

Columbia Heights Capital



MATERIALS PREPARED FOR DISCUSSION

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Contact Information

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Executive Summary

- Taiwan Semiconductor is trading at a discount to fair value
- Company and founder Morris Chang have a consistent 30 year + track record of success, revenue and net income growth
- High probability long term compounder for the next 10-15 years at 15%+ annual returns
- Net Income growth since 2002 at a compounded annual growth rate of 23%, and stable gross, operating and net income margins
- Downside is limited because of current valuation, historical growth rates and underlying macro market trends
- This stock does require a 3 to 5 year time horizon in case of market volatility
- Morris Chang has laid out a detailed “Buffett-like” roadmap for company core values and business philosophy (see Appendix)

Company Overview

- Taiwan Semiconductor is a technology and capacity provider to the global logic Integrated Circuit industry
- Taiwan Semiconductor was founded in 1987 and pioneered the foundry business model by focusing solely on customer designs
- TSMC is the largest pure play semiconductor foundry business manufacturing 8,941 different products using 228 different technologies for 470 different customers in 2015
- TSMC manufactured semiconductors are used in the computer, consumer, communication, industrial and standard semiconductor markets
- Annual capacity in 2015 was 9 million 12-inch equivalent wafers. The company employed 45,000 people in 2015

Contrarian Thesis

- Contrarian Thesis:
 - We think the market is missing this story because Morris Chang has been guiding at 5-10% growth for next year to be conservative and lower expectations
 - I also think the market is not giving TSMC adequate credit for its ability to grow over the next decade
- Diligence to be done:
 - We will do further channel checks on Apple and other suppliers to understand the demand for the next year iPhone cycle
 - We will try do do a better job of understand long term demand dynamics driven by the coming explosion in communications devices, Internet of Things, Cloud Computing, ASIC development and the outsourcing trend

DCF Sensitivity (Base Case)

- Company trades at a discount to fair value
- Company has grown net income since 2002 at a 23% CAGR
- If growth exceeds 10% by a large margin, the stock has breakout potential via multiple expansion

Base Case

NPV Sensitivity Analysis

		Discount Rate				
		\$59.29	7.00%	8.00%	9.00%	10.00%
EPS	7%	\$55.63	\$51.24	\$47.27	\$43.69	
Growth	8%	\$59.89	\$55.11	\$50.80	\$46.90	
Rate	9%	\$64.48	\$59.29	\$54.61	\$50.37	
	10%	\$69.44	\$63.80	\$58.71	\$54.11	
	11%	\$74.79	\$68.66	\$63.13	\$58.14	

NPV Sensitivity Analysis

		Exit Multiple				
		\$59.29	10.0x	15.0x	20.0x	25.0x
EPS	7%	\$41.58	\$51.24	\$60.89	\$70.55	
Growth	8%	\$44.51	\$55.11	\$65.71	\$76.31	
Rate	9%	\$47.67	\$59.29	\$70.91	\$82.53	
	10%	\$51.07	\$63.80	\$76.53	\$89.26	
	11%	\$54.72	\$68.66	\$82.60	\$96.53	

Upside Case

NPV Sensitivity Analysis

		Discount Rate				
		\$59.29	7.00%	8.00%	9.00%	10.00%
EPS	10%	\$69.44	\$63.80	\$58.71	\$54.11	
Growth	15%	\$100.63	\$92.13	\$84.47	\$77.56	
Rate	20%	\$145.56	\$132.90	\$121.51	\$111.24	
	25%	\$209.56	\$190.93	\$174.17	\$159.10	
	30%	\$299.69	\$272.60	\$248.26	\$226.37	

NPV Sensitivity Analysis

		Exit Multiple				
		\$59.29	10.0x	15.0x	20.0x	25.0x
EPS	10%	\$51.07	\$63.80	\$76.53	\$89.26	
Growth	15%	\$72.27	\$92.13	\$111.99	\$131.85	
Rate	20%	\$102.51	\$132.90	\$163.30	\$193.69	
	25%	\$145.21	\$190.93	\$236.64	\$282.36	
	30%	\$204.93	\$272.60	\$340.28	\$407.95	

Financials

- Taiwan Semiconductor has a track record of stable margins and growth
- Long term compounding annual growth of revenue, operating income and net income

		In Millions of United States Dollars																			
		2002A	2003A	2004A	2005A	2006A	2007A	2008A	2009A	2010A	2011A	2012A	2013A	2014A	2015A	2016A	2017E	2018E	2019E	2020E	2021E
Revenue		4,677	5,972	8,104	8,127	9,739	9,949	10,170	9,256	14,397	14,109	17,427	20,014	24,139	25,724	29,434	31,642	34,015	36,566	39,308	42,256
Gross Profit		1,508	2,203	3,649	3,604	4,781	4,389	4,327	4,048	7,106	6,411	8,385	9,432	11,953	12,516	14,744	15,850	17,039	18,316	19,690	21,167
Operating Income		910	1,509	2,788	2,773	3,905	3,445	3,188	2,878	5,463	4,677	6,233	7,042	9,363	9,761	11,736	12,616	13,562	14,580	15,673	16,849
Net Income		623	1,390	2,909	2,855	3,903	3,390	3,069	2,800	5,569	4,442	5,713	6,163	8,044	9,236	10,381	11,160	11,997	12,896	13,864	14,903
Margins	Average																				
Gross Profit	45%	32%	37%	45%	44%	49%	44%	43%	44%	49%	45%	48%	47%	50%	49%	50%	50%	50%	50%	50%	50%
Operating Income	34%	19%	25%	34%	34%	40%	35%	31%	31%	38%	33%	36%	35%	39%	38%	40%	40%	40%	40%	40%	40%
Net Income	32%	13%	23%	36%	35%	40%	34%	30%	30%	39%	31%	33%	31%	33%	36%	35%	35%	35%	35%	35%	35%
Growth	CAGR																				
Revenue	14%		28%	36%	0%	20%	2%	2%	-9%	56%	-2%	24%	15%	21%	7%	14%	8%	8%	8%	8%	8%
Gross Profit	18%		46%	66%	-1%	33%	-8%	-1%	-6%	76%	-10%	31%	12%	27%	5%	18%	8%	8%	8%	8%	8%
Operating Income	20%		66%	85%	-1%	41%	-12%	-7%	-10%	90%	-14%	33%	13%	33%	4%	20%	8%	8%	8%	8%	8%
Net Income	22%		123%	109%	-2%	37%	-13%	-9%	-9%	99%	-20%	29%	8%	31%	15%	12%	8%	8%	8%	8%	8%

22% Net Income CAGR Since 2002

Projected Price / Earnings Ratio

- Reasonable current P/E and forward P/E given growth track record
- Cash adjusted P/E at 13.1x 2017 earnings – a large discount to market multiple

	In Billions of United States Dollars					
	2016A	2017E	2018E	2019E	2020E	2021E
Current Market Cap	159.8	159.8	159.8	159.8	159.8	159.8
Net Income	10.4	11.2	12.0	12.9	13.9	14.9
P/E	15.4x	14.3x	13.3x	12.4x	11.5x	10.7x
Net Cash	13.1	13.1	13.1	13.1	13.1	13.1
Market Cap Net of Cash	146.7	146.7	146.7	146.7	146.7	146.7
Adjusted P/E	14.1x	13.1x	12.2x	11.4x	10.6x	9.8x

ROIC Estimate

- Efficient capital expenditures
- High return on capital for net income and operating cash flow
- Capital expenditures provide competitive advantage, technical edge and moat

		In Millions of United States Dollars																			
		2002A	2003A	2004A	2005A	2006A	2007A	2008A	2009A	2010A	2011A	2012A	2013A	2014A	2015A	2016A	2017E	2018E	2019E	2020E	2021E
Operating Cash Flow		2,839	3,414	4,825	4,787	6,290	5,667	6,761	5,007	7,649	8,253	9,635	11,656	13,339	16,132	16,762	18,531	19,921	21,415	23,021	24,748
Investing Cash Flow		1,792	1,571	4,663	2,361	3,674	2,180	246	3,019	6,736	6,084	9,107	9,430	8,937	6,614	12,279	11,383	12,237	13,154	14,141	15,202
Capital Expenditures		1,592	1,114	2,555	2,435	2,416	2,590	1,808	2,748	6,231	7,132	8,205	9,650	9,130	7,840	10,186	10,643	11,441	12,299	13,221	14,213
Free Cash Flow		1,247	2,300	2,270	2,352	3,874	3,076	4,953	2,259	1,418	1,121	1,431	2,006	4,208	8,292	6,576	7,889	8,480	9,116	9,800	10,535
Margins	Average																				
Operating Cash Flow	59%	61%	57%	60%	59%	65%	57%	66%	54%	53%	58%	55%	58%	55%	63%	57%	59%	59%	59%	59%	59%
Investing Cash Flow	36%	38%	26%	58%	29%	38%	22%	2%	33%	47%	43%	52%	47%	37%	26%	42%	36%	36%	36%	36%	36%
Capital Expenditures	34%	34%	19%	32%	30%	25%	26%	18%	30%	43%	51%	47%	48%	38%	30%	35%	34%	34%	34%	34%	34%
Free Cash Flow	25%	27%	39%	28%	29%	40%	31%	49%	24%	10%	8%	8%	10%	17%	32%	22%	25%	25%	25%	25%	25%
Growth	CAGR																				
Operating Cash Flow	14%		20%	41%	-1%	31%	-10%	19%	-26%	53%	8%	17%	21%	14%	21%	4%	11%	7%	8%	8%	8%
Investing Cash Flow	15%		-12%	197%	-49%	56%	-41%	-89%	1130%	123%	-10%	50%	4%	-5%	-26%	86%	-7%	8%	8%	8%	8%
Capital Expenditures	14%		-30%	129%	-5%	-1%	7%	-30%	52%	127%	14%	15%	18%	-5%	-14%	30%	4%	7%	8%	8%	8%
Free Cash Flow	13%		84%	-1%	4%	65%	-21%	61%	-54%	-37%	-21%	28%	40%	110%	97%	-21%	20%	8%	8%	8%	8%
ROIC																					
Net Income Growth			768	1,518	-54	1,048	-513	-321	-268	2,769	-1,127	1,271	450	1,881	1,192	1,146					
Prior Yr. Capx.	Average		1,592	1,114	2,555	2,435	2,416	2,590	1,808	2,748	6,231	7,132	8,205	9,650	9,130	7,840					
Est. ROIC	24%		48%	136%	-2%	43%	-21%	-12%	-15%	101%	-18%	18%	5%	19%	13%	15%					
Op. Cash Flow Growth			575	1,411	-38	1,503	-624	1,095	-1,754	2,642	604	1,383	2,020	1,683	2,793	630					
Prior Yr. Capx.	Average		1,592	1,114	2,555	2,435	2,416	2,590	1,808	2,748	6,231	7,132	8,205	9,650	9,130	7,840					
Est. ROIC	25%		36%	127%	-1%	62%	-26%	42%	-97%	96%	10%	19%	25%	17%	31%	8%					

Market Size and Market Projections

- Growth Drivers
 - Increase of Fabless Foundry Market Share because of outsourcing trends
 - Increased market share within Fabless because of scale and technology edge

	In Billion of United States Dollars						
	2015	2016	2017	2018	2019	2020	2021
Worldwide Semiconductor Market Size	344	354	365	376	387	399	411
Projected Growth Rate		3%	3%	3%	3%	3%	3%
Fabless Foundry Market Share	13%	14%	14%	15%	16%	17%	18%
Fabless Foundry Market Size	44	48	52	57	63	68	75
TSMC Revenue	26	28	32	35	39	43	48
TSMC Semi Market Share	7%	8%	9%	9%	10%	11%	12%
TSMC Fabless Foundry Market Share	58%	59%	60%	61%	62%	63%	64%
TSMC Growth Rate Implied		11%	11%	11%	11%	11%	11%

Large Addressable Market

Competitive Advantage

- 55% Market share in foundry business allow Taiwan Semiconductor invest heavily in research and development
- Leadership in advanced process technologies is a key factors in TSMC's strong market position. In 2015, 48% of TSMC's wafer revenue came from manufacturing processes with geometries of 28nm and below.
- TSMC has the foundry segments widest technology portfolio and continues to invest in advanced technologies and specialty technologies, a key differentiation from competitors and a strong value add for customers

Risks and Mitigants

Risk: The semiconductor industry is cyclical and subject to global economic trends

Risk Score (1 to 5, 5 is high): 3

Mitigant: The company has proven its ability to ride through cycles and compound capital over long periods of time. Our holding period is also longer term in nature which should help ride any economic volatility. I also recommend a S&P market hedge for those worried about cycle risk. The company may use volatility as an opportunity to gain market share and the underlying technology trends will help buffer economic risk.

Risk: China and Taiwan Geo Political Risk

Risk Score: 2

Mitigant: This risk is applied to many technology companies who source from Asia. I believe that the GeoPolitical climate in China is less likely to affect the tech sector vs. state run companies, regulated industries or more domestic Chinese companies. The China/Taiwan risk rating is low and China's economy is far too large to risk over Taiwan.

Risk: Trend to outsourcing by fabless semiconductor companies slows

Risk Score: 2

Mitigant: TSMC has a heavy customer service culture and has economies of scale and technology differentiation. The long cycle and multi billion dollar capital expenditures make it difficult to compete with in house foundry production.

Risks and Mitigants

Risk: Competition from IDMs

Risk Score: 2

Mitigant: The large IDM companies are focused on design and their own products. They also will be less of a threat because TSCM is 'Foundry only' and thus not a competitor to its customers. It is truly independent. The large IDM's may not be as customer oriented and service oriented to service their own competitors.

Risk: Competition from New Foundry Players

Risk Score: 3

Mitigant: TSMC has spent \$30 billion in capx over the past 3 years which results in a big technology edge. TSMC also has long term relationships and a customer service culture. TSMC has been taking Foundry market share and we expect them to continue to take Foundry market share as technology gets more complex. The mainland China competitors are trying to gain market share, but have had a hard time competing as Taiwan Semiconductor maintains an innovation and capital expenditure edge. Taiwan Semi has been able to maintain market share and gain share.

Market Size

- 2015 worldwide semiconductor market is \$344 billion. Foundry sub segment revenue is \$44 billion. Semiconductor industry growth is projected at 3% per year.
- Foundry sub segment growth projected to be much higher because of increasing semiconductor content in electronic devices, continuing market shares gains by fabless companies, and expanding in-house Application-Specific Integrated Circuits (ASIC) from system companies.
- The foundry segment growth will be driven by communications, computer, consumer and Internet of Things (IoT) growth.
- Taiwan Semi is an important part of the supply chain by providing leading technologies and large scale capacity to complement innovations created along the downstream chain.

Market Share

- Taiwan Semiconductor is the leading worldwide semiconductor foundry for advanced and specialty process techniques.
- 55% market share and scale advantages
- Taiwan Semiconductor differentiates against competition through technology leadership, manufacturing excellence and customer trust.
- This edge is consistent with their historical results.

- Revenue by application appears to be driven by communications, computer, consumer and industrial applications
 - Communications represent 66% of total revenue and are growing at 11% per year
- Revenue by technology is skewing towards next generation chip platforms including 16/20nm and 28nm
- TSMC maintains market share via constant innovation

Management Quality

- Morris Cheng, 85, Founder CEO
- His ethics and integrity appear to be very similar to Warren Buffett
- Education: MIT, BS, Stanford, PHD
- Texas Instruments: 20 years as a successful engineer
- Grew TSMC from 0 to \$168 billion market cap and \$10 billion in annual cash flow
- Has position TSMC in a growth market for the next 10-20 years with only 7% market share of global semiconductor market - room for growth
- Founded in 1987 as world's first semiconductor foundry

Appendix

Company Mission and Vision

- **Company Mission Statement**

- To be the trusted technology and capacity provider of the global logic IC industry for years to come

- **Company Strategy**

- No Conflicts with Customer
- Fabless Foundry Outsource Only
- High Tech Innovation Leader
- Partner with customers

- **Vision**

- Technology leader, competitive with leading IDMs
- Manufacturing leader
- Most reputable, service-oriented and maximum total benefits silicon foundry

Taiwan Semiconductor Core Values

Integrity

Integrity is our most basic and most important core value. We tell the truth. We believe that the record of our accomplishments is the best proof of our merit. Hence, we do not brag. We do not make commitments lightly. Once we make a commitment, we devote ourselves completely to meeting that commitment. We compete to our fullest within the law, but we do not slander our competitors and we respect the intellectual property rights of others. With vendors, we maintain an objective, consistent, and impartial attitude. We do not tolerate any form of corrupt behavior or politicking. When selecting new employees, we place emphasis on the candidates' qualifications and character, not connections or access.

Commitment

TSMC is committed to the welfare of customers, suppliers, employees, shareholders, and society. These stakeholders all contribute to TSMC's success, and TSMC is dedicated to serving their best interests. In return, TSMC hopes all these stakeholders will make a mutual commitment to the Company.

Innovation

Innovation is the wellspring of TSMC's growth, and is a part of all aspects of our business, from strategic planning, marketing and management, to technology and manufacturing. At TSMC, innovation means more than new ideas, it means putting ideas into practice.

Customer Trust

At TSMC, customers come first. Their success is our success, and we value their ability to compete as we value our own. We strive to build deep and enduring relationships with our customers, who trust and rely on us to be part of their success over the long term.

Taiwan Semiconductor Business Philosophy

Integrity

Integrity means:

We tell the truth

We believe that the record of our achievements is the best proof of our merit. Hence, we do not brag or boast.

We do not make commitments lightly. Therefore, once we make a commitment, we devote ourselves completely to meeting that commitment.

With competitors, we compete to our fullest within the limits of the law, but we do not slander them in order to gain benefit for ourselves. We also respect intellectual property rights of others.

With vendors, we maintain an objective, consistent, and impartial attitude.

We do not tolerate any form of corrupt behavior or politicking. At TSMC, company politics are forbidden. When selecting new employees, we place emphasis on the candidates' qualifications and character, not connections or "guan-xi"

Focus on our Core Business: IC Foundry

We must focus on our business at all times, which is dedicated IC foundry, and not distract ourselves with other pursuits.

Globalization

Our target is and always has been the global market. We do not limit ourselves to Taiwan or any other specific geographical region. We recognize that the semiconductor business has no national boundaries, and that to be competitive anywhere we must be competitive worldwide.

Taiwan Semiconductor Business Philosophy

Long-term Vision and Strategies

An enterprise whose success endures is much like a successful marathon runner, whose skills and objectives are quite different from a short-distance sprinter. We truly believe that a person or company that does not plan carefully for the future will soon have problems in the present. We are confident that if we do a good job of long term planning and execution, we will greatly reduce the need for crisis management.

Treating Customers as Partners

Since the company was founded, we have treated our customers as partners and have never competed against them. This policy is the key to our current success and will be crucial to our continued growth. At TSMC, customers come first. Their success is our success, and we value their ability to compete as we value our own.

Building Quality into all Aspects of our Business

Every TSMC employee is responsible for providing the highest quality service. To achieve this, each person continuously evaluates and improves the quality of his or her own work. Our greatest goal is to achieve and maintain complete customer satisfaction.

Unceasing Innovation

Innovation is the wellspring of TSMC's growth. It is vital to all sectors of our business, from strategic planning to marketing to management to technology and production.

Taiwan Semiconductor Business Philosophy

Fostering a Dynamic and Fun Work Environment

For most people who work at TSMC, participating in a challenging and enjoyable work environment full of opportunities to learn new skills is even more important than monetary rewards. To retain talented people who share our goals and interests, we work hard to foster a dynamic and enjoyable work environment.

Keeping Communication Channels Open

TSMC has implemented an open-style management system designed to keep all lines of communication open. Employees openly cooperate with one another, while treating each other with honesty and sincerity. Everyone welcomes constructive criticism and is willing to seek improvement. This management style allows all opinions to be expressed before a final decision is made. Once a decision is made, everyone works together to achieve the set goal.

Caring for Employees and Shareholders, and Being a Good Corporate Citizen

Employees and shareholders are both important constituents of our company. Our goal is to provide salary and benefits packages for employees that are above the industry average. TSMC also aims to earn a return on investment for shareholders above the industry average. We clearly understand that the success of our company depends greatly on the well-being of society and the environment where the company is established. Therefore, it is essential that we give back to society, consistently within our means, and serve as a model corporate citizen.

Historical Growth – 1998- 2015

Revenue Growth: 1998-2015

	<u>Average</u>	<u>Max</u>	<u>Min</u>
Annual Growth	21%	127%	-24%
2 Year Rolling Average	22%	86%	-4%
3 Year Rolling Average	21%	62%	-2%
4 Year Rolling Average	19%	44%	3%
5 Year Rolling Average	18%	40%	3%
6 Year Rolling Average	18%	38%	7%

21% Revenue Growth Since 1998