistently met or exceeded their field quality and reliability requirements. In 2015, a third-party audit verified the effectiveness of TSMC quality management systems in compliance with ISO/TS 16949: 2009 and IECQ QC 080000: 2012 certificates requirements.

5.4 Customer Trust

5.4.1 Customers

TSMC's customers worldwide have a variety of successful product specialties and excellent performance records in various segments of the semiconductor industry. Customers include fabless semiconductor companies, systems companies, and integrated device manufacturers such as Advanced Micro Devices, Inc., Broadcom Corporation, Huawei Tech, Marvell Technology Group Ltd., MediaTek Inc., NVIDIA Corporation, NXP Semiconductors N.V., OmniVision Technologies Inc., Qualcomm Inc., Sony Corporation, Spreadtrum Communications, Inc. Texas Instruments Inc., and many more.

Customer Service

TSMC believes that providing superior service is critical to enhancing customer satisfaction and loyalty, which is very important to retaining existing customers, attracting new customers, and strengthening customer relationships. With a dedicated customer service team as the main contact window for coordination and facilitation, TSMC strives to provide world-class design support, mask making, wafer manufacturing, and backend services to achieve an optimum experience for customers and, in return, to gain customer trust and sustain company profitability.

To facilitate customer interaction and information access on a real-time basis, TSMC-Online offers a suite of web-based applications that provide an active role in design, engineering, and logistics collaborations. Customers have 24/7 access to critical information and customized reports. Design Collaboration focuses on content availability and accessibility, with close attention to complete, accurate, and current information at each level of the design life cycle. Engineering Collaboration includes online access to engineering lots, wafer yields, wafer acceptance test (WAT) analysis, and quality reliability data. Logistics Collaboration provides access to data on any given order status in wafer fabrication, backend process, and shipping.

Customer Satisfaction

To assess customer satisfaction and to ensure that our customer needs are appropriately understood, TSMC conducts the Annual Customer Satisfaction Survey (ACSS) with most active customers, either by web or interview through an independent consultancy.

Complementary to the survey, Quarterly Business Reviews (QBRs) are also conducted by the customer service team so that customers can give feedback to TSMC on a regular basis. Through surveys, feedback reviews and intensive interaction with customers, TSMC is able to maintain close touch for better service and collaboration.

Customer feedback is routinely reviewed and considered by executives and then developed into appropriate improvement plans, all-in-all becoming an integral part of the customer satisfaction process with a complete closed loop. TSMC has maintained a focus on customer survey data not only to evaluate past performance but also as a base to identify future focus areas. TSMC acts on the belief that customer satisfaction leads to loyalty, and customer loyalty leads to higher levels of retention and expansion.

Customers that Accounted for at Least 10% of Annual Consolidated Net Revenue

Unit: NT$ thousands

Customer	2015			2014		
	Net Revenue	As % of 2015 Total Net Revenue	Relation to TSMC	Net Revenue	As % of 2014 Total Net Revenue	Relation to TSMC
Customer A	134,158,421	16%	None	157,631,427	21%	None
Customer B	134,117,206	16%	None	71,184,627	9%	None
Others	575,221,741	68%		533,990,411	70%	
Total Net Revenue	843,497,368	100%		762,806,465	100%	

5.4.2 Open Innovation Platform® (OIP) Initiative

Innovation has long been both an exciting proposition and a challenge. Competition among semiconductor companies is growing more intense in the face of increasing customer consolidation and the commoditization of technology at more mature, conventional levels. Companies must find ways to continue innovating in order to survive and prosper. One way to accelerate innovation is through active collaboration with external partners. At TSMC this is known as "open innovation". It is an "outside in" approach to complement traditional "inside out" methods. TSMC has adopted this path to innovate via its Open Innovation Platform® (OIP) initiative, which is a key part of the TSMC Grand Alliance.

The OIP initiative is a comprehensive design technology infrastructure that encompasses all critical IC implementation areas to reduce design barriers and improve first-time silicon success. OIP promotes the speedy implementation of innovation amongst the semiconductor design community and its ecosystem partners with TSMC's IP, design implementation and DFM capabilities, process technology and backend services.

A key element of OIP is a set of ecosystem interfaces and collaborative components initiated and supported by TSMC that more efficiently empower innovation throughout the supply chain and, in turn, drive the creation and sharing of newly created revenue and profits. TSMC's Active Accuracy Assurance (AAA) initiative is critical to OIP, providing the accuracy and quality required by the ecosystem interfaces and collaborative components.

TSMC's Open Innovation model brings together the creative thinking of customers and partners under the common goal of shortening design time, time-to-volume, time-to-market and, ultimately, time-to-revenue. The model features:

- The foundry segment's earliest and most comprehensive electronic design automation (EDA) certification program, delivering timely design tool enhancement required by new process technologies;
- The foundry segment's largest, most comprehensive and robust silicon-proven IP (intellectual properties) and library portfolio, and;
- Comprehensive design ecosystem alliance programs covering market-leading EDA, library, IPs, and design service partners.

TSMC's OIP Alliance consists of 23 EDA partners, 43 IP partners, and 25 design service partners. TSMC and its partners work together proactively and engage much earlier and deeper than before in order to address mounting design challenges at advanced technology nodes. Through this early and intensive collaboration effort, TSMC OIP is able to deliver the needed design infrastructure with timely enhancement of EDA tools, early availability of critical IPs and quality design services when customers need them. Taking full advantage of the process technologies once they reach production-ready maturity is critical to customers' success.

In September 2015, TSMC hosted an OIP Ecosystem Forum at the Santa Clara Convention Center in California, with keynote addresses from OIP ecosystem partners as well as TSMC executives. The forum was well attended by both customers and ecosystem partners and demonstrated the value of collaboration through OIP to nurture innovations.

TSMC's OIP Partner Management Portal facilitates communication with our ecosystem partners for efficient business productivity. Designed with an intuitive interface, this portal can be accessed via a direct link from TSMC-Online.

5.5 Employees

5.5.1 Human Capital

Human capital is one of TSMC's most important assets. The Company is committed to providing quality jobs with good compensation, meaningful work, and a safe work environment for its employees. Moreover, TSMC is dedicated to fostering a dynamic, enjoyable work environment. The Company's efforts in fostering a "Great Place to Work" are highly recognized, and TSMC has received many awards.

TSMC believes that all employees should be treated with dignity and respect. The Company is committed to upholding workers' rights and respects internationally proclaimed human rights, as outlined by the United Nations Universal Declaration on Human Rights and the International Labor Organization's fundamental conventions on core labor standards.

At the end of 2015, TSMC and its subsidiaries had over 45,272 employees worldwide, including 4,669 managers, 19,645 professionals, 3,789 assistants, and 17,169 technicians. The following table summarized TSMC workforce at the end of February 2016:

Workforce Structure for TSMC and Its Subsidiaries

		2014/12/31	2015/12/31 (Note)	2016/02/29
Job	Managers	4,385	4,669	4,738
	Professionals	18,552	19,645	19,702
	Assistant Engineer/ Clerical	3,530	3,789	3,797
	Technician	17,124	17,169	17,069
Total		43,591	45,272	45,306
Gender	Male (%)	58.0%	58.7%	59.0%
	Female (%)	42.0%	41.3%	41.0%
Education	Ph.D.	4.2%	4.4%	4.4 %
	Master's	37.9%	39.2%	39.4 %
	Bachelor's	26.7%	26.2%	26.3 %
	Other Higher Education	11.4%	12.2%	12.2 %
	High School	19.8%	18.0%	17.7%
Average Age (years)		34.1	34.6	34.8
Average Years of Service (years)		6.9	7.5	7.6

Note: The data shown no longer include TSMC Solid State Lighting, which was sold to Epistar Corporation in February 2015. In addition, TSMC Solar ceased manufacturing operations in August 2015 and was merged into TSMC on December 14, 2015.

5.5.2 Recruitment

TSMC's growth depends on the continued contributions of its devoted employees. In order to strengthen growth momentum, the Company is dedicated to recruiting top-notch professionals for all positions available. TSMC is an equal employment opportunity employer and operates on the principles of open-and-fair recruitment. The Company evaluates all candidates according to their qualifications as related to the requirement of each position without regard to race, gender, age, religion, nationality or political affiliation.

TSMC's continuous growth requires constant talent sourcing and recruitment activities to support its business. The Company recruited over 3,800 employees in 2015, including over 2,700 managers, professionals, and administrative staffs, as well as over 1,100 assistants and technicians.

5.5.3 People Development

Employee development is an integral and critical factor for the growth of a company and should be systematic, disciplined and planned. TSMC is committed to cultivating a consistent and diverse learning environment. To this end, the Company has initiated the "TSMC Employee Training and Education Procedure" to ensure the Company's and the individuals' development objectives can be achieved through the integration of internal and external training resources.

Based on the nature of the individual's job, work performance and career development path, the Individual Development Plan (IDP) is provided. At the same time, TSMC also actively develops talent and creates a high-performance work environment through development programs based on business needs. The Company provides employees a diverse network of learning resources, including on-the-job training, classroom training, e-learning, coaching, mentoring, and job rotation.

The Company provides employees with a wide range of on-site general, professional and management training programs. In addition to engaging external experts as trainers, hundreds of TSMC employees are trained to be qualified instructors to deliver their valuable know-how in internal training courses.

TSMC's training programs include:

- New Employee Training: includes basic training and job orientation for new employees. Furthermore, newcomers' managers and the Company's well-established Buddy System are in place to support newcomers in their assimilation process in both corporate culture and work requirements.
- General Training: refers to training required by government regulations and/or Company policies, as well as training on general subjects for all employees or employees of different job functions. Training topics include industry-specific safety, workplace health and safety, quality, fab emergency response, languages, and personal effectiveness.
- Professional/Functional Training: provides technical and professional training required by different functions within the Company. TSMC offers training courses on equipment engineering, process engineering, accounting, information technology, and so forth.
- Management Training: programs are tailored to the needs of managers at all levels, including new, experienced, and senior managers; optional courses are also available.
- Direct Labor (DL) Training: enables production line employees to acquire the knowledge, skills and attitudes they need to perform their jobs well and to pass the certification for operating equipment. Training includes DL Skill Training, Technician "Train-the-Trainer" Training, and Manufacturing Leader Training.
- Customized Training: programs are tailored to the needs of the organization and/or the people development plan.

In 2015, TSMC conducted 1,337 internal training sessions, which translated to a companywide total of 770,548 training hours with the participation of 527,553 attendees. Employees on average attended over 17 hours of training with the training expenses reaching NT$85,540,407.

Apart from internal training resources, our employees are also subsidized when pursuing external short-term courses, for-credit courses and degrees.

5.5.4 Compensation

TSMC provides a diversified compensation program that is competitive externally, fair internally, and adapted locally. TSMC upholds the philosophy of sharing wealth with employees in order to attract, retain, develop, motivate and reward talented employees. With excellent operating performance, employment at TSMC entitles employees to a comprehensive compensation and benefits program above the industry average.

TSMC's compensation program includes a monthly salary, an employee cash bonus based on quarterly business results, and employees' profit sharing bonus based on annual profit.

The purpose of the employee cash bonus and employees' profit sharing bonus programs is to reward employee contributions appropriately, to encourage employees to work consistently toward ensuring the success of TSMC, and to link employees' interests with those of TSMC's shareholders. The Company determines the amount of the cash bonus and employees' compensation based on operating results and industry practice in the Republic of China. The amount and form of the employee cash bonus and employees' profit sharing bonus are recommended by the Compensation Committee. In addition, the profit sharing bonus is distributed upon the approval of the Board of Directors. 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 annual bonuses as a part of total compensation. The annual bonuses are granted in line with local regulations, market practices, and the overall operating performance of each subsidiary, to encourage employee commitment and development within the Company.

5.5.5 Employee Engagement

Taiwan's Labor Standards Act and the fundamental convention of International Labour Organization prohibit all forms of forced or compulsory labor. TSMC stands firmly with the protocols and has never forced labor from involuntary persons or menaced them with any penalty.

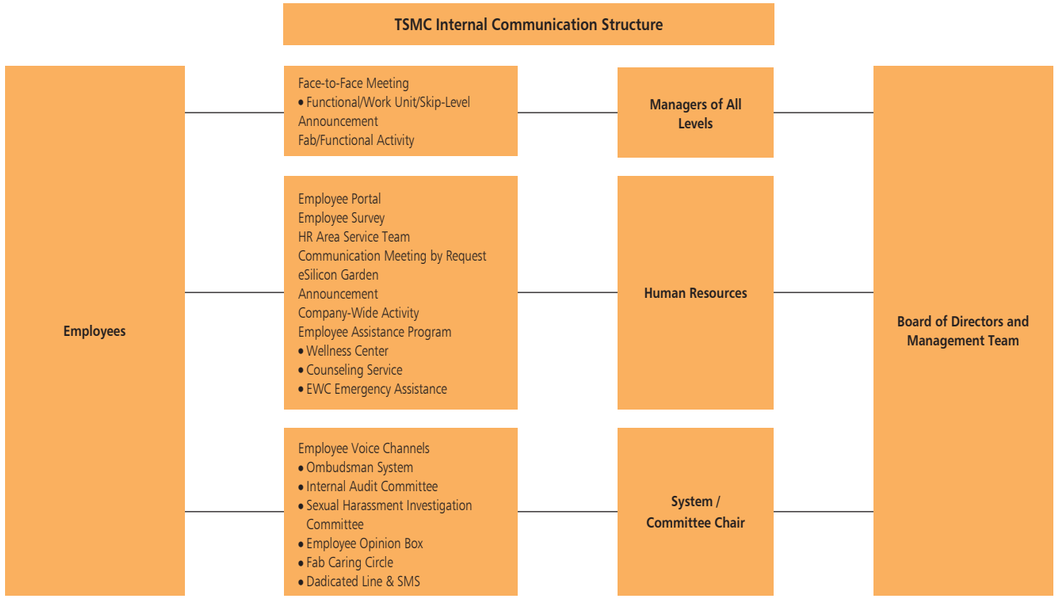
The Company encourages employees to maintain a healthy and well-balanced life while achieving high efficiency and effectiveness at work. To enrich employees' work experience, TSMC continuously implements programs to enhance their communication, well-being, benefit, recognition and rewards. The various initiatives include the following communication, benefit and recognition programs:

Employee Communication

TSMC values two-way communication and is committed to keeping communication channels between the management level, subordinates and peers open and transparent. To ensure that employees' opinions and voices are heard, and their issues are addressed effectively, impartial submission mechanisms, including quarterly labor-management communication meetings, are in place to provide timely support. TSMC's continuous efforts lie in reinforcing mutual and timely employee communication, based on multiple channels and platforms, which in turn fosters harmonious labor relations and creates a win-win situation for the Company and employees.

A host of two-way communication channels are constructed to maintain the free flow of information between managers and employees, including:

- Regular communication meetings for various levels of managers and employees.
- Periodic employee satisfaction surveys, with follow-up actions based on the survey findings.
- The corporate intranet, *myTSMC*, an internal website featuring Chairman's talk, corporate messages, executive interviews, and other activities of interest to employees.
- *eSilicon Garden*, a website hosting TSMC's internal electronic publications providing real-time updates on major activities of the Company, as well as inspirational content featuring outstanding teams and individuals.
- Complaints regarding major management, financial, and auditing issues are handled through two channels, both with high level of confidentiality, including the independent Audit Committee and the Ombudsman system led by an appointed Vice President.
- Employee Opinion Box provides a channel for employees to express their suggestions or opinions regarding their work and the overall work environment.
- Fab Caring Circle in each fab addresses the issues related to employees' work and personal life; the system is dedicated mainly to the Company's direct labor workers.



Core Values are the foundation of our Company. As part of our practice on "Integrity", we abide by the law and go above and beyond to act in accordance to the spirits of the law. With 'commitment', we provide employees with meaning jobs, safe working environment and competitive packages in compensation and benefits. With regards to Labor Union, TSMC respects employees' rights entitled by global labor standards and local regulations, including UN Global Compact's Ten Principles and Taiwan's Labor Union Act. In addition, as a member of the Electronic Industry Citizenship Coalition (EICC), TSMC adopts the EICC Code of Conduct (http://www.tsmc.com/english/csr/eicc_membership.htm) and does not impede employees' freedom of association. The principle and regulation above not only align with TSMC's goal, but also provide practical standards and measurement for our implementation.

The relationship between our management level and employees has been harmonious over the years, thanks to our transparent and effective communication channels; though employees possess the right to form a labor union, no employees have pursued this avenue and issued a request to form one so far, underlying the achievement of the Company's dedication.

In 2015 and as of the date of this Annual Report, there have been no losses resulting from labor disputes.

Employee Benefit Programs

- Convenient on-site services: cafeterias, laundry services, convenience stores, travel, banking, housing, and commuting assistance – are accessible for employees in the fabs.
- Comprehensive health enhancement and management programs: health enhancement programs include weight control, in-fab clinic and dentist services, smoking cessation, massage service, as well as seminars to raise personal health awareness. Health management programs include post health-exam follow-up activities for abnormal cases, prevention of cerebrovascular disease, ergonomic hazards management, and maternal care and protection. Employee assistance programs include five free annual counseling sessions for mental health and financial/legal issues, with extensions available depending on the individual's needs. Diverse employee welfare programs: including 76 hobby clubs, 22 speeches covering various topics, Sports Day, and Family Day. In addition, holiday bonuses, marriage bonuses, condolence allowances and emergency subsidies are also available to address employees' needs.
- Premium Sports Center: a variety of workout facilities available to all employees and their families, as well as exercise sessions conducted by professional instructors.
- Flexible Preschool Service: childcare service, operated to meet employees' work schedules, is available in three fabs in Hsinchu and Tainan.

Employee Recognition

TSMC sponsors various internal award programs to recognize outstanding achievements by employees, both individual and as a team level. With these award programs, TSMC aims to encourage continued employee development, which in turn adds to the Company's competitive advantage.

The award programs include:

- TSMC Medal of Honor, presented by the Chairman, recognizes those who contribute significantly to the Company's business performance.
- TSMC Academy recognizes outstanding TSMC scientists and engineers whose individual technical capabilities make significant contributions to the Company.
- Outstanding Engineer Award for each fab and Total Quality Excellence Award recognize employees' continuous efforts in creating value for the Company.
- Service Award represents TSMC's appreciation of senior employees' dedication and commitment to the Company.
- Excellent Instructor Award praises the outstanding performance and contribution of the Company's internal instructors in training courses for employees.
- Function-wide awards dedicated to innovation, including Idea Forum, and TQE Awards, etc.

Apart from corporate-wide awards, in 2015 distinguished TSMC employees continued to be recognized through a host of prestigious external awards, including the Outstanding Engineer Award, the Outstanding Young Engineer Award, and the National Manager Excellence Award.

5.5.6 Retention

Continuous growth is a major component of TSMC's commitment to its stockholders and employees, and the retention of outstanding employees is crucial in fulfilling this commitment. From employee's initial orientation and adaptation to professional and career development, TSMC works proactively to provide employees with good compensation, innovative, meaningful and enjoyable work, as well as a safe work environment.

TSMC continues to dedicating in employee retention, the Company's total compensation highly surpasses the average compensation among industries. Also, the Company provides surpassing leave programs for long-term retention planning. For example, Ministry of Labor announced the amendment of "Enforcement Rules of the Labor Standards Act" in 2015: to reduce national holidays from 19 days to 12 days. TSMC remains 19-day national holidays.

In 2015, the Company recorded a healthy and manageable turnover rate of 5%.

5.5.7 Retirement Policy

TSMC's retirement policy is set according to the Labor Standards Act and Labor Pension Act of the Republic of China. With the Company's sound financial system, TSMC ensures employees a solid pension contribution and payments, which encourages employees to set long-term career plans and deepens their commitment to TSMC.

5.6 Material Contracts

Investment Agreement and Shareholder Agreement
Term of Investment Agreement:
Effective as of 08/05/2012
Term of Shareholder Agreement:
Effective as of 10/31/2012 and may be terminated as provided in the agreement
Contracting Party:
ASML Holding N.V. (ASML)
Summary:
TSMC joined the Customer Co-Investment Program of ASML Holding N.V. (ASML) and entered into the investment agreement and shareholder agreement. The agreements include an investment of EUR837,815,664 by TSMC Global to acquire a non-voting 5% in ASML's equity with a lock-up period of 2.5 years. TSMC Global has acquired the aforementioned equity on October 31, 2012. The lock-up period expired on May 1, 2015 and as of October 8, 2015, all ASML shares have been disposed.

Research and Development Funding Agreement
Term of Agreement:
10/31/2012 - 12/31/2017
Contracting Party:
ASML Holding N.V. (ASML)
Summary:
TSMC shall provide EUR276 million to ASML's research and development programs from 2013 to 2017.

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 Contingent Liabilities and Unrecognized Commitments" are disclosed in Annual Report section (II), Financial Statements, page 78-79.