



Analog Devices (NASDAQ: ADI)

Signaling a Strong Buy



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ADI is a compelling investment, showcasing value and growth

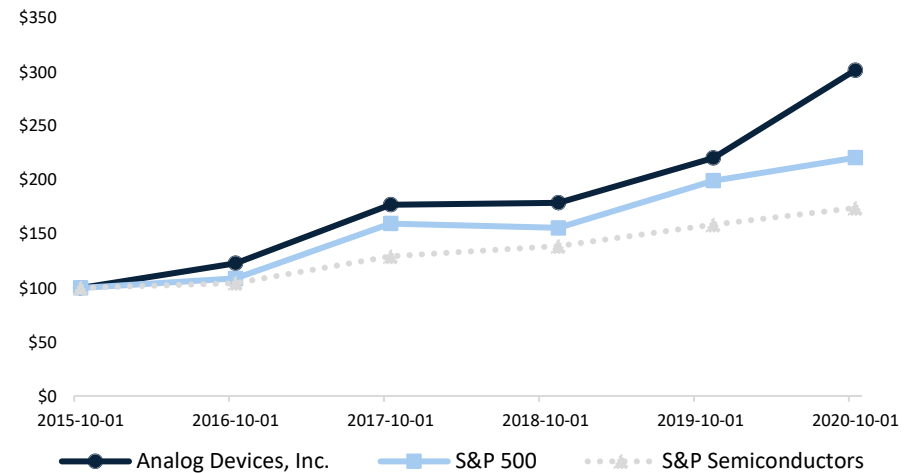
Analog Devices, Inc.

- **Overview:** Analog Devices, Inc. (ADI) is a leading player in the semiconductor industry, primarily operating in internet and communication technology. ADI manufactures, tests, and markets a broad portfolio of solutions, including integrated circuits, software and systems utilizing analog technology, and mixed-signal and digital signal processing technologies.
- **Strengths:** The company's vast intellectual property, comprehensive product portfolio, advanced manufacturing capabilities, and ability to execute for clients make ADI stand out amongst competitors.
- **Strategy:** The firm focuses on three aspects in its business strategy; efficient use of capital, deepening customer-centricity, and capitalizing on secular industry trends.

Investment Theses

1. ADI experiencing significant revenue growth as a first-mover in new, emerging secular trends within the semiconductor industry.
2. Successful M&A Strategy results in both revenue and cost-saving synergies.
3. Significant shareholder value generation through consistent hikes in the quarterly dividend and a target of 100% FCF return to shareholders this fiscal year.

Comparative Stock Performance



Valuation & Target Price

- Semiconductor companies use fundamental valuation methodologies; a DCF analysis and a comparable companies' analysis looking at the EV/EBITDA and P/E multiples.
- Our DCF uses a WACC of 8%. The perpetual growth rate used is 2.75% and the exit multiple method, 16.0x, is inline with the historical EV/EBITDA semiconductor industry multiple.
- Comparable companies' analysis looked at global companies with similar business models and growth profiles.
- Based on our valuation, we arrive at a target price of \$186.34, representing a Buy rating for ADI with an implied return of 15.9%.

ADI's diverse revenue streams a key strength

Company Highlights

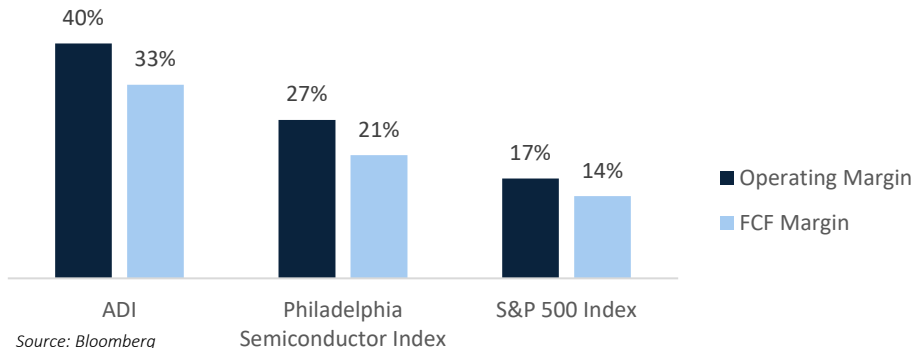
- **Analog Devices, Inc.** is a major player in the semiconductor space, operating in the industrial, communication, automotive, and consumer subsectors.
- **Revenue Model Strengths:**
 - ADI is highly diverse with ~80% of revenue coming from products that contribute 0.1% to overall revenue or less.
 - ADI has very stick products, with 50% of revenues coming from products aged 10 years or older.



Source: Company 10-K

FY20 Adjusted Operating and FCF Margins

Management guidance indicates continued margin improvements through acquisition synergies, greater revenue, and increased utilization of factories.



Source: Bloomberg

FY20 End-Market Breakdown

Consumer

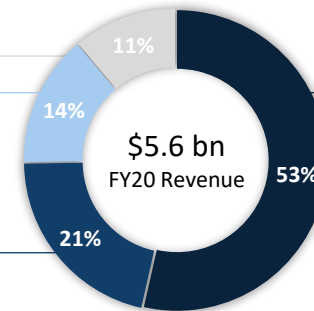
Hearable & Wearable Devices
High-End Audio & Video
Portables

Automotive

Electrification
Infotainment
Autonomous Mobility

Communication

Wires/Optical Networking
Wireless



Industrial

Aerospace and Defense
Energy
Factory Automation
Healthcare
Instrumentation

Source: Company 10-K

Key Metrics

Enterprise Value	\$63.61 bn	Revenue FY20	\$5.60 bn
Market Cap	\$59.48 bn	EBITDA FY20	\$2.36 bn
Shares O/S	0.36 bn	EBITDA Margin	42%
EV/EBITDA FY21E	21.4x	End Customers	>125,000
P/E FY21E	26.6x	Patents	~3,600 US

Source: Yahoo Finance, adjusted numbers

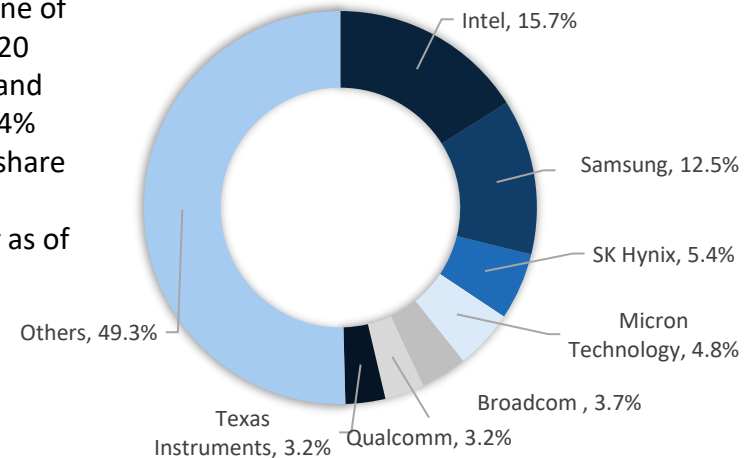
A highly fragmented industry with strong growth prospects

Industry Outlook

- **Market Concentration:** The semiconductor industry is highly fragmented with several players holding market share.
- **Current Growth:** In 2020, global semiconductor sales grew to US \$440 bn, increasing 6.8% from 2019.
 - Regionally, the American markets experienced the highest growth with sales increasing 19.8%. China remains the largest individual market accounting for US \$152 bn, 34.5%, of sales.
- **Key Barrier:** Late 2020 saw a global chip shortage, which could continue into 2021 and squeeze revenues for several firms. The shortage is primarily due to Asian manufacturing firms struggling to expand production as 5G demand has escalated quicker than expected.

Competitive Landscape

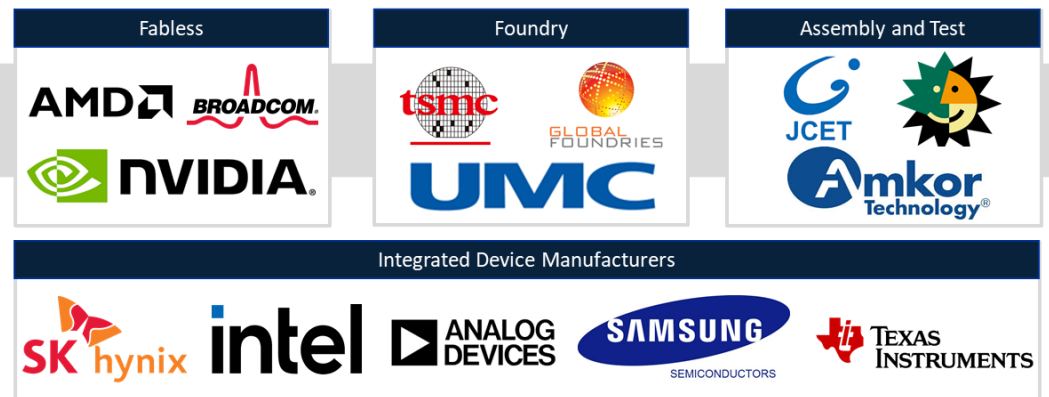
ADI is one of the top 20 players and holds 1.4% market share in the industry as of 2020.



Source: Semiconductor Industry Association

Industry Supply Chain

The semiconductor industry's supply chain is described as the Fabless-Foundry model. Fabless companies, like Qualcomm, focus on design and outsource their manufacturing to foundries, like TSMC, to reduce capital needs. Then, manufacturing companies move products along to systems testing specialists, like Amkor Technology. There are few major players, including ADI, who participate in all steps of the process, the design, manufacturing, and testing. These companies are known as Integrated Device Manufacturers (IDMs).



Source: Semiconductor Industry Association

Semiconductor Industry Driven by Secular Trends

Key Trends

Industrial



Implementing Industry 4.0

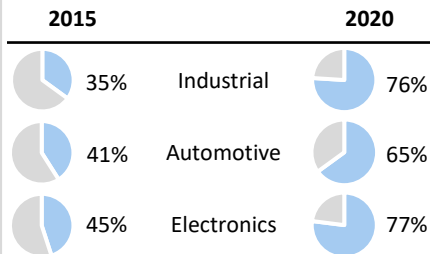
What is Industry 4.0?

- Industry 4.0 is a new industrial revolution where transformative technologies are changing the manufacturing industry.

Industry 4.0 includes:

- AI technology
- Cyber physical systems
- Predictive maintenance

Estimated Adoption of Industry 4.0, by sector



Source: PwC

Communications



5G Communication Networks

5G is the 5th Generation mobile network.

- 5G enables a network that can connect people, machines, objects, and devices.

Why use 5G?

- Higher peak data speeds
- Ultra low latency
- Larger network capacity and availability
- Improved efficiency

Total 5G economic impact by 2030: US \$1,339 bn



Source: PwC

Automotive



Increasing Electric Vehicle Production

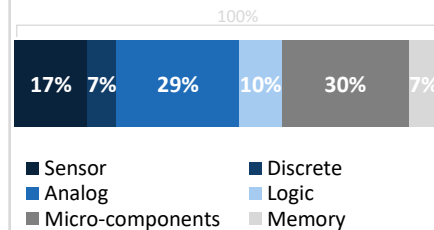
With rising vehicle production worldwide, many vehicles are incorporating advanced electrical systems.

- Expected industry growth at a CAGR of 17.9% over 2021 – 2026.

Applications include:

- 3D mapping
- EV batteries
- Advanced Driver Assist Systems (ADAS)

Automotive Semiconductor Device Segments



Source: Mordor Intelligence, McKinsey

Consumer



Consumer IoT in New Industries

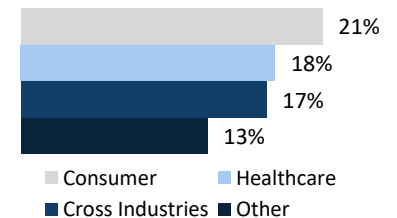
The Internet of Things (IoT) is a system embedding internet connectivity in everyday objects.

- IoT connected devices has surpassed 50 bn.

Applied in a wide range of consumer categories:

- Fitness
- Healthcare
- Home products
- Consumer wearables

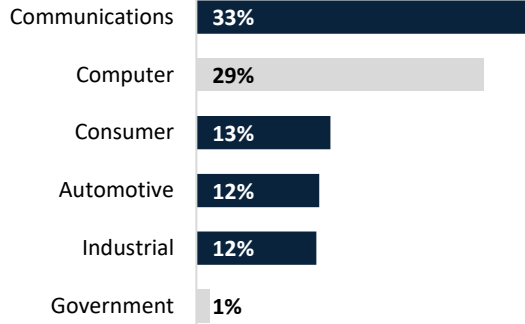
IoT Industries based on 5 Yr CAGR (2016 – 2021)



Source: Mordor Intelligence, IDC Semiannual IoT Guide

ADI capitalizing on industry trends

ADI addressing industry tailwinds faster than competitors in high growth areas



Source: Semiconductor Industry Association

ADI addresses 70% of the semiconductor industry through their 4 segments.

The company has positioned itself well as a leader in high-growth areas within each segment, profiting on increased demand for automation, a major focus on clean energy within the automotive space, and consumers demanding for internet connectivity in their products.

Management has indicated strong double-digit growth for the foreseeable future for the industrial, automotive, and consumer segments. Communications will suffer in the coming year due to trade relations with China and the backlog of manufacturing chips primarily in the Asian region. Nonetheless, the sector will still experience single-digit growth.

Industrial

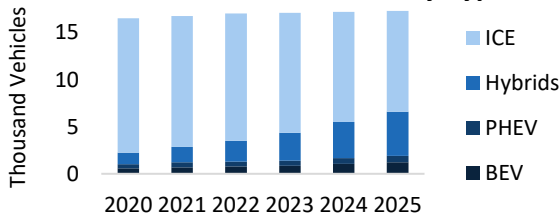
Expansion into Deep Space



Within the industrial segment, ADI is in growing markets like defense/aerospace, providing radar systems, and processing chips for deep space travel as well as the healthcare field, offering applications like x-ray equipment and point-of-care diagnostics.

Automotive

Estimated NA Vehicle Sales by Type



Source: JP Morgan

ADI took an early leadership position in the EV market producing a battery management system. Its product is in more than half of the top 10 selling EVs.

Communications

ADI is a leader in analog communications technology, providing products that address the need for higher speeds, reduced power consumption, and more reliable communications. Broadband communication systems rely on ADI products with calls, texts, and downloads all passing through ADI integrated circuits (ICs). ADI holds 10% market share, second to only Texas Instruments.

Consumer

Evolution of Consumer Wearables



Heartrate Monitors

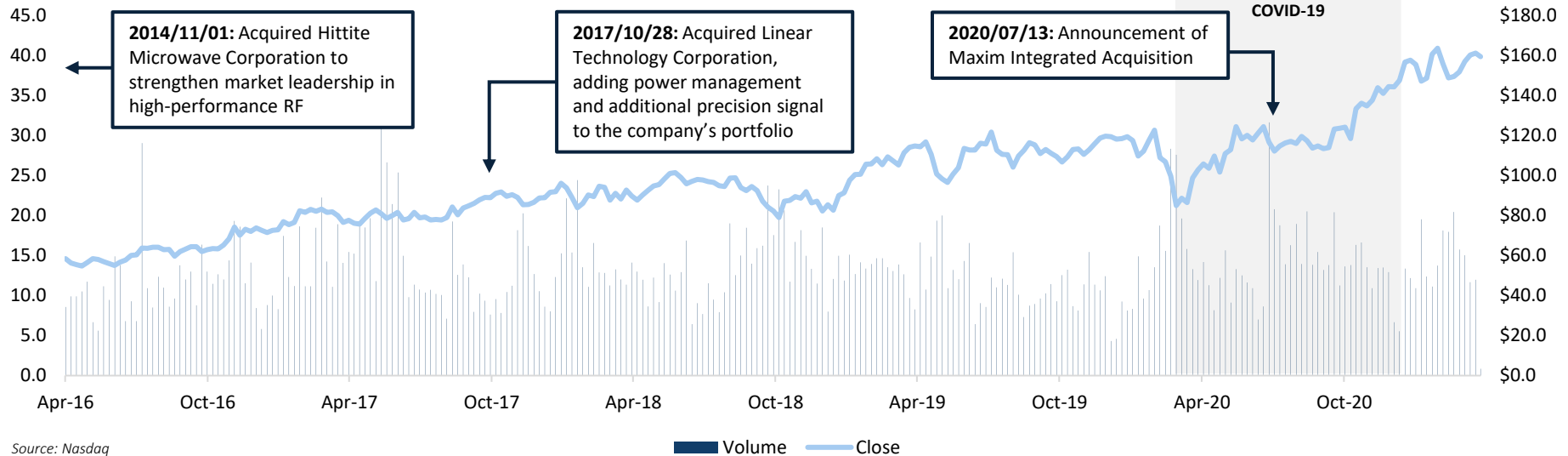


"Wellness Wearables"

Consumer goods, like Smart watches, are requiring more sensors to track health metrics. ADI has established itself within this segment and is looking to expand within consumer goods.

Inorganic growth through scope and scale M&A deals

Analog Devices has accelerated growth and captured market share through M&A activity



Acquisition Strategy

Analog Devices has successfully grown business through acquisitions, targeting technologies that complement existing product offerings, expand market coverage, increase engineering talent, and enhance the company's technological capabilities.

Engineering talent is especially important as ADI maintains a competitive advantage through its combination intellectual property, application knowledge, and technological expertise from talent.

Pending Acquisition with Maxim Integrated

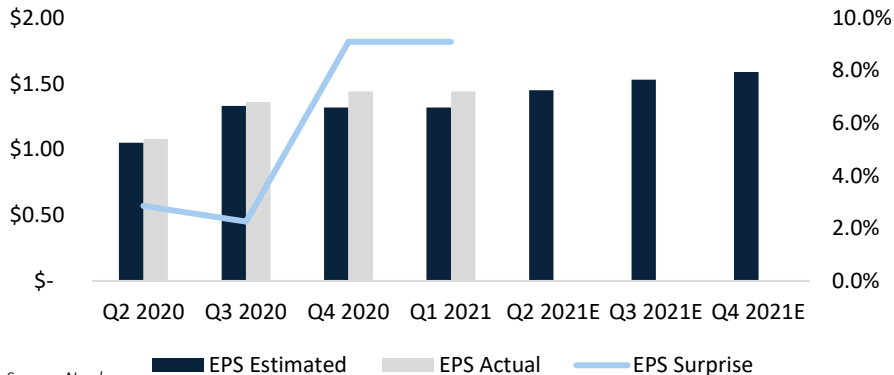
The proposed acquisition of Maxim Integrated, if completed, will enhance the scope and scale of the business and strengthen ADI's position as an analog technology leader. Some of the key benefits include:

- Building up domain expertise and engineering capabilities with the acquisition of key talent.
- Increasing the company's total addressable market by an est. US \$60 bn.
- Acquiring patents and technology in growth segments of the industry.
- Complimentary capabilities allow ADI to better address industry tailwinds.
- The creation of more efficient, leaner operations to increase margins. An estimated \$0.28 bn in cost synergies, improving overall profitability.

ADI generating significant shareholder value

Strong EPS Growth

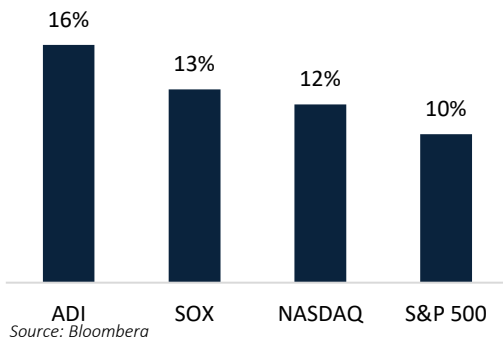
Estimated versus Actual Earnings per Share Q2 2020 – Q4 2021E



In the last year, ADI has realized higher than estimated earnings per share, reflecting strength in the company’s business segments. ADI’s EPS is projected to grow at a steady rate.

Outperforming the Market

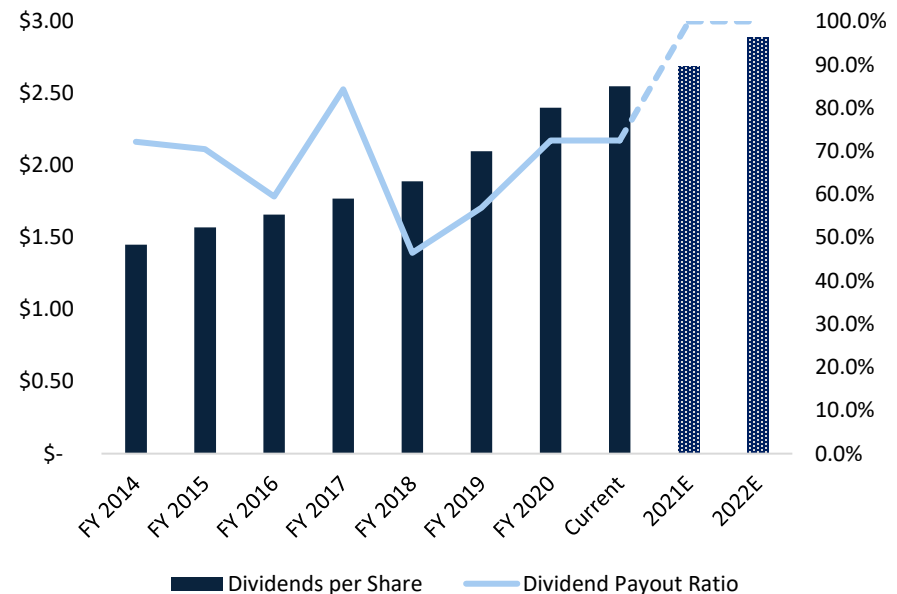
Compounded Annual Return



ADI achieved a 16% compounded annualized stock return since the PHLX Semiconductor Index inception in December 1993, outperforming the market and various indices.

A Growing Dividend

Dividend and Payout Ratio from FY 2014 - FY 2022E



Last quarter, management hiked ADI’s dividend by 11%, showing confidence in their market position. ADI has consistently increased dividends, a positive indicator of performance. Management is also targeting a 100% free cash flow return.

Better than expected EPS results, consistently strong market performance beating out peers, and a growing dividend all generate shareholder value and support a buy recommendation.

Intrinsic valuation yields attractive upside potential

Free Cash Flow

	Oct-16	Oct-17	Oct-18	Oct-19	Oct-20	Oct-21	Oct-22	Oct-23	Oct-24	Oct-25	Oct-26
(Figures in mm USD)	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026
Free Cash Flow											
EBIT	1,028.1	1,055.1	1,881.7	1,710.6	2,234.3	2,457.7	2,703.5	3,041.5	3,497.7	4,109.8	4,602.9
Less: Tax expense	(95.3)	(101.2)	(143.1)	(122.7)	(446.9)	(516.1)	(567.7)	(638.7)	(734.5)	(863.1)	(966.6)
Add: Depreciation and amortization	212.6	728.2	801.2	814.6	808.3	848.8	891.2	935.8	982.5	1,031.7	1,083.3
Less: Capital expenditures	(127.4)	(204.1)	(254.9)	(275.4)	(166.0)	(368.7)	(398.8)	(441.0)	(498.4)	(575.4)	(632.9)
Less: Change in net working capital	(100.6)	216.9	696.9	(35.3)	(300.0)	245.8	270.4	304.1	349.8	411.0	460.3
Unlevered Free Cash Flow	917.4	1,694.9	2,981.8	2,091.8	2,129.8	2,667.5	2,898.6	3,201.6	3,597.1	4,114.0	4,547.0
Discount factor						0.75	1.75	2.75	3.75	4.75	5.75
PV of Unlevered Free Cash Flow						2,518.6	2,535.0	2,593.7	2,699.2	2,859.5	2,927.5

Perpetuity Growth

Perpetuity Growth Method	
Perpetuity Growth Rate	2.75%
PV sum of unlevered FCF	16,133.5
Terminal value	57,750.5
Enterprise Value	73,883.9
Add: Cash	1,048.1
Less: Debt	5,331.9
Less: Other EV adjustments	-
Equity Value	69,600.1
Shares outstanding	368.9
Implied Share Price	\$ 188.67

Current Price	\$ 160.83
Implied Price	\$ 188.67
Total Return	17.3%

Exit Multiple Method	
Terminal EV/EBITDA Multiple	15.0 x
PV sum of unlevered FCF	16,133.5
Terminal value	54,914.12
Enterprise Value	71,047.6
Add: Cash	1,048.1
Less: Debt	5,331.9
Less: Other EV adjustments	-
Equity Value	66,763.8
Shares outstanding	368.9
Implied Share Price	\$ 180.98

Current Price	\$ 160.83
Implied Price	\$ 180.98
Total Return	12.5%

Sensitivity Analysis

		WACC				
		9.00%	8.50%	8.00%	7.50%	7.00%
Perpetuity Growth Rate	1.75%	\$ 136.14	\$ 147.63	\$ 160.97	\$ 176.66	\$ 195.35
	2.25%	\$ 144.50	\$ 157.54	\$ 172.87	\$ 191.14	\$ 213.27
	2.75%	\$ 154.20	\$ 169.18	\$ 187.04	\$ 208.67	\$ 235.40
	3.25%	\$ 165.59	\$ 183.04	\$ 204.18	\$ 230.32	\$ 263.45
	3.75%	\$ 179.15	\$ 199.81	\$ 225.36	\$ 257.74	\$ 300.11

		WACC				
		9.00%	8.50%	8.00%	7.50%	7.00%
Terminal EV/EBITDA Multiple	13.0 x	\$ 152.83	\$ 156.75	\$ 160.79	\$ 164.96	\$ 169.25
	14.0 x	\$ 162.22	\$ 166.39	\$ 170.69	\$ 175.13	\$ 179.70
	15.0 x	\$ 171.61	\$ 176.04	\$ 180.60	\$ 185.30	\$ 190.14
	16.0 x	\$ 181.00	\$ 185.68	\$ 190.50	\$ 195.47	\$ 200.59
	17.0 x	\$ 190.39	\$ 195.32	\$ 200.40	\$ 205.64	\$ 211.04

Relative valuation indicates ADI trades at a discount



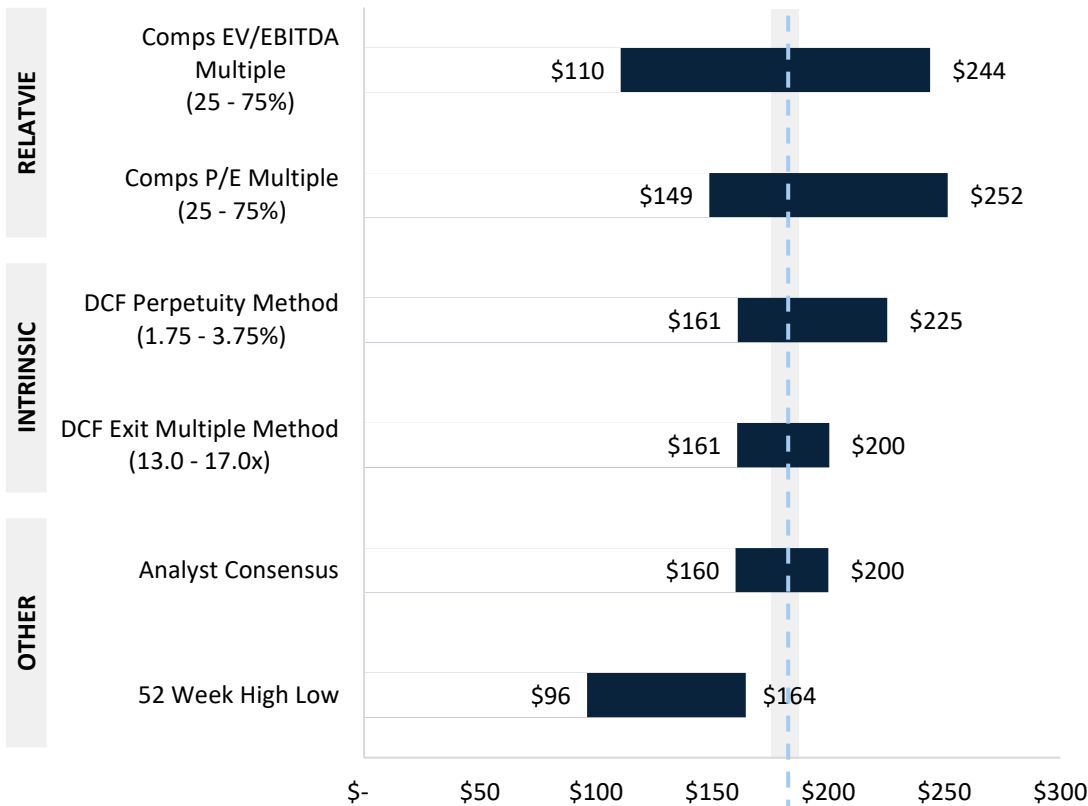
Comparable Companies' Analysis

(Figures in mm USD)

Company	Ticker	Enterprise Value	EV/EBITDA Multiple			P/E Multiple				
			2020A EV/EBITDA	2021E EV/EBITDA	2022E EV/EBITDA	2020A P/E	2021E P/E	2022E P/E		
Advanced Micro Devices, Inc.	(NASDAQ: AMD)	96,773.9	57.6 x	31.0 x	25.0 x	39.4 x	42.2 x	32.1 x		
ON Semiconductor Corporation	(NASDAQ: ON)	20,244.5	19.4 x	15.5 x	13.2 x	76.6 x	26.6 x	21.7 x		
Texas Instruments Incorporated	(NASDAQ:TXN)	177,822.4	25.9 x	21.7 x	20.7 x	32.2 x	28.1 x	26.3 x		
Skyworks Solutions, Inc.	(NASDAQ: WKS)	30,156.4	24.0 x	14.0 x	13.4 x	39.1 x	18.4 x	17.5 x		
Xilinx, Inc.	(NASDAQ: XLNX)	30,571.5	31.1 x	33.8 x	28.6 x	41.8 x	43.0 x	37.0 x		
NVIDIA Corporation	(NASDAQ: NVDA)	338,688.4	58.2 x	43.1 x	38.7 x	80.1 x	41.4 x	36.9 x		
Maxim Integrated Products, Inc.	(NASDAQ: MXIM)	24,824.6	31.0 x	23.5 x	212.1 x	39.6 x	32.7 x	29.7 x		
Broadcom Inc.	(NASDAQ: AVGO)	226,736.4	20.3 x	14.3 x	13.5 x	75.2 x	17.7 x	16.4 x		
Analog Devices, Inc.	(NASDAQ: ADI)	63,614.0	26.7 x	21.4 x	19.7 x	49.0 x	26.6 x	24.0 x		
Median				22.6 x	22.8 x		30.4 x	28.0 x		
Mean				24.6 x	45.6 x		31.3 x	27.2 x		
High				43.1 x	212.1 x		43.0 x	37.0 x		
Low				14.0 x	13.2 x		17.7 x	16.4 x		
				EV/EBITDA Implied Price			P/E Implied Price			
Median			\$	170.48	\$	187.91	\$	183.95	\$	187.63
Mean			\$	186.55	\$	387.40	\$	189.17	\$	182.17
High			\$	335.54	\$	1,843.22	\$	260.13	\$	247.86
Low			\$	101.01	\$	103.78	\$	107.28	\$	109.92

Our final share price is \$186, yielding a 16% upside

Valuation Football Field

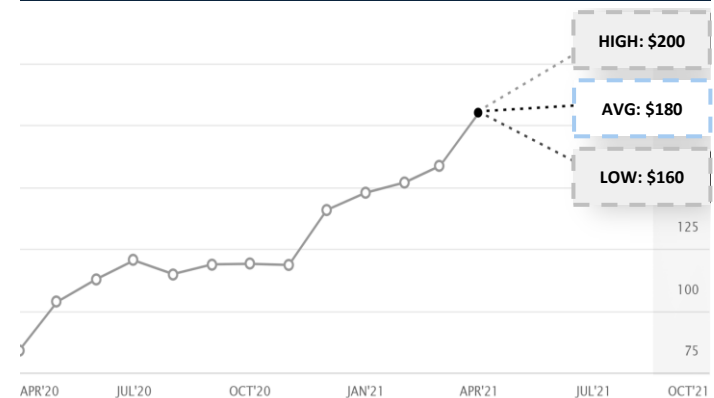


Recommendation: **BUY** | Target Price: **\$186** | Valuation Range: **\$181 - 189**

Valuation Methodology

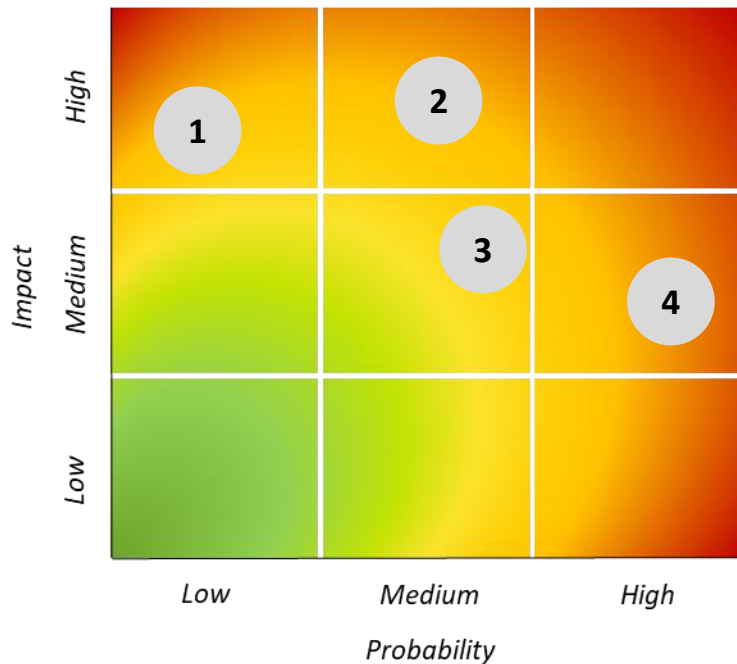
Comps EV/EBITDA (25%)	\$186.55
Comps P/E (25%)	\$189.17
DCF Perpetuity Method (25%)	\$188.67
DCF Exit Multiple Method (25%)	\$180.98
Implied Share Price	\$186.34
Implied Upside	15.9%

Street View: Analyst Ratings (\$)



ADI well-positioned despite potential headwinds

Risk Matrix



Risks and Mitigation

- 1 Inability to close proposed acquisition of Maxim Integrated**
ADI has invested significant resources into external business professionals to ensure the proposed deal will pass. In case the deal fails, ADI is a large enough player to only experience short-lived negative impacts.
- 2 Global Shortage of Semiconductor Chips**
The company can put a higher focus on products and growing industries that do not require chips. Further, ADI sources from multiple manufacturers to ensure production capability.
- 3 COVID-19 Impacts**
ADI has taken many steps to modify their global operations where possible. COVID-19 has also increased demand for products.
- 4 Global Relations Risk (particularly US-China Relations)**
ADI has diversified their operations where if a country that they operate in faces risk, the business can be diverted elsewhere.

Catalysts

Internal:

1. Proposed Maxim Integrated acquisition fuelling inorganic growth, contributing both revenue and cost-saving synergies.
2. First mover in fast growing industries, like aerospace and defense.
3. Continuous investments into R&D and focus on recruiting talent.

External:

1. The shift to cloud and work from home are fuelling demand for the semiconductor industry overall.
2. Accelerated rate of 5G adoption is pushing the need for more communication technology.