

Hitech Semiconductor Industry Operating Benchmarks

Operational and market capitalization data for 102
semiconductor companies

1-Jan-2022



Version







VERSION	NOTES
2021-1.1	Initial version, dated 04.01.21
2021-2.1	Updated financial and market cap data for 06.25.21. Removed companies that merged or were taken private.
2021-3.1	Updated financial and market cap data for 11.30.21. Removed companies that merged or were taken private.
2022-1.1	Updated financial and market cap data for 01.01.22. Added companies and removed those that merged or were taken private.

Versioning convention: This document is versioned as follows: **YYYY.N.n**, where **YYYY** is the year, **N** is the major release number, and **n** is the minor release number. A major release includes one or more of the following: the number of companies changes; reports and analyses change; financial and market cap information are updated, and a new date is attached to the report. A minor fixes errors, including data errors, formatting errors, and inconsistencies.

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2022 Semiconductor Industry Report: Key Takeaways



- The Semiconductor industry 3-year CAGR is 10.9% (overall dollars growth). The average company 3-year CAGR is 7.1% .
- The average Semiconductor company has gross margins of 42.6% , invests 12.8% of revenue in selling, general, and administrative expense, 14.1% in research and development, and generates 14.9% operating margin, 23.8% EBITDA margin, 10.5% free cash flow, and 14.3% return on invested capital.
- The Semiconductor company average inventory turns is 3.9. The median is 3.4 . The difference between the average and the median indicates a few outliers raise the average. The median is more in line with the industry operational structure.
- The average Semiconductor company has 38.6% PP&E, and 39.1% in goodwill and intangibles, both as a percentage of revenue. Goodwill and intangibles are a proxy for mergers and acquisitions; based on this measure, Semiconductor is higher than average in M&A activity. While Semiconductor is traditionally considered an asset-intensive industry, it also has high IP content, leading to high gross margins and significant goodwill and intangible assets.
- As expected, Semiconductor companies that lead in operating profit, net profit, cash flow, and return on investment (ROA, ROIC, economic profit) are also leaders in market cap multiple.
- Semiconductor companies with higher inventory turns tend to have significantly lower market cap multiples than companies with lower inventory turns. This is an indication that inventory turns is a poor indicator of company market performance. (Note: controlling for gross margin yields the same conclusion).
- Semiconductor companies with higher IP content in their products invest more in R&D, have higher gross margins, and significantly higher market cap multiples. There is a symbiotic relationship between gross margin and R&D investment: higher R&D investment leads to more differentiated products and higher gross margins; on the other hand, differentiated products create higher gross margins, which allows for higher R&D investment. Companies in a low gross margin trap may have challenges breaking out of it without multi-year increases in R&D investment (or M&A).
- Historical analysis (using aggregate data and ratios) indicates the operational structure is essentially the same as it was a decade ago. This includes similar gross margins, operating margins, asset intensity, inventory turns, and cash flows. This indicates the industry has a certain physical setpoint and that there are individual winners and losers around that setpoint, but that the overall industry is not operationally performing better than it was a decade ago.
- Individual operational measures are poor statistical predictors of market cap multiple. Quartile analysis was performed to contrast the operational characteristics of market cap multiple leaders with others.
- Market cap multiple leaders have cap multiples that are 2.2X average and 12.1X laggards. Leaders have significantly higher gross margins, invest significantly more in R&D, and generate significantly higher operating margins, cash flow, and return on investment (ROA, ROIC, and economic profit).
- From a supply chain management perspective, data in this report supports the thesis that market leaders run their supply chains with more of a profit center mentality than a cost center mentality, which has historically been the case. This further suggests supply chain management has evolved to a sophisticated multivariate decision science, rather than a unidimensional cost management function.



Data Set

Information on the companies and the data set used in the analysis.

Data Set



COMPANIES

The data set includes 102 publicly-traded Semiconductor companies.

▶ **102**



REVENUE

Aggregate revenue for companies in the data set is \$0.6 trillion for the latest reporting fiscal year as of the date on the cover of this report.

▶ **\$0.6T**



MARKET CAPITALIZATION

Aggregate market cap for companies in the data set is \$4.3 trillion as of date on the cover of this report.

▶ **\$4.3T**

Notes:

1. Unless otherwise noted, all company financial data are based on trailing twelve months results as of the date on the cover of this report.
2. All market capitalizations are as of the date on the cover of this report.
3. M=million; B=billion; T=trillion.

Data Set

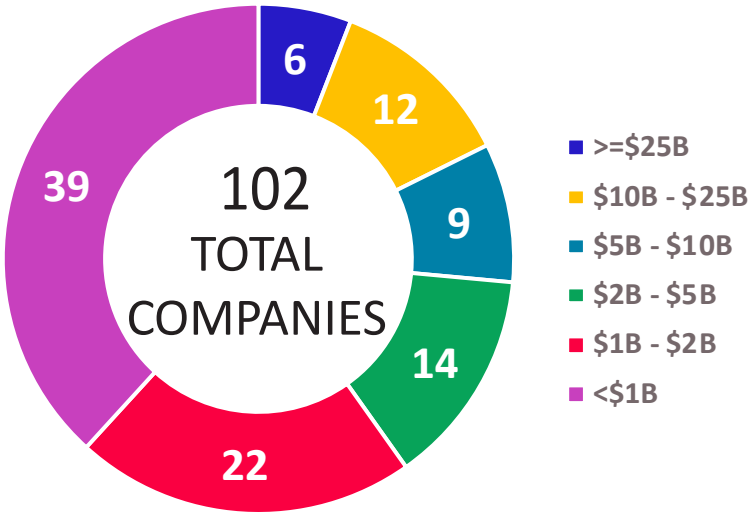
Companies included in this report

Advanced Micro Devices	CMC Materials Inc	MagnaChip Semiconductor	Qualcomm Inc	Texas Instruments Inc
Advantest Corp	Cohu Inc	Marvell Technology Grou	Rambus Inc	Tokyo Electron Ltd
Aixtron SE	Cree Inc	Maxim Integrated Produc	Renesas Electronics Cor	Tower Semiconductor Ltd
Allegro Microsystems In	Daqo New Energy Corp	MaxLinear Inc	Rohm Co Ltd	Ultra Clean Holdings In
Alpha & Omega Semicondu	Dialog Semiconductor PL	MediaTek Inc	Sanken Electric Co Ltd	United Microelectronics
Ambarella Inc	Diodes Inc	Meyer Burger Technology	Semtech Corp	Universal Display Corp
Amkor Technology Inc	Disco Corp	Microchip Technology In	Shanghai Fudan Microele	Veeco Instruments Inc
ams AG	Entegris Inc	Micron Technology Inc	Silicon Laboratories In	Vishay Intertechnology
Analog Devices Inc	FormFactor Inc	Monolithic Power System	Silicon Motion Technolo	Xilinx Inc
Applied Materials Inc	Himax Technologies Inc	NeoPhotonics Corp	Siltronic AG	Xperi Holding Corp
ASE Technology Holding	Ichor Holdings Ltd	Nordic Semiconductor AS	SK Hynix Inc	
ASM International NV	Infineon Technologies A	Nova Measuring Instrume	Skyworks Solutions Inc	
ASM Pacific Technology	Inphi Corp	NVIDIA Corp	SMART Global Holdings I	
ASML Holding NV	Intel Corp	NXP Semiconductors NV	Soitec SA	
Axcelis Technologies In	IPG Photonics Corp	ON Semiconductor Corp	STMicroelectronics NV	
BE Semiconductor Indust	KLA Corp	Onto Innovation Inc	SUESS MicroTec SE	
Broadcom Inc	Kulicke & Soffa Industr	Oxford Instruments PLC	SUMCO Corp	
Brooks Automation Inc	Lam Research Corp	Photronics Inc	Synaptics Inc	
ChipMOS TECHNOLOGIES In	Lattice Semiconductor C	Power Integrations Inc	Taiwan Semiconductor Ma	
Cirrus Logic Inc	MACOM Technology Soluti	Qorvo Inc	Teradyne Inc	

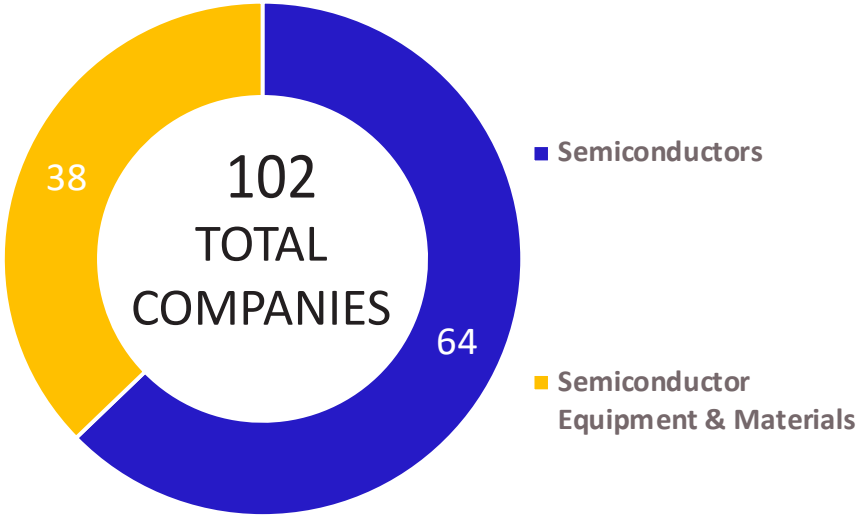
Data Set

Company distribution

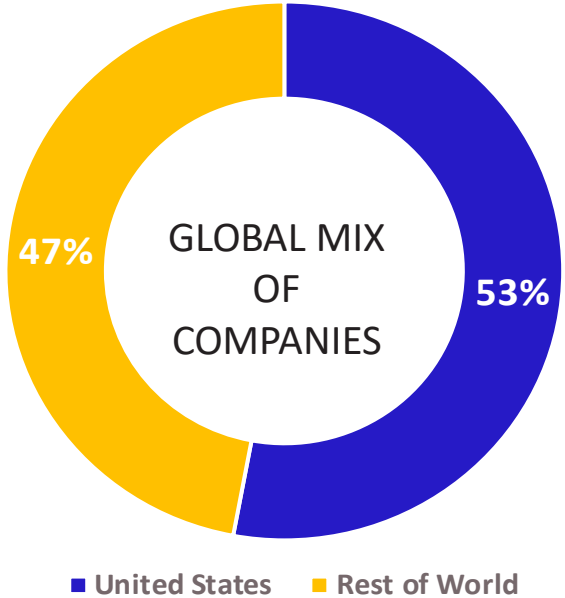
BY ANNUAL REVENUE



BY SUB-INDUSTRY



GEOGRAPHIC REGION



MEDIAN REVENUE = **\$1,479M**

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Data Set

Index of key variables included in this report

This report provides analysis of the following variables (and derivatives) for trailing twelve months (TTM) results and for the historical period from 2010-2020.

REVENUE

GROWTH RATE

GROSS MARGIN

SELLING, GENERAL, AND ADMIN

RESEARCH & DEVELOPMENT

REVENUE PER EMPLOYEE

OPERATING PROFIT

NET PROFIT

FREE CASH FLOW

STOCK COMPENSATION

CASH

DEBT

NET CASH

EBITDA

EQUITY

CAPITAL EXPENDITURES (CAPEX)

PROPERTY, PLANT, AND EQUIPMENT (PP&E, NET)

GOODWILL

DEFERRED REVENUE

REMAINING PERFORMANCE OBLIGATIONS (RPOS)

INVENTORY

DAYS IN PAYABLES

DAYS IN RECEIVABLES

CASH-TO-CASH CYCLE

CAPITALIZATION TO REVENUE

CAPITALIZATION TO EBITDA

RETURN ON INVESTED CAPITAL

RETURN ON ASSETS

RETURN ON PHYSICAL ASSETS

ECONOMIC PROFIT

Data Set

Three different analysis approaches in this analysis



APPROACH	DESCRIPTION	EXAMPLE	GOOD FOR
1. Aggregate averages	Averages are computed by adding up all numbers from all companies. For example, the gross margin for the industry would be the sum of all revenue for all companies minus the sum of all COGS for all companies (divided by the sum of all revenue for all companies).	Average Gross Margin % = $\frac{\text{(sum of all revenues minus sum of all COGS)}}{\text{sum of all revenues}}$	Overall industry structure and operations; smooths outliers.
2. Averages of percentages	Averages are computed by taking the averages of all percentages for all the companies. For example, the average gross margin % is the sum of all gross margin %s for all companies divided by the number of companies.	Average Gross Margin % = $\frac{\text{(sum of all gross margin \%s)}}{\text{(number of companies)}}$	Comparison across companies.
3. Quartile analysis	The market cap multiples of all companies are divided into quartiles. The operating characteristics of the top quartile companies are compared to the others. Likewise, measures for each company are divided into quartiles and the average market cap multiple within each quartile is shown.	<ol style="list-style-type: none">1) Isolate each quartile of market cap multiples; compare gross margin of leaders to others.2) Isolate each quartile of gross margin; display average market cap multiple within each gross margin quartile.	Understanding characteristics of leaders.

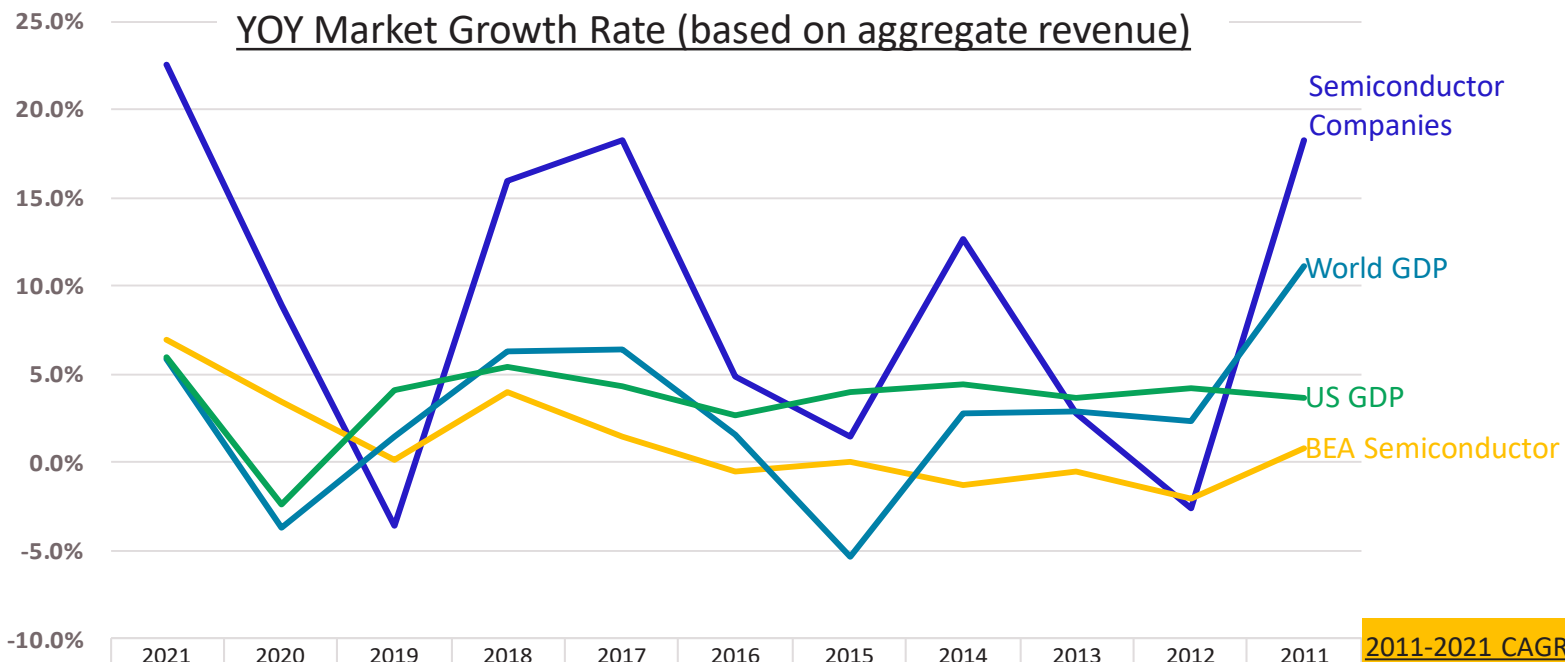


Overall Market

Summary of the market using the companies in this report as a proxy for the overall Semiconductor market. Charts in this section use the “aggregate averages” approach.

Overall Market

YOY growth rates, 2011-2021



NOTES & INSIGHTS

- Semiconductor market CAGR for the past decade 9.1%, which is significantly higher than the global current dollar GDP growth rate (2.8%).
- BEA numbers are for US domestic output only. They are shown here for comparison purposes only. The BEA also does not explicitly have a semiconductor industry; industry output is considered part of computers. These numbers probably understate semiconductor growth.
- Growth rates in the early part of the decade were higher, probably due to the rebound from the great recession of 2009-2010.

Notes:

1. "Semiconductor Companies" represents all companies in the data set for which there are year-over-year revenue numbers. The number of companies varies from year-to-year based on companies going public and some companies merging or being taken private as the decade progresses.
2. "BEA Semiconductor Output" growth is calculated from the US Bureau of Economic Analysis (<https://apps.bea.gov/iTable/iTable.cfm?reqid=150&step=2&isuri=1&categories=gdpixind>), GDP by Industry. Semiconductor output as defined here is based on output of the following sub-industries: Computer and electronic products. BEA updates its past numbers periodically, so past reports may not reflect the same past BEA numbers.
3. World GDP and US GDP numbers are sourced from The World Bank (data.worldbank.org)
4. World GDP and US GDP growth rates are based on *current* dollars. This means they have not been adjusted for inflation. *Current* numbers are used to ensure apples-to-apples comparisons with Semiconductor market growth rates. Note that GDP growth rates are typically reported in constant dollars pegged to a certain year in order to account for the effect of price inflation. Thus, GDP growth rates commonly reported in media are typically lower than those shown here.

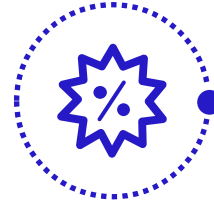
Analysis Summary

Operational ratios based on aggregate data, TTM¹



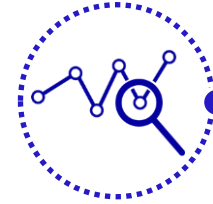
3-YEAR CAGR²

11.1%



GROSS MARGIN

47.7%



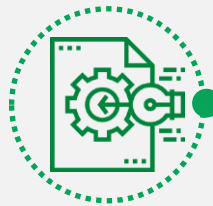
MARKET CAP³

6.9X



NET PROFIT

23.1%



R&D

13.5%



SG&A

7.7%



INVENTORY TURNS

3.5



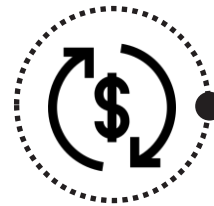
C2C (DAYS)

99.5



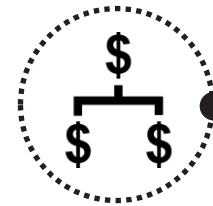
PP&E

49.8%



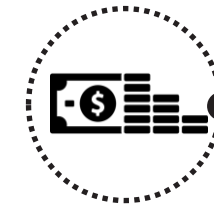
CAPEX

15.1%



FREE CASH FLOW

19.8%



ROIC

15.9%

Notes:

1. All revenue and cost numbers are aggregate values for all companies for the trailing twelve months (TTM) as of the date on the cover of this report.
2. Growth rate is based on total dollars growth of the industry over the past four years.
3. Market capitalization ratio is aggregate market capitalization for all companies as of the date on the cover of this report divided by total revenue for all companies on TTM basis.

Overall Market

Historical key metrics based on aggregate data, 2011-Current



		METRIC	TTM	2021	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	AVG11-21
OPERATIONS	Growth Rate (3YRCAGR)		11.1%	10.9%	9.0%	8.2%	10.6%	9.4%	5.3%	3.5%	7.4%	2.8%	-2.6%	18.3%	7.5%
	Gross Margin		47.7%	47.2%	45.4%	45.8%	49.0%	48.0%	45.3%	46.1%	46.1%	43.6%	42.5%	44.0%	45.7%
	SG&A % of Revenue		7.7%	7.8%	8.5%	8.9%	8.4%	9.3%	10.2%	10.1%	10.1%	11.3%	12.0%	11.1%	9.8%
	R&D % of Revenue		13.5%	13.6%	14.8%	14.9%	13.6%	14.5%	15.7%	15.5%	15.2%	15.9%	15.8%	13.6%	14.8%
	Inventory Turns (COGS/Inv)		3.5	3.5	3.4	3.5	3.7	3.7	3.9	3.9	4.1	4.0	4.0	4.3	3.8
	Days in Inventory		104.2	104.5	108.9	103.0	99.0	98.5	93.7	93.9	89.3	91.1	90.3	84.4	96.1
PROFIT & CASH FLOW	Operating Income		26.0%	25.2%	21.2%	21.2%	26.0%	23.0%	18.4%	19.8%	20.4%	16.1%	14.7%	19.1%	20.4%
	Net Profit		23.1%	22.3%	18.8%	17.5%	22.0%	17.6%	13.4%	16.5%	16.2%	12.7%	10.0%	14.1%	16.5%
	EBITDA		39.2%	40.4%	37.0%	36.1%	38.9%	36.7%	30.1%	32.3%	31.7%	28.5%	25.4%	30.0%	33.4%
	Operating Cash Flow		35.0%	35.2%	33.8%	32.4%	33.5%	30.1%	27.9%	27.5%	27.2%	26.1%	22.9%	25.7%	29.3%
	FCF % of Revenue		19.8%	19.8%	19.2%	15.6%	18.1%	16.5%	14.3%	14.9%	14.1%	12.9%	8.0%	11.6%	15.0%
	CAPEX % of Revenue		15.1%	15.4%	14.6%	16.8%	15.3%	13.6%	13.6%	12.6%	13.1%	13.2%	15.0%	14.1%	14.3%
	Stock Compensation		2.3%	2.2%	2.4%	2.4%	1.9%	2.1%	2.5%	2.2%	2.1%	2.0%	1.9%	1.8%	2.1%
	Days in Receivables		53.4	52.7	51.1	49.7	51.2	52.3	48.6	45.7	49.4	46.9	46.5	41.6	48.7
	Days in Payables		58.1	57.8	59.9	54.2	51.8	54.1	51.7	46.6	51.0	56.5	54.8	57.7	54.2
	Cash-to-Cash Cycle (Days)		99.5	99.4	100.1	98.5	98.4	96.7	90.6	92.9	87.8	81.5	82.0	68.3	90.6
ASSETS	Property, Plant, Equipment %		49.8%	50.9%	57.7%	56.7%	45.9%	46.7%	46.5%	43.1%	42.7%	47.2%	46.2%	41.1%	47.7%
	Cash % of Revenue		39.2%	39.1%	40.1%	33.6%	33.8%	48.0%	44.3%	45.4%	41.1%	42.3%	38.7%	38.9%	40.5%
	Debt % of Revenue		44.5%	44.4%	49.3%	44.8%	32.6%	41.0%	41.2%	35.6%	26.2%	26.1%	24.8%	21.1%	35.2%
	Goodwill and Intangibles % of		44.6%	44.3%	48.1%	48.1%	37.6%	43.7%	41.7%	29.4%	22.1%	22.5%	21.9%	18.9%	34.4%
ROI	ROA		12.7%	12.2%	9.6%	9.4%	13.9%	9.5%	7.2%	9.9%	10.4%	7.7%	6.3%	9.8%	9.6%
	ROIC		15.9%	15.4%	12.1%	11.8%	17.6%	12.1%	9.1%	12.2%	13.2%	9.8%	8.1%	12.9%	12.2%
	Return on Physical Assets		40.1%	38.2%	28.6%	29.4%	43.9%	37.9%	30.3%	34.6%	36.5%	26.3%	24.2%	35.4%	33.2%
	Economic Profit % of Revenue		16.4%	15.4%	16.4%	12.1%	15.9%	10.0%	7.9%	9.7%	10.3%	7.7%	5.3%	8.9%	10.9%
CAP	Market Cap / Revenue		6.9	7.1	8.7	6.8	4.3	3.5	5.2	3.8	3.0	3.6	3.1	2.4	4.7
	Market Cap / EBITDA		17.6	17.6	23.4	18.1	10.7	8.6	14.5	9.9	7.9	10.7	10.0	6.4	12.5

HISTORY

	2010	2000
	45.6%	51.1%
	10.9%	12.3%
	13.5%	10.9%
	4.2	4.5
	87.9	81.3
	20.8%	26.2%
	16.5%	23.5%
	32.6%	37.9%
	27.2%	28.3%
	14.8%	7.1%
	12.4%	21.2%
	1.9%	
	47.8	64.1
	63.0	85.4
	72.6	60.0
	42.7%	49.0%
	43.3%	34.8%
	17.7%	16.4%
	13.5%	12.6%
	11.0%	16.5%
	14.4%	20.9%
	37.3%	43.7%
	11.0%	13.6%
	2.5	4.0
	6.6	10.1

NOTES & INSIGHTS

- This chart shows the operational structure of the industry today and for the past decade.
- These data indicate that the operational structure of the industry has remained relatively constant for the past decade.
- This indicates that industry operates around a certain “setpoint” driven by physics and physical characteristics.
- That said, individual companies deviate significantly from the overall structural setpoint, resulting in significantly different company-level operational results (next section).
- The final three years of CAGR are one-year growth rates (due to lack of data).
- Historical numbers beyond ten years have fewer companies and need further analysis for apples-to-apples comparisons.



Analysis Summary

Charts that summarize key variables in the report. Charts in this section use the “averages of percentages” approach. In other words, it shows the averages of all percentages for all companies. (These numbers will differ from industry structural numbers in the previous section)

Analysis Summary

Average and median for different variables, TTM



The table below contains the average and median values for the 102 companies investigated. This shows that the average Semiconductor company operates with a gross margin of **42.6%**, spends **12.8%** of revenue on SG&A, **14.1%** on R&D, and has inventory turns of **3.9**, operating income of **14.9%**, net income of **13.7%**, free cash flow of **10.5%**, and return on invested capital of **14.3%**.

	REVENUE (TTM)		OPERATIONS				PROFIT AND CASH			ROIC
	Annual Revenue (\$M)	3-Year CAGR	Gross Margin	SG&A	R&D	Inventory Turns	Operating Income	Net Income	Free Cash Flow	
Average	\$6,061	7.1%	42.6%	12.8%	14.1%	3.9	14.9%	13.7%	10.5%	14.3%
Median	\$1,479	6.5%	44.4%	11.8%	12.5%	3.4	16.4%	14.2%	13.2%	12.1%

Notes:

1. TTM = trailing twelve months. All revenue and cost numbers are based on trailing twelve months results as of the date on the cover of this report. This report provides the averages of the percentages of all companies, including outliers.
2. Growth rate is based on the past four years of financial results
3. All percentage numbers are a percentage of revenue. Average is the average of all the percentages for each of the companies.

Analysis Summary

Average values by revenue quartile, TTM¹

Market cap multiples and gross margins are consistent across the revenue bands. Smaller companies spend more money on SG&A. Larger companies have larger operating margins, net margins, and ROIC.

All numbers are averages within each quartile

		REVENUE (TTM)		MKT CAP	OPERATIONS				PROFIT AND CASH			
	#	Revenue(\$M)	3-Year CAGR	Mkt Cap/ Revenue	Gross Margin	SG&A	R&D	Inventory Turns	Operating Income	Net Income	Free Cash Flow	ROIC
Quartile 4	26	\$19,830	10.5%	6.8	47.0%	8.5%	12.7%	4.0	24.7%	21.2%	21.0%	21.1%
Quartile 3	25	\$2,695	7.4%	4.6	37.7%	12.1%	11.4%	4.2	16.9%	13.7%	12.7%	16.1%
Quartile 2	25	\$999	8.4%	5.5	41.7%	14.1%	13.6%	4.5	15.1%	19.9%	9.8%	16.6%
Quartile 1	26	\$398	2.2%	7.6	43.8%	16.3%	17.9%	3.1	3.1%	0.1%	-1.5%	3.7%

REVENUE QUANTILES (\$M)

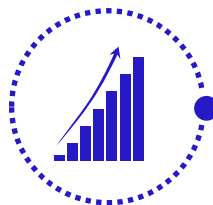
Quartile 4 >= \$5,616
 Quartile 3 >= \$1,479 , < \$5,616
 Quartile 2 >= \$684 , < \$1,479
 Quartile 1 < \$684

Notes:

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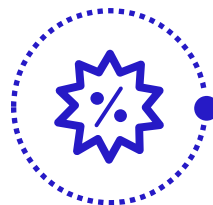
Analysis Summary

Average numbers for the entire data set, TTM¹



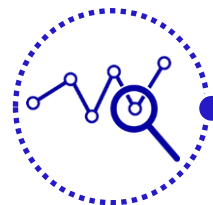
3-YEAR CAGR

7.1%



GROSS MARGIN

42.6%



MARKET CAP

6.1X



NET PROFIT

13.7%



R&D

14.1%



SG&A

12.8%



INVENTORY TURNS

3.9



C2C (DAYS)

121.9



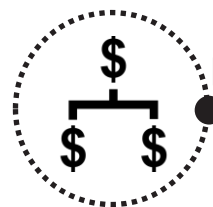
PP&E

38.6%



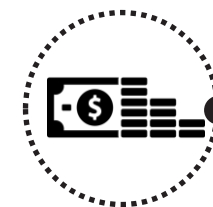
CAPEX

10.6%



FREE CASH FLOW

10.5%



ROIC

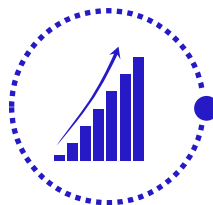
14.3%

Notes:

1. All revenue and cost numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report for all companies in the data set.
2. All ratios shown here are averages of the ratios of each company.

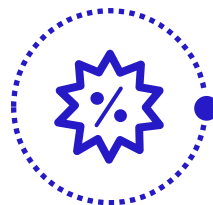
Analysis Summary

Average numbers for the top-quartile market cap¹ multiple leaders



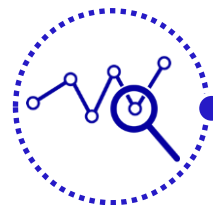
3-YEAR CAGR²

10.5%



GROSS MARGIN

55.8%



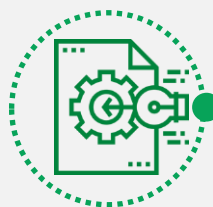
MARKET CAP

13.7X



NET PROFIT

17.1%



R&D

19.8%



SG&A

13.9%



INVENTORY TURNS

3.5



C2C (DAYS)

144.7



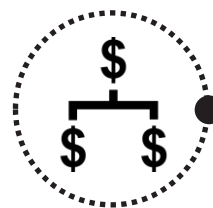
PP&E

31.6%



CAPEX

12.5%



FREE CASH FLOW

16.1%



ROIC

18.2%

Notes:

1. All revenue and cost numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report for all companies in the top quartile of market cap multiple performance.
2. All ratios shown here are averages of the ratios of each company.

Analysis Summary

Key metric benchmarks and relationship to market cap multiple

Average metric value within the quartile and corresponding average market cap within the quartile

	n=102 METRIC	INDUSTRY BENCHMARKS			MARKET CAP MULTIPLE		
		Q4 AVG	MEDIAN	Q1 AVG	Q4 AVG	Q1 AVG	
OPERATIONS	3-Year CAGR	23.2%	6.5%	-7.8%	7.5	5.6	
	Gross Margin	63.6%	44.4%	20.0%	10.7	1.9	← Gross margin is important to market performance, indicating product superiority and pricing power are paramount.
	SG&A	23.0%	11.8%	4.5%	9.1	4.8	
	R&D	26.0%	16.4%	5.0%	9.7	3.7	
PROFIT	Operating Margin	33.0%	16.4%	-6.3%	8.4	5.0	← All forms of profitability have the highest correlation with market performance.
	EBITDA Margin	42.7%	24.9%	3.4%	7.9	4.3	
	Net Profit Margin	35.3%	14.2%	-9.2%	8.6	5.1	
CASH	Free Cash Flow	30.2%	13.2%	-15.3%	10.3	3.8	
	CAPEX % of Revenue	28.6%	5.5%	1.8%	4.5	4.8	
	PP&E (net) % of Revenue	96.2%	23.0%	8.4%	4.1	6.3	
ROI	ROIC % of Revenue	35.7%	12.1%	-3.6%	8.4	6.0	← All forms of ROI are strong indicators of market performance, at about the same level as profitability.
	ROA % of Revenue	27.1%	9.1%	-2.7%	8.6	5.7	
	ROPA % of Revenue	118.3%	30.9%	-4.6%	9.5	5.4	
	Economic Profit % of Revenue	23.8%	8.0%	-14.9%	8.6	5.6	
C2C	Inventory Turns	7.0	3.4	1.8	4.4	8.0	← Inventory turns and cash-to-cash (days) correlate little or negatively with market performance
	Payables (days)	230.2	108.3	56.6	8.0	4.4	
	Receivables (days)	121.4	55.5	34.9	5.0	6.8	
	Cash-to-Cash (days)	95.8	104.4	41.4	6.6	3.5	

Notes:

1. All metric numbers are based on trailing twelve months (TTM) results as of the date on the cover of this report. Market capitalization numbers are as of the date on the cover of this report.
2. This chart uses the averages and medians of the percentages of each company within a quartile and across the entire data set. Q4=top quartile; Q1=bottom quartile.
3. Source of all data is Calcbench and YCharts and Worldlocity analysis.

Analysis Summary

Market cap multiple quartile comparison

This chart compares the operating characteristics of each market cap multiple quartile in order to glean insights into what cap leaders do differently. It summarizes the difference between the top and bottom quartiles in order to draw contrasts.

VARIABLE	DATA SET	QUARTILE (AVGS WITHIN EACH CAP QUARTILE)				DIFFERENCE
	AVG	TOP (Q4)	Q3	Q2	BOTTOM (Q1)	TOP-BOTTOM
Market Cap Multiple	6.1	13.7	6.5	3.2	1.1	12.1X
1-Year Growth	7.1%	10.5%	6.7%	3.4%	7.7%	2.8 pps
Gross Margin	42.6%	55.8%	47.7%	38.6%	28.4%	27.4 pps
SG&A	12.8%	13.9%	14.0%	12.7%	10.7%	3.2 pps
R&D	14.1%	19.8%	15.1%	12.1%	9.2%	10.6 pps
Operating Profit	14.9%	21.0%	16.7%	12.8%	9.2%	11.7 pps
Net Profit	13.7%	17.1%	19.8%	10.6%	7.4%	9.6 pps
Inventory Turns	3.9	3.5	3.3	3.8	5.2	-1.7 Turns
C2C Cycle (days)	121.9	144.7	132.4	104.3	105.2	39.4 Days
Net Cash	12.5%	17.0%	14.4%	22.7%	-3.8%	20.8 pps
CAPEX	10.6%	12.5%	10.6%	11.0%	8.3%	4.2 pps
Free Cash Flow	10.5%	16.1%	11.0%	9.4%	5.3%	10.8 pps
ROIC	14.3%	18.2%	17.9%	12.6%	8.6%	9.6 pps
Return on Physical Assets	46.6%	76.5%	52.7%	30.9%	26.0%	50.4 pps
Economic Profit	6.4%	10.7%	7.5%	4.5%	2.9%	7.7 pps

NOTES & INSIGHTS

- Leaders have market cap multiples that are 2.2X average, and 12.1X laggards.
- Leaders have significantly higher gross margins and investments in R&D. This is perhaps a chicken-and-egg question: does the higher investment in R&D result in a higher gross margin product, or does the higher gross margin product allow for a higher investment in R&D? It is likely a symbiotic and self-reinforcing relationship.
- Leaders excel in all forms of profitability, cash flow, and return on investment.
- Paradoxically, cap leaders do not lead in inventory turns. Cap laggards are more likely to lead in inventory turns than cap leaders. This is likely because cap leaders are managing their supply chains as profit centers and cap laggards are solely focused on cost.
- All financial numbers are for the trailing twelve months as of the date on the cover of this report. All market cap numbers are as of the date on the cover of this report.

Appendix

Additional supporting material and notes.

Notes and Definitions

1. Primary data sources for the analysis are YCharts and Calcbench.
2. Companies included in this analysis are filtered based on available financial, operational, and market cap data. Some significant companies such as Samsung and LG have been excluded because of lack of market capitalization data from the primary data sources.
3. Free cash flow = operating cash flow minus CAPEX.
4. ROA = return on assets = net income divided by total assets.
5. ROIC = return on invested capital = net income divided by (total debt plus equity).
 1. Note: the formal definition of ROIC uses NOPAT in the numerator. Furthermore, some companies may employ their own specific definition. The results here will be close to the formal definition, but generally slightly less.
6. ROCE = return on capital employed = EBIT divided by capital employed. Capital employed = total assets minus total current liabilities.
7. ROPA = return on physical assets = operating profit divided by (PP&E (net) plus inventory).
8. Economic profit = net operating profit after taxes (NOPAT) minus weighted average cost of capital (WACC) times capital invested. Capital invested = Equity plus the non-current portion of debt. WACC is industry-specific, as publicly reported by Aswath Damodaran, NYU Stern Business School.
9. Inventory turns = COGS (end of period) divided by inventory (end of period).
10. C2C = cash-to-cash in days = days in receivables plus days in inventory minus days in payables.
11. Unless otherwise noted, all data are based on the most recent fiscal year (MRY) for each company, as reported in the SEC EDGAR database as of the date on the cover of this report.
12. Historical data is for fiscal years 2010-2020 for all companies. The number of companies grows for each year in the historical analysis, as more companies became public across the decade.
13. In the case of companies formed from mergers, the oldest company is used to designate the resultant company founding year.
14. 3-Year CAGR is based on the past four years of annual financial data.
15. Market capitalization is based on the stock prices as of the date on the cover of this report for each company. Market cap to revenue ratios are market capitalization divided by trailing twelve months (TTM) revenue through the most recently reported fiscal quarter as of the date on the cover of this report.
16. EBITDA is calculated as operating income plus depreciation and amortization.
17. Adjusted EBITDA = EBITDA minus stock compensation
18. Cash = cash, cash equivalents, and marketable securities.
19. Total debt includes short-term debt, the current portion of long-term debt, long-term debt, borrowings under credit facility, capital lease obligations, convertible notes, and deferred rent.
20. CAPEX = gross CAPEX, in other words it does not net out the sale of assets.
21. Enterprise value (EV) = market cap plus total debt minus cash.
22. Most companies allocate depreciation and amortization costs to individual cost buckets, including cost of revenue, SG&A, and R&D. Some subset of companies explicitly show depreciation and amortization costs on the income statement after the other cost buckets. No attempt was made to reallocate these costs for this subset of companies. This has the effect of understating COGS, SG&A, and R&D for those companies.
23. Individual company YOY numbers may be distorted due to mergers and acquisitions. No attempt has been made to normalize for mergers, acquisitions, and divestitures.

Notes and Definitions

24. Aggregate inventory turns is calculated as follows: sum of all COGS for all companies in an industry divided by sum of all inventories for all companies in an industry. In a certain small number of cases, companies do not have an inventory entry on their balance sheets. In this case, to maintain consistency across calculations, inventory is assumed to be zero for those companies. This is most prevalent in service-oriented industries such as transportation and wholesale distribution, where certain companies own zero inventory. This may have the effect of slightly overstating aggregate inventory turns versus if the calculation were only done for those companies that carry inventory. (Note: in goods-producing industries, companies without COGS or without inventories have been filtered out of the analysis).



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