FORMFACTOR INC
Form 10-K
February 26, 2019

UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549
FORM 10-K
(Mark One)
ý ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 29, 2018
Or
o TRANSITION REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the transition period from to
Commission file number: 000-50307

FormFactor, Inc.
(Exact name of registrant as specified in its charter)

Delaware	13-3711155
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification No.)

7005 Southfront Road, Livermore, California 94551
(Address of principal executive offices, including zip code)
(925) 290-4000
(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act: Common Stock
Name of each exchange on which registered: NASDAQ Global Market
Securities registered pursuant to Section 12(g) of the Act: None
Indicate by check mark if the registrant is a well-known seasoned issuer, as defined in Rule 405 of the Securities Act. Yes o No ý
Indicate by check mark if the registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Exchange Act. Yes o No ý
Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Exchange Act during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ý No o
Indicate by check mark whether the registrant submitted electronically and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of the Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes x No o
Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K ý
Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act:

Large accelerated filer ý	Accelerated filer o	Non-accelerated filer o (Do not check if a smaller	Smaller reporting company o	Emerging growth company o

reporting company)

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act. o

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes o No ý

Aggregate market value of registrant's common stock held by non-affiliates of the registrant, based upon the closing price of a share of the registrant's common stock on June 30, 2018 (the last business day of the registrant's most recently completed second quarter) as reported by NASDAQ Global Market on that date: $498,775,456. Shares of the registrant's common stock held by each executive officer, director and person who owns 5% or more of the outstanding common stock of the registrant have been excluded in that such persons may be deemed to be affiliates. This determination of affiliate status is not necessarily a conclusive determination for other purposes.

The number of shares of the registrant's common stock, par value $0.001 per share, outstanding as of February 20, 2019 was 74,478,445 shares.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement for the 2019 Annual Meeting of Stockholders, which will be filed within 120 days of the end of the registrant's fiscal year ended December 29, 2018, are incorporated by reference in Part III hereof. Except with respect to information specifically incorporated by reference in this Annual Report on Form 10-K, the Proxy Statement is not deemed to be filed as a part of this Annual Report on Form 10-K.

FORMFACTOR, INC.
Form 10-K for the Fiscal Year Ended December 29, 2018
Index

Throughout this Annual Report on Form 10-K, we refer to FormFactor, Inc. and its consolidated subsidiaries as "the Company," "FormFactor," "we," "us," and "our." Our fiscal year ends on the last Saturday in December. Our last three fiscal years ended on December 29, 2018, December 30, 2017 and December 31, 2016.

NOTE REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K contains forward-looking statements within the meaning of the Securities Exchange Act of 1934 and the Securities Act of 1933, which are subject to known and unknown risks and uncertainties. The forward-looking statements include statements concerning, among other things, our business strategy (including the influence of anticipated trends and developments in our business and the markets in which we operate), financial results, operating results, revenues, gross margin, operating expenses, products, projected costs and capital expenditures, research and development programs, sales and marketing initiatives and competition. In some cases, you can identify these statements by our use of forward-looking words, such as "may," "might," "will," "could," "should," "expect," "plan," "anticipate," "believe," "estimate," "predict," "intend" and "continue," the negative or plural of these words and other comparable terminology. Forward-looking statements are based on information available to us as of the filing date of this Annual Report on Form 10-K and our current expectations about future events, which are inherently subject to change and involve known and unknown risks and uncertainties. You should not place undue reliance on these forward-looking statements. We have no obligation to update any of these statements, and we assume no obligation to do so. Actual events or results may differ materially from those expressed or implied by these statements due to various factors, including but not limited to the matters discussed below in the section entitled "Item 1A: Risk Factors," and elsewhere in this Annual Report on Form 10-K.

Our operating results have fluctuated in the past and are likely to continue to fluctuate. You should not rely on period-to-period comparisons of our financial results as indicators of our future performance. Some of the important factors that could cause our revenues, operating results and outlook to fluctuate from period to period include:

- customer demand for and adoption of our products;
- market and competitive conditions in our industry, the semiconductor industry and the economy as a whole;
- the timing and success of new technologies and product introductions by our competitors and by us;
- our ability to work efficiently with our customers on their qualification of our new technologies and products;
- our ability to deliver reliable, cost-effective products that meet our customers’ testing requirements in a timely manner;
- our ability to transition to new product architectures to solve next-generation semiconductor test and measurement challenges, and to bring new products into volume production on time and at acceptable yields and cost;
- our ability to implement measures for enabling efficiencies and supporting growth in our design, applications, manufacturing and other operational activities;
- the reduction, rescheduling or cancellation of orders by our customers;
- our ability to collect accounts receivables owed by our customers;
- our product and customer sales mix and geographical sales mix;
- a reduction in the price or the profitability of our products due to competitive pressures or other factors;
- the timely availability or the cost of components and materials utilized in our products;
- our ability to efficiently optimize manufacturing capacity and production yields as necessary to meet customer demand and ramp variable production volumes at our manufacturing facilities;
- our ability to protect our intellectual property against infringement and continue our investment in research and development and design activities;
- any disruption in the operation of our manufacturing facilities;
- changes in trade, tariff or export regulations in the markets where we produce or sell our products; and
- the timing of and return on our investments in research and development.

PART I

Item 1: Business

General

FormFactor, Inc., headquartered in Livermore, California, is a leading provider of electrical test and measurement technologies. We provide a broad range of high-performance probe cards, analytical probes, probe stations and thermal sub-systems to both semiconductor companies and scientific institutions. Our products provide electrical information from a variety of semiconductor and electro-optical devices and integrated circuits from research, to development through production. Customers use our products and services to lower production costs, improve yields, and enable development of their complex next generation products.

FormFactor, Inc. was incorporated in 1993, and we introduced our first product in 1995. In October 2012, we acquired Astria Semiconductor Holdings, Inc., including its subsidiary Micro-Probe Incorporated (together "MicroProbe"), and, in June 2016, we acquired Cascade Microtech, Inc. ("Cascade Microtech"). These acquisitions helped transform our business into a broader electrical test and measurement market leader with greater scale, diversification and market opportunities.

As of December 29, 2018, we operate in two reportable segments consisting of the Probe Cards Segment and the Systems Segment. Sales of our probe cards and analytical probes are included in the Probe Cards Segment, while sales of our probe stations and thermal sub-systems are included in the Systems Segment.

Products

We design, manufacture and sell multiple product lines, including probe cards, analytical probes, probe stations, thermal sub-systems, and related services.

Probe cards. Our probe cards utilize a variety of technologies and product architectures, including micro-electromechanical systems (MEMS) technologies. We use advanced design and automation technologies to enable our rapid and cost-effective manufacturing of resilient multi-material composite spring-like electrically-conductive contact elements with characteristic length scales of a few microns. These contact elements are designed to provide a specific range of forces on, and across, a chip’s bond pad, solder bump, or copper pillar, during the test process and maintain their shape and position over a range of compression levels. In addition, while maintaining these mechanical characteristics, the contact elements must achieve reliable and high-fidelity electrical contact through wafer surfaces that are generally oxidized or otherwise contaminated, and must maintain these attributes over hundreds of thousands, and even millions, of compression cycles. Our range of capabilities enable us to rapidly produce customer-design specific probe cards that deliver leading precision, reliability, and electro-mechanical performance.

Our probe cards are customized for our customers’ unique wafer and chip designs by modifying and adapting our standard product architectures to meet an individual customer’s design layout and electrical test requirements. We offer probe cards to test a variety of semiconductor device types, including systems on a chip, mobile application processors, microprocessors, microcontrollers, graphic processors, radio frequency, analog, mixed signal, image sensors, electro-optical, DRAM memory, NAND flash memory and NOR flash memory devices.

For many advanced applications, our products must maintain tens of thousands of simultaneous high-fidelity low-impedance electrical contacts with the corresponding chip contacts on the wafer. Our present technologies enable probe cards with over 100,000 contact elements with spacings as small as 40 microns over geometries as large as 300mm. In addition, for high signal-fidelity devices such as wireless radio frequency transceivers and automotive radar chips, our probe card technologies are capable of testing at millimeter-wave frequencies range, currently up to 81 GHz.

We have invested, and intend to continue to invest, considerable resources in proprietary probe card design tools and processes. These tools and processes are intended to enable the rapid and accurate customization of products required to meet customer requirements, including automated routing and trace length adjustment within our probe cards, to rapidly design complex structures.

In addition, some of our customers test certain chips over a large range of operating temperatures, such as for automotive applications. We design probe cards to provide for a precise match with the thermal expansion characteristics of the wafer under test across the range of test operating temperatures. For many of our products, our customers can use the same probe card for both low and high temperature testing. We also design probe cards for customers that require extreme positional accuracy at a specific temperature.

Through on-going investments in both our technology and operations, we continue to innovate and improve so that our products will meet customers’ future technical roadmap performance, quality, and commercial requirements. We also focus upon leveraging these ongoing investments across all advanced probe card markets to realize synergies and economies of scale to benefit our competitiveness, time-to-market and overall profitability.

Analytical Probes. We offer over 50 different analytical probe models for engineering and production testing. Analytical probes are used for a diverse set of applications, including device characterization, electrical simulation model development, failure analysis, and prototype design debugging. Our customers for analytical probes include universities, research institutions, semiconductor integrated device manufacturers, semiconductor foundries, and fabless semiconductor companies. We continue to add new models of analytical probes that address measurements with higher complexities and at higher frequencies.

Probe Stations. Probe stations, also referred to as probing systems, are a critical tool development of new generations of semiconductor processes and designs. Probe stations are highly configurable for the required measurements, the size and type of wafer under test, the characteristics of the device design to be tested, and the temperatures at which testing is to be performed. Process development and design complexities have continually increased with each new generation of semiconductor technology to accommodate smaller design geometries, new materials and more layers. Probing systems are a fundamental tool for characterizing and verifying electrical performance and reliability to enable new semiconductor technologies. We design our probing systems for semiconductor design engineers to capture and analyze more accurate data in a shorter amount of time.

We build upon our probe stations to create integrated measurement systems that provide complete solutions for our customers’ complex measurement requirements. These systems include test instrumentation, probe, cabling configurations, and software to enable fast, accurate, on-wafer data collection for complex application and measurement needs. We offer pre-configured and customized measurement systems for production testing, power device characterization, vacuum probing, cryogenic probing, high-pressure probing, and a variety of other specific applications.

Thermal Subsystems. Our thermal subsystems produce thermal chucks and other test systems used in probe stations. Thermal chuck systems enable the testing of devices at precise temperatures or across a range of temperatures.

Services and Support. In addition to routine installation services at the time of sale, we offer services to enable our customers to maintain and more effectively utilize our products and to enhance our customer relationships. In addition to traditional maintenance services, our applications engineers assist our customers in test methodologies to make advanced measurements during process and product development, and during mass production.

Customers

Our customers include companies that design or make semiconductor, and semiconductor related products in the Foundry & Logic, DRAM, Flash, Display and Sensor markets. Our customers use our products to test nearly all semiconductor device types, including mobile application processors, microprocessors, microcontrollers, graphic processors, radio frequency, analog, mixed signal, image sensors, opto-electrical, DRAM memory, NAND flash memory and NOR flash memory devices.

Fabless semiconductor suppliers do not manufacture their own semiconductors, but they purchase our analytical probes and probe stations for research and development, and device characterization. They also purchase, or direct their foundries or wafer test facilities to purchase, our probe cards to test wafers manufactured for them.

We believe our customers consider timely service and support to be an important aspect of our relationship. Our probe stations are installed at customer sites either by us, our manufacturers’ representatives or our distributors, depending on the complexity of the installation and the customer’s geographic location. We assist our customers in the selection, integration and use of our products through application engineering support. We also provide worldwide on-site probe card maintenance and service training, seminars and telephone support. Our manufacturers’ representatives and distributors provide additional service and support.

Information concerning revenue by geographic region and by country based upon ship-to location appears under Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations - Revenues - Revenues by Geographic Region and Note 16 of the Notes to Consolidated Financial Statements included in Part II, Item 8 of this Annual Report on Form 10-K.

Information concerning revenue concentration by customer appears under Note 2 of the Notes to Consolidated Financial Statements included in Part II, Item 8 of this Annual Report on Form 10-K. The following customers represent 10% or more of our quarterly revenues:

	Fiscal Quarters Ended							
	Dec. 29, 2018	Sep. 29, 2018	June 30, 2018	March 31, 2018	Dec. 30, 2017	Sep. 30, 2017	July 1, 2017	April 1, 2017
Intel Corporation	21.9%	24.4 %	15.1%	14.0%	21.0 %	30.6 %	24.9%	26.7%
Samsung Electronics., LTD.	13.8%	*	*	10.1%	*	*	*	10.3%
Taiwan Semiconductor Manufacturing Co.,LTD.	10.9%	*	*	*	*	*	*	*
SK Hynix Inc.	*	*	11.5%	*	*	*	*	*
Micron Technology, Inc.	*	12.0 %	*	*	13.1 %	*	*	*
	46.6%	36.4 %	26.6%	24.1%	34.1 %	30.6 %	24.9%	37.0%

* Less than 10% of revenues.

Segment and Enterprise-Wide Disclosures

See Note 16 of the Notes to Consolidated Financial Statements included in Part II, Item 8 of this Annual Report on Form 10-K for certain financial information related to our segments and our enterprise-wide disclosures.

Backlog

We manufacture our products based on order backlog and customer commitments. Backlog includes only orders with written authorizations and scheduled shipment dates. Backlog also includes revenue for existing product service agreements to be earned within the next 12 to 24 months. Customers may delay delivery of products or cancel orders prior to shipment, subject to possible cancellation penalties. Due to possible changes in delivery schedules and cancellations of orders, our backlog on any particular date is not necessarily indicative of actual sales for any succeeding period. Delays in delivery schedules or a reduction in backlog during any particular period could have a material adverse effect on our business and results of operations.

Manufacturing

Our probe cards are designed for each of our customers' unique designs, by modifying and adapting our product architectures to meet an individual customer’s chip layout and test requirements. Our proprietary manufacturing processes for our probe cards include: a complex interconnection system-level design process; a front-end process, which may include wire bonding, photolithography, plating and metallurgical processes, dry and electro-deposition, pick and place assembly; and a back-end process, which includes general assembly and test. Critical steps in our manufacturing process are performed in a variety of clean room environments, including as stringent as a Class 100 environment, depending on the requirements of the specific manufacturing processes.

Our probe stations are designed to provide highly accurate electrical measurements enabled by precise and reliable mechanical components and assemblies. We prototype and test our new standard product designs and components to ensure high electrical signal integrity, mechanical accuracy and safety. We also monitor our product quality throughout the various stages of our manufacturing processes using a variety of process control methods and tests.

We depend on suppliers for materials and some critical components of our manufacturing processes, including ceramic and organic substrates and complex printed circuit boards. We also rely on suppliers to provide certain contact elements and interconnects incorporated into our products. Some of these components and materials are supplied by a single vendor, and some are subject to certain minimum order quantities. Generally, we rely on purchase orders rather than long-term contracts with our suppliers, which subjects us to risks, including price increases, manufacturing capacity constraints and component shortages. We continually assess and evaluate alternative sources of supply for all components and materials.

Our primary manufacturing facilities are located in Livermore, San Jose and Carlsbad, California, Beaverton, Oregon, United States, and in Thiendorf, Germany. We also perform manufacturing operations in our facilities in Munich, Germany; Suzhou, China; and Yokohama, Japan.

We maintain repair and service capabilities in Livermore, San Jose, and Carlsbad, California and Beaverton, Oregon, United States; Thiendorf, Dresden and Munich, Germany; Bundang, South Korea; Yokohama and Hiroshima, Japan; Suzhou and Shanghai, China; Hsinchu, Taiwan; and Singapore.

Research, Development and Engineering

The semiconductor industry is subject to rapid technological change and new product introductions and enhancements. We believe that our continued commitment to research and development and our timely introduction of new and enhanced products and technologies are integral to maintaining and enhancing our competitive position. We allocate significant resources to these efforts and prioritize those resources to prepare for our customers' next generation electrical test and measurement challenges. We also increasingly seek to deploy our resources to solve fundamental challenges that are both common to, and provide competitive advantage across, our probe card and system product offerings and roadmaps.

Sales and Marketing

We sell our products worldwide through a global direct sales force and through a combination of manufacturers' representatives and distributors.

Our direct sales and marketing staff is located in the United States, China, France, Germany, Italy, United Kingdom, Japan, Singapore, South Korea, and Taiwan. They work closely with customers in the effort to understand their businesses, anticipate trends and define products that will provide significant technical and economic advantages to our customers. We employ a highly skilled team of application and customer support engineers that support our customers as they integrate our products into their research, development and manufacturing processes. Through these customer relationships, we seek to develop a close understanding of customer and product requirements to align our capabilities with our customers' roadmaps and production ramps.

We also have a network of representatives and distributors across the globe to broaden our reach. We engage sales representatives to act as independent third parties that agree to promote our products, at our prices and on terms set by us, in return for a commission based on sales. We typically use sales representatives in areas that we believe require greater levels of customer support than we can deliver from our own sales offices and where local language capabilities can offer an advantage. Our distributors purchase our products and resell them at prices and upon terms set by the particular distributor. We typically use distributors in particular geographies due to local regulations or business customs.

Environmental Matters

We are subject to U.S. federal, state, local, and foreign governmental laws and regulations relating to the protection of the environment, including those governing the discharge of pollutants into the air and water, the management and disposal of hazardous substances and wastes, the clean-up of contaminated sites and the maintenance of a safe workplace. We believe that we comply in all material respects with the environmental laws and regulations that apply to us. We did not receive any notices of violations of environmental laws and regulations in fiscal 2018, 2017 or 2016. In the future, we may receive notices of violations of environmental regulations, or otherwise learn of such violations. Environmental contamination or violations may negatively impact our business.

Competition

The markets for our products are highly competitive and we anticipate that these markets will continually evolve and be subject to rapid technological change. Our current and potential competitors are as below:

Probe Card Market. The probe card market comprises many domestic and foreign companies, and has historically been fragmented with many local suppliers servicing individual customers in often differentiated applications. Our primary competitors are Advantest Corporation, AMST Co., Ltd., Feinmetall GmbH, Japan Electronic Materials Corporation, Korea Instrument Co., Ltd., M2N Co., Ltd., Microfriend Inc., Micronics Japan Co., Ltd., MPI Corporation, Micro Square Technology Inc., NHK Spring Co., Ltd., Soulbrain Engineering, Nidec SV TCL, Synergie CAD, TechnoProbe S.p.A, TSE Co., Ltd., WinWay Technology Co., Ltd., WILL-Technology Co., Ltd., and Yokowo, among others. In addition to the ability to address probe card performance and capability requirements in differing applications, the primary competitive factors in the markets in which we compete include product quality and reliability, price, total cost of ownership, design and manufacturing lead times, service capability, geographic proximity, field applications support and timeliness of delivery.

Probe card vendors such as Japan Electronic Materials Corporation, Micronics Japan Company, Ltd. and TechnoProbe, offer probe cards built using similar types of lithographic patterning as do we. The high capital investment and other costs associated with the development of lithographically defined probe cards and the time and high cost of the customer evaluation process represent significant barriers to entry for this type of technology.

We believe that the primary competitive factors in the production probe card market depend upon the type of integrated circuit being tested, but also include customer service, knowledge of measurement techniques, delivery time, price, probe card lifetime, chip damage prevention, probe tip touch-down accuracy, speed and frequency of the probe card, number of chips contacted in parallel, number of probe tips and their layout, signal integrity, and frequency and effectiveness of any required cleaning. As a result of our relative strengths in these areas, we believe that we compete favorably in the advanced probe card market, and in probe cards for parallel testing of chips with densely-packed bond pads, bumps or pillars, and in high signal integrity testing of wireless radio frequency devices that operate up to millimeter-wave frequencies, as needed for 5G wireless networks.

Analytical Probes. Our primary competitor in the analytical probe market is GGB Industries Inc. Regional competitors include Yokowo and TechnoProbe Co Ltd. in Japan, and MPI/Allstron in Taiwan. We believe that the primary competitive factors in this market are breadth of probe types, probe frequency and electrical signal integrity, contact integrity and the related cleaning required, knowledge of measurement techniques, calibration support, delivery time and price. We believe that we compete favorably with respect to these factors.

Probe Stations. Our primary competitors in the probe station market are HiSOL, Inc., LTD/Accretech, The Micromanipulator Company Inc., MPI Corporation, Semiprobe, Signatone Corporation, Tokyo Electron (“TEL”), Tokyo Seimitsu Co., Vector Semiconductor Co. Ltd., and Wentworth Laboratories Inc. We believe that the primary competitive factors in the probe station market are measurement accuracy and versatility, measurement speed, automation features, knowledge of measurement techniques, completeness of the measurement solutions, delivery time and price. We believe that we compete favorably with respect to these factors.

Thermal Subsystems. In the market for thermal subsystems, we compete principally against ERS Electronic GmbH, Espec Corp, and Temptronic Corporation. In addition, many of our probe station competitors develop and produce their own thermal subsystems for use in their products. We believe the primary competitive factors in this market are thermal performance, reliability, flexibility and completeness of product offerings. We believe that we compete favorably with respect to these factors.

Some of our competitors are also suppliers of other types of test equipment or other semiconductor equipment and may have greater financial and other resources than we do. Our competitors may enhance their current products and may introduce new products that will be competitive with ours. New alternatives to our products may also be introduced, by our current competitors or others, which may reduce the value of one or more of our products.

Semiconductor manufacturers may implement chip designs that include capabilities or use other methodologies that increase test throughput and reduce test content. This may reduce or eliminate some or all of our current products’ advantages. Semiconductor manufacturers may also increase their use of test strategies that include low performance semiconductor testers, less complex probe cards, or test procedures that do not involve our products. Our ability to compete favorably may also adversely affect the long-standing relationships between our competitors and certain semiconductor manufacturers.

Intellectual Property

Our success depends in part upon our ability to continue to innovate and invest in research and development to meet the testing requirements of our customers, to maintain and protect our proprietary technology, and to conduct our business without infringing on the proprietary rights of others. We rely on a combination of patents, trade secrets, trademarks and contractual restrictions on disclosure to protect our intellectual property rights. We have filed actions to enforce those rights against third parties in the past, and may pursue such actions in the future.

We have generated, and continue to generate and maintain, patents and other intellectual property rights covering innovations that are intended to create a competitive advantage, and to support the protection of our investments in research and development. We believe that we possess one of the most substantial patent portfolios relevant to our products.

Although we believe that our patents and other intellectual property rights have significant value, we do not believe that maintaining or growing our business is materially dependent on any single patent. Due to the rapid pace of innovation within the markets that we serve, it is possible that our protection through patents may be less important than factors such as our technological expertise, continuing development of new products and technologies, protection of trade secrets, market penetration, customer relationships, and our ability to provide comprehensive support and service to customers worldwide.

No assurance can be given that any patents will not be challenged, invalidated or circumvented, or that the rights granted thereunder will provide us with a sustained competitive advantage. In addition, there can be no assurance that we will be able to protect our technology, or that competitors will not be able to independently develop similar or functionally competitive technologies, design around our patents, or attempt to manufacture and sell infringing products in countries that do not strongly enforce intellectual property rights.

Employees

As of December 29, 2018, we had 1,676 regular full-time employees, including 984 in operations, 327 in research and development, 234 in sales and marketing and 131 in general and administrative functions. By region, 1,188 of our employees were in North America, 315 in Asia and 173 in Europe. No employees are currently covered by a collective bargaining agreement. However, certain employees at our manufacturing facility in Thiendorf, Germany, are represented by a works council. We believe that, overall, our relations with our employees are good.

Available Information
We maintain a website at http://www.formfactor.com. We make available free of charge on our website our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, current reports on Form 8-K and amendments to those reports filed or furnished pursuant to Section 13(a) or 15(d) of the Exchange Act, as soon as reasonably practicable after we electronically file such material with, or furnish it to, the United State Securities and Exchange Commission, or SEC. The reference to our website does not constitute incorporation by reference of the information contained at the site.

The public may also read and copy any materials that we file with the SEC at the SEC's Public Reference Room at 100 F Street N.E., Washington, D.C. 20549. The public may obtain information on the operation of the Public Reference Room by calling the SEC at 1-800-SEC-0330. The SEC also maintains an Internet website that contains reports and other information regarding issuers, such as FormFactor, that file electronically with the SEC. The SEC's Internet website is located at http://www.sec.gov.

Directors and Executive Officers
The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

Item 1A: Risk Factors

In addition to the other information in this Annual Report on Form 10-K, you should carefully consider the risk factors discussed in this Annual Report on Form 10-K in evaluating FormFactor and our business. If any of the identified risks actually occur, our business, financial condition and results of operations could be materially adversely affected, the trading price of our common stock could decline, and you may lose all or part of your investment in our common stock. The risks and uncertainties described in this Annual Report on Form 10-K are not the only ones we face. Additional risks that we currently do not know about, or that we currently believe to be sufficiently important to describe here, may also impair our business operations or the trading price of our common stock.

Risks Relating to the Nature and Operations of Our Business

The markets in which we participate are competitive, and if we do not compete effectively, our operating results could be harmed.
We have experienced increased competition in the markets in which we operate, and we expect competition to intensify in the future. Increased competition has resulted in, and in the future is likely to result in, price reductions, reduced gross margins or loss of market share. Competitors might introduce new competitive products for the same markets that our products currently serve. These products may have better performance, lower prices, shorter delivery times or broader acceptance than our products.

In addition, it is possible that new competitors, including test equipment manufacturers, may offer new technologies that reduce the value of our products. Also, semiconductor manufacturers may implement chip designs or methodologies that increase test throughput, reduce test content, or change their test procedures, thereby eliminating some or all of our current product advantages.

Our current or potential competitors may have larger customer bases, more established customer relationships or greater financial, technical, manufacturing, marketing and other resources than we do. As a result, they might be able to respond more quickly to new or emerging technologies and changes in customer requirements, devote greater resources to the development, promotion, sale and support of their products, and reduce prices to increase market share.

If we do not innovate and keep pace with technological developments in the semiconductor industry, our products might not be competitive, and our revenues and operating results could suffer.
We must continue to innovate and to invest in research and development to improve our competitive position and to meet the testing requirements of our customers. Our future growth depends, in significant part, upon our ability to work effectively with and anticipate the testing needs of our customers and to develop and support new products and product enhancements to meet these needs on a timely and cost-effective basis. Our customers' testing needs are becoming more challenging as the semiconductor industry continues to experience rapid technological change driven by the demand for complex circuits that are shrinking in size, are increasing in speed and functionality, and also becoming less expensive to produce.

Successful product design, development and introduction on a timely basis require that we:

- collaborate with customers to understand their future requirements;

9

- design innovative and performance-enhancing product architectures, technologies and features that differentiate our products from those of our competitors;
- in some cases, engage with third parties who have particular expertise in order to complete one or more aspects of the design and manufacturing process;
- qualify with the customer(s) the new product, or an existing product incorporating new technology;
- transition our products to new manufacturing technologies;
- offer our products for sale at competitive price levels while maintaining our gross-margins within our financial model;
- identify emerging technological trends in our target markets;
- maintain effective marketing strategies;
- respond effectively to technological changes or product announcements by others; and
- adjust to changing market conditions quickly and cost-effectively.

Not only do we need the technical expertise to implement the changes necessary to keep our technologies current, but we must also rely heavily on the judgment of our management to anticipate future market trends. If we are unable to timely predict industry changes or industry trends, or if we are unable to modify our products or design, manufacture and deliver new products on a timely basis, or if a third party with which we engage does not timely deliver a component or service for one of our product modifications or new products, we might lose customers or market share. In addition, we might not be able to recover our research and development expenditures, which could harm our operating results.

We depend upon the sale of our probe card products for the substantial majority of our revenues.
Although we have progressed in diversifying our product offerings in recent years, we derive the majority of our revenues from the sale of our probe card products, primarily to manufacturers of microprocessor, foundry & logic and memory devices. We anticipate that sales of probe cards will represent a substantial majority of our revenues for the foreseeable future. Our success depends in large part upon the continued acceptance of our products on the basis of a variety of factors including performance, quality, timely delivery and price, and depends upon our ability to continue to develop and introduce new products that meet our customers' requirements. The degree to which we depend upon the sales of our probe card products for our revenues may increase our susceptibility to failures to satisfy the customers for such products, which may adversely affect our revenues and our ability to grow our business.

We derive a substantial portion of our revenues from a small number of customers.
A relatively small number of customers account for a significant portion of our revenues. One customer represented 19%, 26% and 30% of total revenues in fiscal 2018, 2017 and 2016, respectively. We anticipate that sales of our products to a relatively small number of customers will continue to account for a significant portion of our revenues. Consolidation in the semiconductor industry may increase this concentration. In the future, the loss of any of these customers, or cancellation, reduction or deferral of even a small number of purchases of our products by these customers could significantly reduce our revenues. Cancellations, reductions, deferrals or non-payment of invoices, could result from another downturn in the semiconductor industry, manufacturing delays, quality or reliability issues with our products, or from interruptions to our customers' operations due to fire, natural disasters or other events, or other issues with the financial stability of our customers. Furthermore, because our probe cards are custom products designed for our customers' unique wafer designs, any cancellations, reductions or delays can result in significant, non-recoverable costs. In some situations, our customers might be able to cancel or reduce orders without a significant penalty.

If our relationships with our customers deteriorate, our product development activities could be harmed.
The success of our product development efforts depends upon our ability to anticipate market trends and to collaborate closely with our customers. Our relationships with these customers provide us with access to valuable information regarding manufacturing and process technology trends in the semiconductor industry, which enables us to better plan our product development activities. These relationships also provide us with opportunities to understand the

performance and functionality requirements of our customers, which improves our ability to customize our products to fulfill their needs. Our relationships with our customers could deteriorate as a result of a variety of factors, such as if they become concerned about our ability to deliver quality products on a timely basis or to protect their intellectual property. Many of our customers are large companies that place significant orders with us, and the consequences of deterioration in our relationship with any of these companies could be significant due to the competitiveness of our industry and the significant influence that these companies exert in our market.

Consolidation in the semiconductor industry and within the semiconductor test equipment market could adversely affect the market for our products and negatively impact our ability to compete.

Consolidation in the semiconductor industry may reduce our customer base and could adversely affect the market for our products, which could cause a decline in our revenues. With consolidation, the number of actual and potential customers for our products has decreased in recent years. Consolidation may lead to relatively fewer opportunities to sell our products if we are not chosen as a supplier by any given prospective customer, and may lead to increased pricing pressures from customers that have greater volume purchasing power.

There has also been consolidation within the semiconductor test equipment market. This consolidation trend could change our interactions and relationships with semiconductor tester and prober companies and negatively impact our revenue and operating results.

Changes in customers' test strategies, equipment and processes could decrease customer demand for our products.
The demand for our products depends in large part upon the number of semiconductor designs, the pace of technology and architecture transitions in chip designs and overall semiconductor unit volume. The number of probe cards involved in a customer's wafer testing can depend upon the number of devices being tested, the complexity of these devices, the test software program, the test equipment itself, and the utilization of chip designs featuring design-for-testability capabilities. Customers may demand fewer probe cards or probing systems if they use test strategies that reduce the technical requirements on test equipment, improve available data on device performance earlier in the manufacturing process, or test devices later in the manufacturing process. Changes in the effectiveness of test technologies and test strategies used by customers may cause us to lose sales and revenues.

We may also lose sales if new semiconductor technologies or designs are implemented which cannot be efficiently tested using the products that we offer, or if semiconductor manufacturers reduce the amount or degree of testing that they perform. We may also incur significant research and development expenses in order to introduce new product architectures and platforms to serve the testing needs of new semiconductor technologies.

Cyclicality in the semiconductor industry may adversely impact our sales.
The semiconductor industry has historically been cyclical and is characterized by wide fluctuations in product supply and demand. From time to time, this industry has experienced significant downturns, often in connection with, or in anticipation of, maturing product and technology cycles, excess inventories and declines in general economic conditions. The global economic and semiconductor downturns have caused and may in the future cause our operating results to decline dramatically from one period to the next. Our business depends heavily upon the development and manufacture of new semiconductors, the rate at which semiconductor manufacturers make transitions to smaller nanometer technology nodes and implement tooling cycles, the volume of production by semiconductor manufacturers and the overall financial strength of our customers, which, in turn, depend upon the current and anticipated market demand for semiconductors and products, such as servers, personal computers, automobiles and cell phones, that use semiconductors. During industry downturns, semiconductor manufacturers sharply curtail their spending, including their spending on our products, which may adversely impact our revenues, gross margins and results of operations. Further, a protracted downturn could cause one or more of our customers to become insolvent, resulting in a loss of revenue and impacting our ability to collect on accounts receivable. The timing, length and severity of these cyclical downturns are difficult to predict and our business depends on our ability to plan for and react to these cyclical changes.

Because we generally do not have a sufficient backlog of unfilled orders to meet our quarterly revenue targets, revenues in any quarter are substantially dependent upon customer orders received and fulfilled in that quarter.
Our revenues are difficult to forecast because we generally do not have sufficient backlog of unfilled orders to meet our quarterly revenue targets at the beginning of a quarter. Rather, a substantial percentage of our revenues in any quarter depend upon customer orders for our products that we receive and fulfill in that quarter. Because our expense levels are based in part on our expectations as to future revenues and to a large extent are fixed in the short term, we might be unable to adjust spending in time to compensate for any unexpected shortfall in revenues. Accordingly, any significant shortfall of revenues in relation to our expectations could hurt our operating results.

If our ability to forecast demand for our products or the predictability of our manufacturing yields deteriorates, we could incur high inventory losses.

Each semiconductor chip design requires a custom probe card. Because our products are design-specific, demand for our products is difficult to forecast. Due to our customers’ short delivery time requirements, we often design and procure materials and, at times, produce our products in anticipation of demand for our products rather than in response to an order. Our manufacturing yields and inventory requirements, particularly for new probe card products or when we are operating at high output levels, have at times been unpredictable. If we do not obtain orders as we anticipate, if we suffer manufacturing errors, or if we build additional inventory to compensate for unpredictable manufacturing yields, we could have excess or obsolete inventory that we may not be able to sell, which would likely result in inventory write-offs or material charges for scrap.

If we are unable to efficiently manufacture our existing and new products, our business may be materially adversely affected.
We must continuously improve our manufacturing processes in an effort to increase yields and product performance, lower our costs and reduce the time required for us to design, manufacture and deliver our products in volume. If we cannot do these things, both our existing products and our new products may not be commercially successful, our revenues may be adversely affected, our customer relationships and our reputation may be harmed and our business may be materially adversely affected.

To improve our manufacturing processes, we have incurred, and may incur in the future, substantial costs in an effort to optimize capacity and yields, implement new manufacturing technologies, methods and processes, purchase new equipment, upgrade existing equipment and train technical personnel. We have experienced, and may experience in the future, manufacturing delays and other inefficiencies in connection with implementation of these improvements and customer qualifications of new processes, which have caused and could cause in the future, our operating results to decline.

We have also experienced, and may experience in the future, difficulties in manufacturing our complex products in volume on time, and at acceptable yields and cost and installation issues in the field due to the complexity of customer design requirements, including integration of probe cards with varying customer test cell environments and testing of semiconductor devices over a wide temperature range.

If we are unable to continue to reduce the time it takes for us to design and produce products, our growth could be impeded.

Our customers continuously seek to reduce the time it takes them to introduce new products to market. The cyclicality of the semiconductor industry, coupled with changing demands for semiconductor products, requires our customers to be flexible and highly adaptable to changes in the design, volume and mix of products they must produce. We may be unable to design and produce our products within the short cycle times required to respond to such rapid changes. We have lost sales in the past where we were unable to meet a customer's required delivery schedules. If we are unable to continue to reduce the time it takes for us to design, manufacture and ship our products in response to the needs of our customers, our competitive position could be harmed and we could lose sales.

Products that do not meet specifications or that contain defects could damage our reputation, decrease market acceptance of our technology, cause us to lose customers and revenues, and result in liability to us.

The complexity and ongoing development of our product designs and manufacturing processes could lead to design or manufacturing problems. Problems might result from a number of factors, including design defects, materials failure, failure of components manufactured by our suppliers to meet our specifications, contamination in the manufacturing environment, impurities in the materials used, and unknown sensitivities to process conditions such as temperature and humidity, and equipment failures. Any errors or defects could:

- cause lower than anticipated yields and lengthen delivery schedules;
- cause delays in product shipments;
- cause delays in new product introductions;
- cause us to incur warranty expenses;
- result in increased costs and diversion of development resources;
- cause us to incur increased charges due to unusable inventory;
- require design modifications; or
- decrease market acceptance or customer satisfaction with these products.

The occurrence of any one or more of these events could adversely affect our business, reputation and operating results.

As part of our sales process, we could incur substantial sales and engineering expenses that do not result in revenues.

Our customers generally expend significant efforts evaluating and qualifying our products prior to placing an order. While our customers are evaluating our products, we might incur substantial sales, marketing, and research and development expenses. For example, we typically expend significant resources educating our prospective customers regarding the uses and benefits of our probe cards and developing probe cards customized to the potential customer's needs, for which we might not be reimbursed. Although we commit substantial resources to our sales efforts, we might never receive any revenues from a customer. For example, many semiconductor chip designs never reach production, including designs for which we may have expended design effort and expense. In addition, prospective customers might decide not to use our products or use our products for a relatively small percentage of their requirements after we have expended significant effort and expense toward product design, development, and/or manufacture.

We obtain some of the components and materials we use in our products from a sole source or a limited group of suppliers, and the partial or complete loss of one of these suppliers could cause production delays.
We obtain some of the components and materials used in our products, such as printed circuit board assemblies, plating materials and ceramic substrates, from a sole source or a limited group of suppliers, and in some cases alternative sources are not currently available. Because we rely on purchase orders rather than long-term contracts with the majority of our suppliers, we cannot guarantee our ability to obtain components and materials in the long term. A sole or limited source supplier could increase prices, which could lead to a decline in our gross profit. Our dependence upon sole or limited source suppliers exposes us to several other risks, including inability to obtain an adequate supply of materials, late deliveries, poor component quality, and business disruptions

while we seek to identify and qualify alternative suppliers. The occurrence of any of these risks could adversely impact our business, results of operations and financial condition.

The use of cash and incurrence of substantial indebtedness in connection with the financing of our acquisition of Cascade Microtech may have an adverse impact on our liquidity, limit our flexibility in responding to other business opportunities and increase our vulnerability to adverse economic and industry conditions.
Our acquisition of Cascade Microtech in 2016 was financed in part by the use of cash on hand and the incurrence of a significant amount of indebtedness. As of December 29, 2018, we had $98.5 million of cash and cash equivalents, $50.5 million of short-term investments and $64.8 million term loan debt outstanding, net of debt-related issuance costs. Our use of cash on hand and indebtedness to finance the cash portion of the transaction consideration reduced our liquidity. We must generate cash from operations to pay principal and interest on our debt, thereby reducing the availability of cash flow for working capital and capital expenditure needs or to pursue other initiatives. The senior secured term loan facility contains financial covenants requiring us to maintain a certain leverage ratio of consolidated total indebtedness to EBITDA and a fixed charge coverage ratio. In addition, it also imposes limitations on our ability to incur liens and indebtedness or to pay dividends, make certain investments, or dispose of assets (in each case, subject to customary exceptions). Our ability to comply with these financial and restrictive covenants can be affected by events beyond our control. The indebtedness and restrictive covenants will also have the effect of limiting our ability to obtain additional financing, if needed, which may limit our flexibility in the conduct of our business and makes us more vulnerable to economic downturns and adverse competitive and industry conditions. In addition, a breach of the financial or restrictive covenants, among other things, could result in an event of default with respect to the senior secured term loan facility, which, if not cured or waived, could result in the obligations under the facility becoming immediately due and payable.

Because we conduct most of our business internationally, we are subject to operational, economic, financial and political risks abroad.
Sales of our products to customers outside of the United States represent a significant part of our past and anticipated revenues. Our international sales as a percentage of our revenues were 75%, 66% and 67% for fiscal 2018, 2017 and 2016, respectively. Certain of our non-U.S. based customers also purchase through their subsidiaries in the United States. In the future, we expect international sales, to continue to account for a significant percentage of our revenues. Accordingly, we will be subject to risks and challenges that we would not otherwise face if we conducted our business solely in the United States.

These risks and challenges include:

- compliance with a wide variety of foreign laws and regulations;
- legal uncertainties regarding taxes, tariffs, quotas, export controls, export licenses and other trade barriers;
- political and economic instability or foreign conflicts that involve or affect the countries of our customers;
- difficulties in collecting accounts receivable and longer accounts receivable payment cycles;
- difficulties in staffing and managing personnel, distributors and representatives;
- reduced protection for intellectual property rights in some countries;
- currency exchange rate fluctuations, which could affect the value of our assets denominated in local currency, as well as the price of our products relative to locally produced products;
- seasonal fluctuations in purchasing patterns in other countries; and
- fluctuations in freight rates and transportation disruptions.

Any of these factors could harm our existing international operations, impair our ability to continue expanding into international markets or materially adversely affect our operating results. Political developments in the United States and elsewhere may increase the risks and uncertainties associated with conducting international business, including the possibilities of greater tariffs and other trade barriers in the regions where we conduct business. In fiscal 2018 we observed a trend of increasing risks and challenges in the conduct of our international business activities, including with expanded tariffs and trade controls affecting the United States and China. Additionally, we are required to comply with foreign import and export requirements, customs and value added tax standards. Our failure to meet these requirements and standards could negatively impact our business operations.

Our foreign operations expose us to additional risks relating to currency fluctuations.
Our international operations are significant to our revenues and net income, and we plan to continue to grow internationally. We have significant business operations located in Germany. While we report our financial results in U.S. dollars, we incur certain costs in other currencies, and have certain foreign currency denominated assets and liabilities. We, therefore, face exposure to fluctuations in currency exchange rates. Although we may hedge a portion of our international currency exposure, significant fluctuations in exchange rates between the U.S. dollar and foreign currencies may adversely affect our revenues and earnings. Additionally, hedging programs are inherently risky and could expose us to additional costs and risks that could adversely affect our financial condition and results of operations.

If we fail to protect our proprietary rights, our competitors might gain access to our technology, which could adversely affect our ability to compete successfully in our markets.
If we choose not to protect our proprietary rights or fail in our efforts to protect our proprietary rights, our competitors might gain access to our technology. Unauthorized parties might attempt to copy aspects of our products or to obtain and use information that we regard as proprietary. Others might independently develop similar or competing technologies or methods or design around our patents. In addition, the laws of many foreign countries in which we or our customers do business do not protect our intellectual property rights to the same extent as the laws of the United States. As a result, our proprietary rights could be compromised, our competitors might offer products similar to ours and we might not be able to compete successfully. We also cannot assure that:

- our means of protecting our proprietary rights will be adequate;
- patents will be issued from our pending or future applications;
- our existing or future patents will be sufficient in scope or strength to provide any meaningful protection or commercial advantage to us;
- our patents or other intellectual property will not be invalidated, circumvented or successfully challenged in the United States or foreign countries; or
- others will not misappropriate our proprietary technologies or independently develop similar technologies, duplicate our products or design around any of our patents or other intellectual property, or attempt to manufacture and sell infringing products in countries that do not strongly enforce intellectual property rights.

We have spent and may be required to spend in the future, significant resources to monitor and protect our intellectual property rights. Any litigation, whether or not resolved in our favor, and whether initiated by us or by a third party, could result in significant and possibly material expenses to us and divert the efforts of our management and technical personnel.

We might be subject to claims of infringement of other parties' proprietary rights.
In the future, as we have in the past, we might receive claims that we are infringing intellectual property rights of others and inquiries about our interest in a license or assertions that we need a license to such intellectual property. The semiconductor industry is characterized by uncertain and conflicting intellectual property claims and vigorous protection and pursuit of these rights. The resolution of any claims of this nature, with or without merit, could be time consuming, result in costly litigation or cause product shipment delays. In the event of an adverse ruling or settlement, we might be required to pay substantial damages, cease the use or sale of infringing products, spend significant resources to develop non-infringing technology, discontinue the use of certain technology and/or enter into license agreements. License agreements, if required, might not be available on terms acceptable to us or at all. The loss of access to any of our intellectual property or the ability to use any of our technology could harm our business. Finally, certain of our customer contracts contain provisions that require us to defend or indemnify our customers for third party intellectual property infringement claims, which would increase the cost to us of an adverse ruling or settlement.

We have recorded significant restructuring, inventory write-offs and asset impairment charges in the past and may do so again in the future, which could have a material negative impact on our business.
We recorded restructuring charges in fiscal 2018, 2017 and 2016, and impairment charges related to our long-lived assets in fiscal 2016. We may implement restructuring plans in the future, which would require us to take additional, potentially material, restructuring charges related to employee terminations, asset disposal or exit costs. We may also be required to write off additional inventory if our product build plans or usage of inventory experience declines, and such additional write-offs could constitute material charges. In addition, significant adverse changes in market conditions could require us to take additional material impairment charges related to our long-lived assets if the changes impact the critical assumptions or estimates that we use in our assessment of the recoverability of our long-lived assets. Any such additional charges, whether related to restructuring, asset impairment or factory

underutilization may have a material negative impact on our operating results and related financial statements.

We rely on the security and integrity of our electronic data systems and our business could be damaged by a disruption, security breach or other compromise of these systems.
We rely on electronic data systems to operate and manage our business and to process, maintain, and safeguard information, including information belonging to our customers, partners, and personnel. These systems may be subject to failures or disruptions as a result of, among other things, natural disasters, accidents, power disruptions, telecommunications failures, new system implementations, acts of terrorism or war, physical security breaches, computer viruses, or other cyber security attacks. Such system failures or disruptions could subject us to downtimes and delays, compromise or loss of sensitive or confidential information or intellectual property, destruction or corruption of data, financial losses from remedial actions, liabilities to customers or other third parties, or damage to our reputation or customer relationships. Any of the foregoing could have a material adverse effect on our business, operating results and financial condition.

We may not be able to recruit or retain qualified personnel.
We believe our ability to manage successfully and grow our business and to develop new products depends, in large part, on our ability to recruit and retain qualified employees, particularly highly skilled technical, sales, management, and key staff personnel. Competition for qualified resources is intense and other companies may have greater resources available to provide substantial inducements to lure key personnel away from us or to offer more competitive compensation packages to individuals we are trying to hire.

Our failure to comply with environmental laws and regulations could subject us to significant fines and liabilities, and new laws and regulations or changes in regulatory interpretation or enforcement could make compliance more difficult and costly.
We are subject to various U.S. federal, state and local, and foreign governmental laws and regulations relating to the protection of the environment, including those governing the discharge of pollutants into the air and water, the management and disposal of hazardous substances and wastes, the cleanup of contaminated sites and the maintenance of a safe workplace. We could incur substantial costs, including cleanup costs, civil or criminal fines or sanctions and third-party claims for property damage or personal injury, as a result of violations of or liabilities under environmental laws and regulations or non-compliance with the environmental permits required at our facilities.

These laws, regulations and permits also could require the installation of costly pollution control equipment or operational changes to limit pollution emissions or decrease the likelihood of accidental releases of hazardous substances. In addition, changing laws and regulations, new laws and regulations, stricter enforcement of existing laws and regulations, the discovery of previously unknown contamination at our or others' sites or the imposition of new cleanup requirements could require us to curtail our operations, restrict our future expansion, subject us to liability and cause us to incur future costs that could harm our operations, thereby adversely impacting our operating results and cash flow.

Natural and man-made disasters may negatively impact our business.
Our business is vulnerable to the direct and indirect impact of natural and man-made disasters, such as floods, earthquakes, volcanic eruptions, nuclear accidents, and acts of terrorism. Material parts of our manufacturing and research and development operations are located in areas of California and Oregon that are prone to earthquakes and could be substantially disrupted in the event of an earthquake. It is also possible that future natural and man-made disasters could negatively impact the sales of our products as a result of impacts upon our customer's ability to make or sell their products, or impacts upon our suppliers' ability to supply components to us on a timely basis.

Risks Relating to Our Acquisitions

We may make additional acquisitions and investments in the future, which could put a strain on our resources, cause ownership dilution to our stockholders and adversely affect our financial results.
We may in the future make other acquisitions or investments, which may subject us to new or heightened risks. Integrating any newly acquired businesses, products or technologies into our company could put a strain on our resources, could be expensive and time consuming, could substantially reduce our cash reserves, could cause delays in product delivery and might not be successful. Future acquisitions and investments could divert management's attention from other business concerns and expose our business to unforeseen liabilities or risks associated with entering new markets. In addition, we might lose key employees while integrating new organizations. We might not be successful in integrating any acquired businesses, products or technologies, and might not achieve anticipated revenues and cost benefits. Investments that we make may not result in a return consistent with our projections upon which such investments are made, or may require additional investment that we did not originally anticipate. In addition, future acquisitions could result in customer dissatisfaction, performance problems with an acquired company, potentially dilutive issuances of equity securities or the incurrence of debt and restrictive debt covenants, contingent liabilities, possible impairment charges related to goodwill or other intangible assets or other unanticipated events or

circumstances. If any of these risks were to come about, our business, financial results and stock price could be materially and adversely affected.

If goodwill or other intangible assets that we recorded in connection with our past acquisitions become impaired, we could be required to take significant charges against earnings.

In connection with our accounting for the Cascade Microtech and MicroProbe acquisitions, we have recorded a significant amount of goodwill and other intangible assets. Under U.S. generally accepted accounting principles, or GAAP, we must assess, at least annually and potentially more frequently, whether the value of goodwill and other indefinite-lived intangible assets have been impaired. Finite-lived intangible assets will be assessed for impairment in the event of an impairment indicator. Any reduction or impairment of the value of goodwill or other intangible assets will result in a charge against earnings, which could materially adversely affect our results of operations and stockholders' equity in future periods. Refer to Note 2 to Notes to Consolidated Financial Statements - Goodwill and Intangible Assets for further details relating to our annual goodwill impairment assessment.

Risks Relating to Owning Our Stock

If we fail to maintain an effective system of internal and disclosure controls and procedures, we may not be able to accurately report our financial results or prevent fraud.
Effective internal and disclosure controls and procedures are necessary for us to provide reliable financial reports, to prevent fraud and to operate successfully as a public company. If we cannot provide reliable financial reports or prevent fraud, our business and reputation may be harmed. We regularly review and assess our internal controls over financial reporting and our disclosure controls and procedures. As part of that process, we may discover material weaknesses in our internal controls. If we fail to maintain effective controls or timely effect any necessary improvement of our internal and disclosure controls, we may not have accurate information to make management decisions, our operating results could be harmed or we may fail to meet our reporting obligations. Ineffective internal and disclosure controls could also cause stockholders to lose confidence in our reported financial information and our ability to manage our business, which would likely have a negative effect on the trading price of our securities.

The trading price of our common stock has been and is likely to continue to be volatile, and you might not be able to sell your shares at or above the price that you paid for them.
The trading prices of the securities of technology companies have been highly volatile. During fiscal 2018, our stock price (NASDAQ Global Market close price) ranged from $11.45 per share to $16.85 per share. The trading price of our common stock is likely to continue to be subject to wide fluctuations. Factors affecting the trading price of our common stock could include:

- variations in our operating results;
- our forecasts and financial guidance for future periods;
- announcements of technological innovations, new products or product enhancements, new product adoptions at semiconductor customers or significant agreements by us or by our competitors;
- reports regarding our ability to bring new products into volume production efficiently;
- the gain or loss of significant orders or customers;
- changes in the estimates of our operating results or changes in recommendations by any securities analysts that elect to follow our common stock;
- rulings on litigations and proceedings;
- seasonality, principally due to our customers' purchasing cycles;
- market and competitive conditions in our industry, the entire semiconductor industry and the economy as a whole;
- recruitment or departure of key personnel; and
- announcements of mergers and acquisition transactions and the ability to successfully integrate the business activities of the acquired/merged company.

In addition, if the market for technology stocks or the stock market in general experiences loss of investor confidence, the trading price of our common stock could decline for reasons unrelated to our business, operating results or financial condition. The trading price of our common stock also might decline in reaction to events that affect other companies in our industry even if these events do not directly affect us.

Provisions of our certificate of incorporation and bylaws or Delaware law might discourage, delay or prevent a change of control of our company or changes in our management and, therefore, depress the trading price of our common stock.
Delaware corporate law and our certificate of incorporation and bylaws contain provisions that could discourage, delay or prevent a change in control of our company or changes in our management that the stockholders of our company may deem advantageous. These provisions:

- establish a classified board of directors so that not all members of our board are elected at one time;

- provide that directors may only be removed "for cause" and only with the approval of 66.7% of our stockholders;
- require super-majority voting to amend some provisions in our certificate of incorporation and bylaws;
- authorize the issuance of "blank check" preferred stock that our board could issue to increase the number of outstanding shares and to discourage a takeover attempt;
- limit the ability of our stockholders to call special meetings of stockholders;
- prohibit stockholder action by written consent, which requires all stockholder actions to be taken at a meeting of our stockholders;
- provide that the board of directors is expressly authorized to make, alter or repeal our bylaws; and
- establish advance notice requirements for nominations for election to our board or for proposing matters that can be acted upon by stockholders at stockholder meetings.

In addition, Section 203 of the Delaware General Corporation Law may discourage, delay or prevent a change in control of our company. In addition, each of our named executive officers and certain other executives of the company have entered into change of control severance agreements, which were approved by our Compensation Committee, which could increase the costs associated with a change of control and thus, potentially deter such a transaction.

Item 1B: Unresolved Staff Comments

None.

Item 2: Properties

Our corporate headquarters, which includes sales, marketing, administration, manufacturing, engineering, and research and development facilities, is located in Livermore, California, United States. Our corporate headquarters comprises a campus of four buildings totaling approximately 169,000 square feet. We presently lease those four buildings. In addition, we lease office, repair and service, manufacturing and/or research and development space both inside and outside of the United States. The leases expire at various times through 2028. We believe that our existing and planned facilities are suitable for our current needs.

Information concerning our properties as of December 29, 2018 is set forth below:

Location	Principal Use	Square Footage	Ownership
Livermore, California, United States	Corporate headquarters, sales, marketing, administration, product design, manufacturing, service and repair, distribution, research and development	168,636	Leased
Beaverton, Oregon, United States	Sales, marketing, administration, product design, manufacturing, service and repair, distribution, research and development	98,946	Leased
Carlsbad, California, United States	Sales, Product design, administration, manufacturing, service and repair, distribution, research and development	30,876	Leased
San Jose, California, United States	Administration, product design, manufacturing, service and repair, distribution, research and development	23,860	Leased
St. Paul, Minnesota, United States	Marketing and design	9,122	Leased
Thiendorf, Germany	Sales, marketing, administration, manufacturing, service and repair, distribution, research and development	45,790	Leased
Munich, Germany	Sales, Manufacturing, service and repair, distribution, research and development	12,809	Leased
Dresden, Germany	Sales and service	2,960	Leased
Singapore	Sales, administration, product design, service, and field service	24,413	Leased
Jubei City, Hsinchu, Taiwan	Sales, administration, product design, field service and repair center	18,568	Leased
Bundang, South Korea	Sales, administration, product design, field service, and repair center	15,310	Leased
Yokohama City, Japan	Sales, marketing, administration, product design, manufacturing, service and repair, distribution, research and development	15,210	Leased
Hiroshima, Japan	Repair center	1,007	Leased
Suzhou, China	Sales, marketing, administration, product design, manufacturing, service and repair, distribution, research and development	15,177	Leased
Shanghai, China	Sales and service	1,865	Leased
Montbonoot Saint Martin, France	Sales and service	4,736	Leased
Legnano, Italy	Sales office	215	Leased

Item 3: Legal Proceedings

From time to time, we may be subject to legal proceedings and claims in the ordinary course of business. As of December 29, 2018, and as of the filing of this Annual Report on Form 10-K, we were not involved in any material legal proceedings. In the future, we may become a party to additional legal proceedings that may require us to spend significant resources, including proceedings designed to protect our intellectual property rights. Litigation can be expensive and disruptive to normal business operations. Moreover, the results of legal proceedings are difficult to predict, and the costs incurred in litigation can be substantial, regardless of outcome.

Item 4: Mine Safety Disclosures

Not applicable.

PART II

Item 5: Market for Registrant's Common Equity, Related Stockholder Matters and Issuer Purchases of Equity Securities

Price Range of Common Stock

Our common stock is listed on the NASDAQ Global Market under the symbol "FORM." The following table sets forth the range of high and low closing sales prices per share as reported on the Nasdaq Global Market for the periods indicated.

Fiscal 2018	High	Low
First Quarter	$16.85	$12.25
Second Quarter	15.05	11.45
Third Quarter	15.90	12.80
Fourth Quarter	16.49	11.51
Fiscal 2017	High	Low
First Quarter	$12.70	$10.65
Second Quarter	15.45	10.60
Third Quarter	16.85	11.90
Fourth Quarter	18.20	14.85

The closing sales price of our common stock on the NASDAQ Global Market was $16.20 per share on February 20, 2019. As of February 20, 2019, there were 165 registered holders of record of our common stock.

Repurchase of Common Stock

In February 2017, our Board of Directors authorized a program to repurchase up to $25 million of outstanding common stock to offset potential dilution from sales of common stock under our employee stock purchase plan and exercises of stock options. The share repurchase program will expire on February 1, 2020. During the year ended December 29, 2018, we did not repurchase any shares and, as of December 29, 2018, $6.0 million remained available for future repurchases.

Repurchased shares are retired upon the settlement of the related trade transactions with the excess of cost over par value charged to additional paid-in capital.

Dividend Policy

We have never declared or paid cash dividends on our common stock and we do not currently anticipate declaring or paying cash dividends on our common stock.

Stock Price Performance Graph

The following graph shows the total stockholder return of an investment of $100 in cash on December 28, 2013 through December 29, 2018 for (1) our common stock, (2) the S&P 500 Index and (3) the RDG Semiconductor Composite Index. All values assume reinvestment of the full amount of all dividends. No cash dividends have been declared on shares of our common stock. Stockholder returns over the indicated period are based on historical data and are not necessarily indicative of future stockholder returns.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
Among FormFactor, Inc., the S&P 500 Index, and the RDG Semiconductor Composite Index

*$100 invested on December 28, 2013 in stock or index, including reinvestment of dividends.

	Cumulative Total Return					
	December 28, 2013	December 27, 2014	December 26, 2015	December 31, 2016	December 30, 2017	December 29, 2018
FormFactor, Inc.	$100.00	$ 140.88	$ 148.37	$ 182.41	$ 254.89	$ 228.18
S&P 500	100.00	113.69	115.26	129.05	157.22	150.33
RDG Semiconductor Composite	100.00	128.26	118.01	157.41	216.98	197.02

Item 6: Selected Financial Data

The following selected consolidated financial data is derived from our consolidated financial statements. This data should be read in conjunction with our consolidated financial statements and the related notes, and Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations contained elsewhere in this Annual Report on Form 10-K.

	Fiscal 2018 (1)(2)	Fiscal 2017 (2)	Fiscal 2016 (2)(3)(5)(6)	Fiscal 2015 (2)(4)	Fiscal 2014 (2)(3)
	(Dollars in thousands, except per share data)				
Consolidated Statements of Operations Data:					
Revenues	$529,675	$548,441	$ 383,881	$282,358	$268,530
Gross profit	210,339	215,597	102,682	85,738	77,439
Net income (loss)	104,036	40,913	(6,557)	(1,523)	(19,185)
Basic net income (loss) per share	1.42	0.57	(0.10)	(0.03)	(0.34)
Diluted net income (loss) per share	1.38	0.55	(0.10)	(0.03)	(0.34)
Consolidated Balance Sheets Data:					
Cash, cash equivalents and marketable securities	$149,003	$140,172	$ 108,905	$187,589	$163,837
Working capital	235,302	213,693	172,002	214,437	196,412
Total assets	728,222	646,574	618,982	342,723	344,243
Term loan, net of current portion	34,971	87,228	125,475	—	—
Total stockholders' equity	580,164	458,637	401,056	294,681	289,436
Number of employees	1,676	1,685	1,571	958	907

(1) Fiscal 2018 net income includes an income tax benefit of $75.8 million from a valuation allowance release against certain U.S. deferred tax assets. See Note 14 of Notes to Consolidated Financial Statements.

(2) Fiscal 2018, 2017, 2016, 2015 and 2014 net income (loss) includes restructuring charges, net, of $0.2 million, $0.8 million, $7.3 million, $0.6 million and $2.7 million, respectively. See Note 6 of Notes to Consolidated Financial Statements.

(3) Fiscal 2016 and 2014 net loss includes impairment charges of $12.4 million and $1.2 million, respectively. See Note 7 of Notes to Consolidated Financial Statements.

(4) Fiscal 2015 net loss includes the following: i) a $1.5 million gain from a business interruption insurance claim relating to a factory fire at a customer; and ii) a $1.0 million net gain from the sale of intellectual property.

(5) Fiscal 2016 includes a $44.0 million tax benefit from the release of deferred tax asset valuation allowances due to deferred tax liabilities established on the acquired identifiable intangible assets from our acquisition of Cascade Microtech. Refer to Results of Operations in Management's Discussion and Analysis.

(6) Fiscal 2016 includes the following as a result of the Cascade Microtech acquisition: i) $82.6 million in revenue; ii) $27.8 million of intangible amortization expense; and iii) a $7.6 million charge for inventory-related step-up amortization.

Item 7: Management's Discussion and Analysis of Financial Condition and Results of Operations

The following discussion and analysis of our financial condition and results of operations should be read in conjunction with our consolidated financial statements and the related notes included elsewhere in this Annual Report on Form 10-K. In addition to historical consolidated financial information, the following discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions as described under the "Note Regarding Forward-Looking Statements" that appears earlier in this Annual Report on Form 10-K. Our actual results could differ materially from those anticipated by these forward-looking statements as a result of many factors, including those discussed under "Item 1A: Risk Factors" and elsewhere in this Annual Report on Form 10-K.

Overview

FormFactor, Inc., headquartered in Livermore, California, is a leading provider of electrical test and measurement solutions. We provide a broad range of high-performance probe cards, analytical probes, probe stations and thermal sub-systems to both semiconductor companies and scientific institutions. Our products provide electrical information from a variety of semiconductor and electro-optical devices and integrated circuits from development to production. Customers use our products and services to lower production costs, improve yields, and enable development of complex next-generation devices.

On June 24, 2016, we completed the acquisition of Cascade Microtech, Inc. ("Cascade Microtech"), headquartered in Beaverton, Oregon and, accordingly, our Consolidated Statements of Operations include the results of operations of Cascade Microtech since that date. Therefore, our consolidated financial results for fiscal 2016 may not be directly comparable to our consolidated financial results for fiscal 2018 and 2017.

We operate in two reportable segments consisting of the Probe Cards segment and the Systems segment. Sales of our probe cards and analytical probes are included in the Probe Cards segment, while sales of our probe stations and thermal sub-systems are included in the Systems segment.

We generated net income of $104.0 million in fiscal 2018 compared to net income of $40.9 million in fiscal 2017 and a net loss of $6.6 million in fiscal 2016. The increase in net income in fiscal 2018 compared to fiscal 2017 was primarily due to a $75.8 million income tax benefit recognized in fiscal 2018 related to the release of valuation allowances against certain U.S. deferred tax assets, partially offset by lower revenues and higher operating expenses. The increase in net income in fiscal 2017 compared to fiscal 2016 was primarily due to increased revenues generated by the acquisition of Cascade Microtech at the end of the second quarter of fiscal 2016, increased demand for our legacy products, and lower restructuring and impairment charges, partially offset by increased operating expenses and a $44.0 million income tax benefit recognized in fiscal 2016 related to the release of valuation allowances on our deferred tax assets in connection with our acquisition of Cascade Microtech.

Fiscal Year

We operate on a 52/53 week fiscal year, whereby the fiscal year ends on the last Saturday of December. The fiscal years ended December 29, 2018, December 30, 2017 and December 31, 2016 included 52 weeks, 52 weeks and 53 weeks (with an extra week falling in the fourth quarter), respectively.

Use of Estimates

Preparation of our financial statements requires management to make estimates and assumptions that affect the reported amounts of assets, liabilities, revenues and expenses. Management bases its estimates on historical experience and on various other assumptions that it believes to be reasonable under the circumstances, the results of which form the basis for making judgments about the carrying values of assets and liabilities that are not readily apparent from other sources. Actual results may differ from these estimates under different assumptions or conditions.

Critical Accounting Policies

Our discussion and analysis of our financial condition and results of operations are based upon our consolidated financial statements, which have been prepared in accordance with generally accepted accounting principles ("GAAP"). The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets and liabilities at the date of the financial statements and the reported amounts of net revenue and expenses in the reporting period. Our accounting policies are fundamental to understanding our financial condition and results of operations reported in our financial statements and related disclosures. We have identified the following accounting policies as being critical because they require our management to make particularly difficult, subjective and/or complex judgments about the effect of matters that are inherently uncertain. Our management has discussed the development, selection, application and disclosure of these critical accounting policies with the Audit Committee of our Board of Directors.

Revenue Recognition
We recognize revenue upon transferring control of products and services, and the amounts recognized reflect the consideration we expect to be entitled to receive in exchange for these products and services. An arrangement may include some or all of the following products and services: probe cards, systems, accessories, installation services, service contracts and extended warranty contracts.

A performance obligation is a promise in a contract to transfer a distinct good or service to the customer. In contracts with multiple performance obligations, we identify each performance obligation and evaluate whether the performance obligation is distinct within the context of the contract at contract inception. Performance obligations that are not distinct at contract inception are combined and accounted for as one unit. Generally, the performance obligations in a contract are considered distinct within the context of the contract and are accounted for as separate units.

Our products may be customized to our customers' specifications, however, control of our product is typically transferred to the
customer at the point in time the product is either shipped or delivered, depending on the terms of the arrangement, as the criteria for over time recognition are not met. In limited circumstances, substantive acceptance by the customer exists, which results in the deferral of revenue until acceptance is formally received from the customer. Judgment may be required in determining if the acceptance clause is substantive.

Installation services are routinely provided to customers purchasing our systems. Installation services are a distinct performance obligation apart from the systems and are recognized in the period they are performed. Service contracts, which include repair and maintenance service contracts, and extended warranty contracts are also distinct performance obligations and are recognized over the contractual service period, which ranges from one to three years. For service contracts recognized over time, we use a days-elapsed input to measure progress.

A contract's transaction price is allocated to each distinct performance obligation and recognized as revenue when, or as, the performance obligation is satisfied. In determining the transaction price, we evaluate whether the price is subject to refund or adjustment to determine the net consideration to which we expect to be entitled. We generally do not grant return privileges, except for defective products during the warranty period. Sales incentives and other programs that we may make available to customers are considered to be a form of variable consideration, which is estimated in determining the contract's transaction price to be allocated to the performance obligations.

For contracts with multiple performance obligations, we allocate the contract's transaction price to each performance obligation
based on its relative stand-alone selling price. The stand-alone selling prices are determined based on observable prices, which are the prices at which we separately sell the products. For items which do not have observable prices, we use our best estimate of the stand-alone selling prices.

We account for tax assessed by a governmental authority that is directly imposed on a revenue-producing transaction (i.e., sales, use, value added) on a net (excluded from revenue) basis.

Inventory Valuation
We state our inventories at the lower of cost (principally standard cost which approximates actual cost on a first in, first out basis) or net realizable value. We continually assess the value of our inventory and will periodically write

down its value for estimated excess inventory and product obsolescence based upon assumptions about past consumption, recent purchases and backlog. On a quarterly basis, we review inventory quantities on hand and on order under non-cancelable purchase commitments in comparison to our past consumption, recent purchases, backlog and other factors to determine what inventory quantities, if any, may not be sellable. Based on this analysis, we write down the affected inventory value for estimated excess and obsolescence charges. At the point of loss recognition, a new, lower cost basis for that inventory is established, and subsequent changes in facts and circumstances do not result in the restoration or increase in that newly established cost basis. Market conditions are subject to change, and demand for our products can fluctuate significantly. Actual consumption of inventories could differ from forecasted demand, and this difference could have a material impact on our gross profit and inventory balances based on additional provisions for excess or obsolete inventories or a benefit from the sale of inventories previously written down.

Income Taxes

We utilize the asset and liability method of accounting for income taxes, under which deferred taxes are determined based on the temporary differences between the financial statement and tax basis of assets and liabilities using tax rates expected to be in effect during the years in which the basis differences reverse and for operating losses and tax credit carryforwards. We estimate our provision for income taxes and amounts ultimately payable or recoverable in numerous tax jurisdictions around the world. Estimates involve interpretations of regulations and are inherently complex. Resolution of income tax treatments in individual jurisdictions may not be known for many years after completion of any fiscal year. We are required to evaluate the realizability of our deferred tax assets on an ongoing basis to determine whether there is a need for a valuation allowance with respect to such deferred tax assets. A valuation allowance is recorded when it is more likely than not that some or all of the deferred tax assets will not be realized. In evaluating the ability to recover deferred tax assets, we consider all available positive and negative evidence, giving greater weight to our recent cumulative income, our historical ability to utilize net operating losses in recent years and our forecast of future taxable income, including the reversal of temporary differences and the implementation of feasible and prudent tax planning strategies.

Results of Operations

The following table sets forth our operating results as a percentage of revenues:

	Fiscal 2018	Fiscal 2017	Fiscal 2016
Revenues	100.0 %	100.0 %	100.0 %
Cost of revenues	60.3	60.7	73.3
Gross profit	39.7	39.3	26.7
Operating expenses:			
Research and development	14.2	13.5	15.0
Selling, general and administrative	18.7	17.3	19.1
Restructuring and impairment charges, net	*	0.1	5.1
Total operating expenses	32.9	30.9	39.2
Operating income (loss)	6.8	8.4	(12.5)
Interest income	0.3	0.1	0.1
Interest expense	(0.6)	(0.8)	(0.6)
Other expense, net	*	*	(0.1)
Income (loss) before income taxes	6.5	7.7	(13.1)
Provision (benefit) for income taxes	(13.2)	0.2	(11.4)
Net income (loss)	19.7 %	7.5 %	(1.7)%

* Less than 0.1%.

Revenues by Segment

	Fiscal 2018	Fiscal 2017	Fiscal 2016
	(In thousands)		
Probe Cards	$434,269	$454,794	$337,970
Systems	95,406	93,647	45,911
Total	$529,675	$548,441	$383,881

Revenues by Market

	Fiscal 2018	% of Revenues	Fiscal 2017	% of Revenues	Change $	%
	(In thousands, except percentages)					
Probe Cards Markets:						
Foundry & Logic	$258,459	48.8 %	$313,714	57.2 %	$(55,255)	(17.6)%
DRAM	135,333	25.6	124,685	22.7	10,648	8.5

Flash	40,477	7.6	16,395	3.0	24,082	146.9
Systems Market:						
Systems	95,406	18.0	93,647	17.1	1,759	1.9
Total revenues	$529,675	100.0 %	$548,441	100.0 %	$(18,766)	(3.4)%

	Fiscal 2017	% of Revenues		Fiscal 2016	% of Revenues		Change $	%	
	(In thousands, except percentages)								
Probe Cards Markets:									
Foundry & Logic	$313,714	57.2	%	$237,591	61.9	%	$76,123	32.0	%
DRAM	124,685	22.7		86,910	22.6		37,775	43.5	
Flash	16,395	3.0		13,469	3.5		2,926	21.7	
Systems Market:									
Systems	93,647	17.1		45,911	12.0		47,736	104.0	
Total revenues	$548,441	100.0	%	$383,881	100.0	%	$164,560	42.9	%

The decrease in Foundry & Logic product revenue in fiscal 2018 compared to fiscal 2017 was primarily the result of lower demand from one major customer as a result of delays in its node transitions. This major customer accounted for 19.0% of total revenues for fiscal 2018, compared to 25.9% for fiscal 2017.

The increase in DRAM and Flash product revenue in fiscal 2018 compared to fiscal 2017 was driven by increased unit sales as a result of increased design wins and customer demand.

The increase in Systems product revenue in fiscal 2018 compared to fiscal 2017 was driven by increased unit sales of thermal sub-systems due to increased customer demand, partially offset by lower revenue from probe stations due to changes in product sales mix, which decreased the average selling price of units sold.

The increase in Foundry & Logic product revenue in fiscal 2017 compared to fiscal 2016 was primarily the result of strong customer demand across all end markets, including data center, mobile and automotive, as well as to the June 2016 acquisition of Cascade Microtech. All probe card revenues associated with former Cascade Microtech products and technologies are included in our Foundry & Logic revenues.

The increase in DRAM product revenue in fiscal 2017 compared to fiscal 2016 was the result of increased customer demand in the DRAM market driven by a combination of node transitions, customer capacity additions and new designs.

Flash product revenue increased in fiscal 2017 compared to fiscal 2016 due to an increase in the number of design wins.

The increases in Systems product revenue in fiscal 2017 compared to fiscal 2016 was driven by the June 2016 acquisition of Cascade Microtech. Prior to the acquisition, we did not operate in the Systems market.

Revenues by Geographic Region

	Fiscal 2018	% of Revenues		Fiscal 2017	% of Revenues		Fiscal 2016	% of Revenues	
	(In thousands, except percentages)								
United States	$133,648	25.2	%	$186,654	34.0	%	$127,641	33.3	%
Taiwan	107,476	20.3		96,903	17.7		57,331	14.9	
South Korea	91,247	17.2		81,727	14.9		65,508	17.1	
China	77,851	14.7		61,100	11.1		28,219	7.4	
Japan	49,814	9.4		44,559	8.1		38,650	10.0	
Europe	39,671	7.5		45,086	8.2		49,445	12.9	
Asia-Pacific(1)	25,980	4.9		29,902	5.5		15,440	4.0	
Rest of the world	3,988	0.8		2,510	0.5		1,647	0.4	

Total Revenues	$529,675	100.0 %	$548,441	100.0 %	$383,881	100.0 %

(1) Asia-Pacific includes all countries in the region except Taiwan, South Korea, China and Japan, which are disclosed separately.

Geographic revenue information is based on the location to which we ship the product. For example, if a certain South Korean customer purchases through their U.S. subsidiary and requests the products to be shipped to an address in South Korea, this sale will be reflected in the revenue for South Korea rather than U.S.

Changes in revenue by geographic region in fiscal 2018 compared to fiscal 2017 were primarily attributable to changes in customer demand, shifts in customer regional manufacturing strategies, and product sales mix.

The increases in geographical revenues across the regions in fiscal 2017 compared to fiscal 2016 were primarily attributable to additional revenues generated as a result of our acquisition of Cascade Microtech and strong demand for our legacy products across the board. The decrease in Europe was driven by decreases in legacy product revenue, partially offset by increases in sales of products related to our Cascade Microtech acquisition.

Cost of Revenues and Gross Margins

Cost of revenues consists primarily of manufacturing materials, payroll, shipping and handling costs, manufacturing-related overhead and amortization of certain intangible assets. Our manufacturing operations rely on a limited number of suppliers to provide key components and materials for our products, some of which are a sole source. We order materials and supplies based on backlog and forecasted customer orders. Tooling and setup costs related to changing manufacturing lots at our suppliers are also included in the cost of revenues. We expense all warranty costs, inventory provisions and amortization of certain intangible assets as cost of revenues.

Gross profit and gross margin by segment were as follows (dollars in thousands):

	Fiscal 2018			
	Probe Cards	Systems	Corporate and Other	Total
Gross profit	$187,320	$47,074	$(24,055)	$210,339
Gross margin	43.1 %	49.3 %	— %	39.7 %

	Fiscal 2017			
	Probe Cards	Systems	Corporate and Other	Total
Gross profit	$195,903	$46,647	$(26,953)	$215,597
Gross margin	43.1 %	49.8 %	— %	39.3 %

	Fiscal 2016			
	Probe Cards	Systems	Corporate and Other	Total
Gross profit	$121,407	$23,925	$(42,650)	$102,682
Gross margin	35.9 %	52.1 %	— %	26.7 %

Probe Cards

Gross profit in the Probe Cards segment decreased in fiscal 2018 compared to fiscal 2017 due to decreased sales. Gross margins remained relatively consistent as positive impacts from changes in product mix and improvements in operating efficiencies were offset by lower volume and factory utilization.

Gross profit and gross margin increased in fiscal 2017 compared to fiscal 2016 in the Probe Cards segment as a result of increased sales to several major customers, favorable product mix, higher factory utilization and improved manufacturing efficiency.

Systems

Gross profit and gross margin in the Systems segment remained relatively consistent in fiscal 2018 compared to fiscal 2017.

Gross margins decreased in the Systems segment in fiscal 2017 compared to fiscal 2016 primarily due to unfavorable changes in product mix and foreign currency exchange rates. Prior to the acquisition of Cascade Microtech in June 2016, we only operated in the Probe Cards segment and did not generate any Systems segment revenue.

Corporate and Other

Corporate and Other includes unallocated expenses relating to amortization of intangible assets, share-based compensation, acquisition-related costs, including charges related to inventory stepped up to fair value and other costs, which are not used in evaluating the results of, or in allocating resources to, our reportable segments.

Overall

Gross profit and gross margin fluctuate with revenue levels, product mix, selling prices, factory loading and material costs. For fiscal 2018 compared to fiscal 2017, gross profit decreased due to lower revenue, while gross margins increased due to product mix, partially offset by lower utilization.

The increase in overall gross margins in fiscal 2017 compared to fiscal 2016 was due to strong revenues, favorable product mix and higher factory utilization in our DRAM and Foundry & Logic products, as well as improved manufacturing efficiency. Fiscal 2016 gross margin also included the impact of higher amortization of backlog and inventory step-up, which reduced gross margin.

Stock-based compensation expense included in gross profit for fiscal 2018, 2017 and 2016 was $3.5 million, $3.5 million and $2.5 million, respectively.

Research and Development

	Fiscal Year Ended			
	December 29, 2018	December 30, 2017	$ Change	% Change
	(Dollars in thousands)			
Research and development	$74,976	$ 73,807	$1,169	1.6 %
% of revenues	14.2 %	13.5 %		

	Fiscal Year Ended			
	December 30, 2017	December 31, 2016	$ Change	% Change
	(Dollars in thousands)			
Research and development	$73,807	$ 57,453	$16,354	28.5 %
% of revenues	13.5 %	15.0 %		

The increase in research and development expenses in fiscal 2018 compared to fiscal 2017 was primarily driven by an increase in project material costs to support research and development within our Probe Cards segment, partially offset by a decrease in employee incentive compensation. The lower employee incentive compensation was primarily due to decreased profitability from lower revenues. The components of this increase were as follows (in millions):

	Fiscal 2018 compared to Fiscal 2017
Employee compensation costs	$ (0.2)
Stock-based compensation	0.1
Project material costs	0.4
Depreciation	0.4
Other	0.5
	$ 1.2

The increase in research and development expenses in fiscal 2017 compared to fiscal 2016 was primarily due to our acquisition of Cascade Microtech in June 2016, as well as an increase in incentive plan costs related to improved performance.

26

The components of this increase were as follows (in millions):

	Fiscal 2017 compared to Fiscal 2016
Employee compensation costs	$ 12.5
Stock-based compensation	2.0
Project material costs	0.2
Depreciation	0.7
Other	1.0
	$ 16.4

Stock-based compensation expense included within research and development in fiscal 2018, 2017 and 2016 was $5.4 million, $5.3 million and $3.3 million, respectively.

Selling, General and Administrative

	Fiscal Year Ended			
	December 29, 2018	December 30, 2017	$ Change	% Change
	(Dollars in thousands)			
Selling, general and administrative	$99,094	$ 94,679	$4,415	4.7 %
% of revenues	18.7 %	17.3 %		

	Fiscal Year Ended			
	December 30, 2017	December 31, 2016	$ Change	% Change
	(Dollars in thousands)			
Selling, general and administrative	$94,679	$ 73,444	$21,235	28.9 %
% of revenues	17.3 %	19.1 %		

The increase in fiscal 2018 compared to fiscal 2017 was primarily due to an increase in consulting fees related to information systems implementation and stock-based compensation, partially offset by a reduction in employee incentive compensation due to decreased profitability from lower revenues. The components of this increase were as follows (in millions):

	Fiscal 2018 compared to Fiscal 2017
Employee compensation costs	$ (0.2)
Stock-based compensation	1.5
Depreciation and amortization	0.7
Consulting fees	1.5
Other	0.9
	$ 4.4

The increase in selling, general and administrative expenses in fiscal 2017 compared to fiscal 2016 was primarily due to our acquisition of Cascade Microtech in June 2016, an increase in incentive plan costs related to improved performance, and amortization of intangible assets, offset by a reduction in acquisition related costs.

The components of this increase were as follows (in millions):

	Fiscal 2017 compared to Fiscal 2016
Employee compensation costs	$ 14.0
Consulting fees	3.3
Depreciation and amortization	2.7
Travel related costs	2.0
Stock-based compensation	2.5
Acquisition related	(5.1)
Other	1.8
	$ 21.2

Stock-based compensation expense included within selling, general and administrative expenses in fiscal 2018, 2017 and 2016 was $8.9 million, $7.4 million and $4.9 million, respectively.

Restructuring and Impairment Charges, net

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(Dollars in thousands)		
Restructuring and impairment charges, net	$ 160	$ 810	$ 19,692
% of revenues	*	0.1 %	5.1 %

* Less than 0.1%.

Restructuring and impairment charges, net are comprised of costs related to employee termination benefits, cost of long-lived assets abandoned or impaired, as well as contract termination costs.

Restructuring charges in fiscal 2018 were related to a specific product line and associated personnel within the Systems segment. Restructuring and impairment charges, net, in fiscal 2017 and 2016, were related to the integration of Cascade Microtech into our operations. The fiscal 2016 period also included costs related to the consolidation of our operations and a $12.4 million charge for the write-off of in-process research and development.

See Notes 6 and Note 7 of Notes to Consolidated Financial Statements for additional information.

Interest Income and Interest Expense

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(Dollars in thousands)		
Interest income	$ 1,356	$ 548	$ 327
Weighted average balance of cash and investments	$ 138,467	$ 124,637	$ 131,610
Weighted average yield on cash and investments	1.51 %	0.84 %	0.31 %
Interest expense	$ 3,314	$ 4,491	$ 2,391
Average debt outstanding	$ 90,086	$ 127,598	$ 76,228
Weighted average interest rate on debt	3.98 %	3.07 %	1.25 %

Interest income is earned on our cash, cash equivalents, restricted cash and marketable securities. The increase in interest income in fiscal 2018 compared to fiscal 2017 was attributable to higher investment yields, as well as higher average investment balances. The increase in interest income in fiscal 2017 compared with fiscal 2016 was attributable to higher investment yields partially offset by lower average cash and investment balances.

Interest expense primarily includes interest on our term loan, partially offset from income from our interest-rate swap derivative contracts, as well as term loan issuance costs amortization charges. The decrease in interest expense in fiscal 2018 compared to fiscal 2017 was primarily due to lower outstanding debt balances as a result of principal payments made, partially offset by higher interest rates. The increase in interest expense in fiscal 2017 compared to fiscal 2016 was attributable to the term loan entered into at the end of June 2016 in connection with our acquisition of Cascade Microtech and, accordingly, was not outstanding for the first six months of fiscal 2016.

Other Income (Expense), Net

Other income (expense), net primarily includes the effects of foreign currency impact and various other gains and losses.

Provision (Benefit) For Income Taxes

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(Dollars in thousands)		
Provision (benefit) for income taxes	$ (70,109)	$ 1,293	$ (43,638)
Effective tax rate	(206.6)%	3.1%	86.9%

Provision for income taxes reflects the tax provision on our operations in foreign and U.S. jurisdictions, offset by tax benefits from a partial release of valuation allowance against U.S. federal and state deferred tax assets and from lapsing of statute of limitations related to uncertain tax positions in foreign jurisdictions. As of December 29, 2018, we maintain a valuation allowance of $34.0 million primarily against our California deferred tax assets and foreign tax credits, due to uncertainty about the future realization of these assets.

The benefit for income taxes in fiscal 2018 includes a $75.8 million reduction to our valuation allowance on our U.S. deferred tax assets ("DTAs") as sufficient positive evidence existed to support the realization of such DTAs. The effective tax rate in fiscal 2018 also benefited from a lower statutory tax rate in the U.S., partially offset by higher profits in foreign jurisdictions.

The provision for income taxes in fiscal 2017 includes taxes on higher profits in foreign jurisdictions compared to fiscal 2016 and was reduced in fiscal 2017 for refundable AMT tax credits in the U.S. of $2.4 million. In fiscal 2017 we maintained a full valuation allowance against our U.S. federal and state DTAs.

The income tax benefit in fiscal 2016 was primarily due to the release of valuation allowance on our DTA in connection with our acquisition of Cascade Microtech in June 2016 as a result of the establishment of deferred tax liabilities ("DTLs") on the acquired identifiable intangible assets. These DTLs exceeded the acquired DTAs by $44.0 million and created additional sources of income to realize a tax benefit for our previously-existing DTAs. Accordingly, the valuation allowance on a portion of our DTAs was released and resulted in an income tax benefit of $44.0 million.

Our effective tax rate may vary from period to period based on changes in estimated taxable income or loss by jurisdiction, changes to the valuation allowance, changes to U.S. federal, state or foreign tax laws, future expansion into areas with varying country, state, and local income tax rates, deductibility of certain costs and expenses by jurisdiction.

Liquidity and Capital Resources

Capital Resources

Our working capital increased to $235.3 million at December 29, 2018 compared to $213.7 million at December 30, 2017 primarily due to cash generated from operations, partially offset by cash used for the acquisition of property, plant and equipment and payments on our term loan.

Cash and cash equivalents primarily consist of deposits held at banks and money market funds. Marketable securities primarily consist of U.S. agency securities and corporate bonds. We typically invest in highly-rated securities with low probabilities of default. Our investment policy requires investments to be rated single A or better, and limits the types of acceptable investments, issuer concentration and duration of the investment.

Our cash, cash equivalents and marketable securities totaled approximately $149.0 million at December 29, 2018 compared to $140.2 million at December 30, 2017. We believe that we will be able to satisfy our working capital requirements for at least the next twelve months with the liquidity provided by our existing cash, cash equivalents, marketable securities and cash provided by operations. To the extent necessary, we may consider entering into short and long-term debt obligations, raising cash through a stock issuance, or obtaining new financing facilities, which may not be available on terms favorable to us. Our future capital requirements may vary materially from those now planned.

If we are unsuccessful in maintaining or growing our revenues, maintaining or reducing our cost structure (in response to an industry demand downturn or other event), or increasing our available cash through debt or equity financings, our cash, cash equivalents and marketable securities may decline in fiscal 2019.

We utilize a variety of tax planning and financing strategies in an effort to manage our worldwide cash and deploy funds to locations where they are needed. As part of these strategies, we indefinitely reinvest a portion of our foreign earnings. During fiscal 2018, we repatriated $16.5 million of foreign earnings. Should we require additional capital in the U.S., we may elect to repatriate indefinitely-reinvested foreign funds or raise capital in the U.S.

Cash Flows

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(Dollars in thousands)		
Net cash provided by operating activities	$68,700	$ 86,323	$ 17,423
Net cash used in investing activities	(21,295)	(59,425)	(205,539)
Net cash (used in) provided by financing activities	(39,329)	(39,470)	143,614

Operating Activities
Net cash provided by operating activities in fiscal 2018 was primarily attributable to net income of $104.0 million, which included $2.1 million of net non-cash income, offset by operating assets and liabilities using $33.3 million of cash as discussed in more detail below.

Accounts receivable increased $13.8 million to $95.3 million at December 29, 2018 compared to $81.5 million at December 30, 2017 as a result of increased revenues in the fourth quarter of 2018 compared to the fourth quarter of 2017, changes in the timing of customer shipments, and changes in payments terms related to customer mix.

Inventories, net, increased $9.9 million to $77.7 million at December 29, 2018 compared to $67.8 million at December 30, 2017 as a result of changes in product mix and increased inventory purchases to shorten lead times and improve vendor pricing, partially offset by a $10.5 million increase to our provision for excess and obsolete inventories.

Investing Activities
Net cash used in investing activities in fiscal 2018 primarily related to $19.9 million of cash used in the acquisition of property, plant and equipment and $1.5 million used for the purchase of marketable securities, net of maturities.

Financing Activities

Net cash used in financing activities in fiscal 2018 primarily related to $41.3 million of principal payments made towards the repayment of our term loan, and $5.8 million related to tax withholdings associated with the net share settlements of our equity awards, partially offset by $7.7 million of proceeds received from issuances of common stock under our stock incentive plans.

Debt Facility

On June 24, 2016, we entered into a credit agreement (the “Credit Agreement”) with HSBC Bank USA, National Association ("HSBC"). Pursuant to the Credit Agreement, the lenders provided us with a senior secured term loan facility of $150 million (the “Term Loan”). The proceeds of the Term Loan were used to finance a portion of the purchase price paid in connection with the acquisition of Cascade Microtech. As of December 29, 2018, the balance outstanding was $65.0 million.

The Term Loan bears interest at a rate equal to, at our option, (i) the applicable London Interbank Offered Rate ("LIBOR") rate plus 2.00% per annum or (ii) Base Rate (as defined in the Credit Agreement) plus 1.00% per annum. We have currently elected to pay interest at 2.00% over the one-month LIBOR rate. Interest payments are payable in monthly installments over a five-year period. As of December 29, 2018, the interest rate pursuant to the Term Loan was 4.35%.

On July 25, 2016, we entered into an interest rate swap agreement with HSBC and other lenders to hedge the interest payments on the Term Loan for the notional amount of $95.6 million. As future levels of LIBOR over the life of the loan are uncertain, we entered into these interest-rate swap agreements to hedge the exposure in interest rate risks associated with movement in LIBOR rates. By entering into the agreements, we convert a floating rate interest at one-month LIBOR plus 2% into a fixed rate interest at 2.939%. As of December 29, 2018, the notional amount of the loan that is subject to this interest rate swap is $60.0 million. See Note 8 of Notes to Condensed Consolidated Financial Statements for additional information.

The Term Loan amortizes in equal quarterly installments, which began June 30, 2016, in annual amounts equal to 5% for year one, 10% for year two, 20% for year three, 30% for year four and 35% for year five. The Credit Agreement allows voluntary prepayment to be made at any time to prepay the Term Loan in whole or in part without penalty or premium. As of December 29, 2018, we have made prepayments of $40.0 million in addition to scheduled installments per the Credit Agreement, including $15.0 million of prepayments made in fiscal 2018.

The obligations under the Term Loan are guaranteed by substantially all of our assets and the assets of our domestic subsidiaries, subject to certain customary exceptions.

The Credit Agreement contains negative covenants customary for financing of this type, as well as certain financial maintenance covenants. As of December 29, 2018, we were in compliance with all covenants under the Credit Agreement.

Stock Repurchase Program

In February 2017, our Board of Directors authorized a program to repurchase up to $25 million of outstanding common stock to offset potential dilution from issuances of common stock under our stock-based incentive plans. The share repurchase program will expire on February 1, 2020. During fiscal 2018, we did not repurchase any shares and, as of December 29, 2018, $6.0 million remained available for future repurchases.

Repurchased shares are retired upon the settlement of the related trade transactions with the excess of cost over par value charged to additional paid-in capital. All repurchases were made in compliance with Rule 10b-18 under the Securities Exchange Act of 1934, as amended.

Contractual Obligations and Commitments

The following table summarizes our significant contractual commitments to make future payments in cash under contractual obligations as of December 29, 2018 (in thousands):

	Payments Due In Fiscal Year						
	2019	2020	2021	2022	2023	After 2022	Total
Operating leases	$6,256	$6,522	$5,742	$4,786	$4,355	$20,382	$48,043
Senior secured term loan facility-principal payments	30,000	35,000	—	—	—	—	65,000
Senior secured term loan facility-interest payments[1]	2,190	556	—	—	—	—	2,746
Total	$38,446	$42,078	$5,742	$4,786	$4,355	$20,382	$115,789

(1) Represents our minimum interest payment commitments at 4.35% per annum.

The table above excludes our gross liability for unrecognized tax benefits, which totaled $25.2 million as of December 29, 2018. The timing of any payments which could result from these unrecognized tax benefits will depend upon a number of factors. Accordingly, the timing of payment cannot be estimated and has been excluded from the table above.

Off-Balance Sheet Arrangements

Historically, we have not participated in transactions that have generated relationships with unconsolidated entities or financial partnerships, such as entities often referred to as structured finance or special purpose entities, which would have been established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes. As of December 29, 2018, we were not involved in any off-balance sheet arrangements.

Indemnification Agreements

We have entered, and may from time to time in the ordinary course of our business enter, into contractual arrangements with third parties that include indemnification obligations. Under these contractual arrangements, we have agreed to defend, indemnify and/or hold the third party harmless from and against certain liabilities. These arrangements include indemnities in favor of customers in the event that our products or services infringe a third party's intellectual property or cause property or other indemnities in favor of our lessors in connection with facility leasehold liabilities that we may cause. In addition, we have entered into indemnification agreements with our directors and certain of our officers, and our bylaws contain indemnification obligations in favor of our directors, officers and agents. These indemnity arrangements may limit the type of the claim, the total amount that we can be required to pay in connection with the indemnification obligation and the time within which an indemnification claim can be made. The duration of the indemnification obligation may vary, and for most arrangements, survives the agreement term and is indefinite. We believe that substantially all of our indemnity arrangements provide either for limitations on the maximum potential future payments we could be obligated to make, or for limitations on the types of claims and damages we could be obligated to indemnify, or both. However, it is not possible to determine or reasonably estimate the maximum potential amount of future payments under these indemnification obligations due to the varying terms of such obligations, a lack of history of prior indemnification claims, the unique facts and circumstances involved in each particular contractual arrangement and in each potential future claim for indemnification, and the contingency of any potential liabilities upon the occurrence of events that are not reasonably determinable. We have not had any material requests for indemnification under these arrangements. We have not recorded any liabilities for these indemnification arrangements on our Consolidated Balance Sheets as of December 29, 2018 or December 30, 2017.

New Accounting Pronouncements

See Note 18 of Notes to Consolidated Financial Statements.

Item 7A: Quantitative and Qualitative Disclosures about Market Risk

Foreign Currency Exchange Risk

We conduct certain operations in foreign currencies. We enter into currency forward exchange contracts to hedge a portion, but not all, of existing foreign currency denominated amounts. Gains and losses on these contracts are generally recognized in Other income (expense), net in our Consolidated Statements of Operations. Because the effect of movements in currency exchange rates on the currency forward exchange contracts generally offsets the related effect on the underlying items being hedged, these financial instruments are not expected to subject us to risks that would otherwise result from changes in currency exchange rates. We do not use derivative financial instruments for trading or speculative purposes. We recognized a net loss from our foreign exchange of $0.3 million, $0.6 million and $0.7 million, respectively in fiscal 2018, 2017 and 2016.

Interest Rate Sensitivity

Our exposure to market risk for changes in interest rates relates primarily to our investment portfolio. We invest in a number of securities including U.S. agency discount notes, money market funds and commercial paper. We attempt to ensure the safety and preservation of our invested principal funds by limiting default risk, market risk and reinvestment risk. We mitigate default risk by investing in high grade investment securities. By policy, we limit the amount of credit exposure to an issuer, except U.S. Treasuries and U.S. agencies.

Our exposure to interest rate risk arising from our Term Loan (See Note 5 of Notes to Consolidated Financial Statements) is insignificant as a result of the interest-rate swap agreement (See Note 8 of Notes to Consolidated Financial Statements) that we entered into with HSBC and other lenders to hedge the interest payments on our Term Loan.

We use interest rate derivative instruments to manage interest rate exposures. We do not use derivative instruments for trading or speculative purposes. The fair market value of our fixed rate securities may be adversely impacted by increases in interest rates while income earned on floating rate securities may decline as a result of decreases in interest rates. A hypothetical 100 basis-point (one percentage point) increase or decrease in interest rates compared to rates at December 29, 2018 and December 30, 2017 would have affected the fair value of our investment portfolio by $0.7 million and $1.1 million, respectively.

Item 8: Financial Statements and Supplementary Data

Consolidated Financial Statements

The consolidated financial statements and supplementary data required by this item are included in the section entitled "Consolidated Financial Statements" of this Annual Report on Form 10-K. See Item 15 for a list of our consolidated financial statements.

Item 9: Changes in and Disagreements with Accountants on Accounting and Financial Disclosure

None.

Item 9A: Controls and Procedures

Evaluation of Disclosure Controls and Procedures

Based on our management's evaluation (with the participation of our principal executive officer and principal financial officer), as of the end of the period covered by this report, our principal executive officer and principal financial officer have concluded that our disclosure controls and procedures (as defined in Rules 13a-15(e) and 15d-15(e) under the Securities Exchange Act of 1934, as amended, (the "Exchange Act")) were effective to ensure that information required to be disclosed by us in reports that we file or submit under the Exchange Act is recorded, processed, summarized and reported within the time periods specified in Securities and Exchange Commission rules and forms and is accumulated and communicated to our management, including our principal executive officer and principal financial officer, as appropriate to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There have been no changes in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) that occurred during the quarter ended December 29, 2018, that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act. Internal control over financial reporting is a process designed by, or under the supervision of, our Principal Executive Officer and Principal Financial Officer, and effected by our board of directors, management and other personnel and consultants, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles, and includes those policies and procedures that:

(i) pertain to the maintenance of records that in reasonable detail accurately and fairly reflect our transactions and dispositions of assets;

(ii) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that our receipts and expenditures are being made only in accordance with the authorization of our management and directors; and

(iii) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use or disposition of our assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

Under the supervision and with the participation of our management, including our Principal Executive Officer and Principal Financial Officer, we conducted an assessment of the effectiveness of our internal control over financial reporting as of December 29, 2018. In making this assessment, our management used the criteria set forth in Internal Control-Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission ("COSO"). Based on the results of this assessment, management has concluded that our internal control over financial reporting was effective as of December 29, 2018.

The effectiveness of our internal control over financial reporting as of December 29, 2018 has been audited by KPMG LLP, an independent registered public accounting firm, as stated in their report which appears in this Annual Report on Form 10-K.

Limitations on the Effectiveness of Controls

Control systems, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control systems’ objectives are being met. Further, the design of any control systems must reflect the fact that there are resource constraints, and the benefits of all controls must be considered relative to their costs. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud, if any, within our company have been detected. These inherent limitations include the realities that judgments in decision making can be faulty and that breakdowns can occur because of simple error or mistake. Control systems can also be circumvented by the individual acts of some persons, by collusion of two or more people, or by management override of the controls. The design of any system of controls is based, in part, on certain assumptions about the likelihood of future events, and there can be no assurance that any design will succeed in achieving its stated goals under all potential future conditions. Over time, controls may become inadequate because of changes in conditions or deterioration in the degree of compliance with policies or procedures.

CEO and CFO Certifications

We have attached as exhibits to this Annual Report on Form 10-K the certifications of our Chief Executive Officer and Chief Financial Officer, which are required in accordance with the Exchange Act. We recommend that this Item 9A be read in conjunction with the certifications for a more complete understanding of the subject matter presented.

Item 9B: Other Information

None.

PART III

Item 10: Directors, Executive Officers and Corporate Governance

The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

Item 11: Executive Compensation

The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

Item 12: Security Ownership of Certain Beneficial Owners and Management and Related Stockholder Matters

The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

Item 13: Certain Relationships and Related Transactions, and Director Independence

The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

Item 14: Principal Accounting Fees and Services

The information required by this item is incorporated by reference to the proxy statement for our 2019 Annual Meeting of Stockholders.

PART IV

Item 15: Exhibits, Financial Statement Schedules

Financial Statements and Schedules

The Consolidated Financial Statements, together with the report thereon of KPMG LLP, are included on the pages indicated below:

Financial statement schedules have been omitted because they are not applicable or the required information is shown in the consolidated financial statements or notes thereto.

Exhibits

The exhibits listed in the accompanying index to exhibits are filed or incorporated by reference as part of this Annual Report on Form 10-K.

Item 16: Form 10-K Summary

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the Registrant has duly caused this report to be signed on its behalf by the undersigned, thereunto duly authorized, in the City of Livermore, State of California, on February 26, 2019.

FORMFACTOR, INC.

By: /s/ SHAI SHAHAR
Shai Shahar
Chief Financial Officer
(Principal Financial Officer and Principal Accounting Officer)

POWER OF ATTORNEY

KNOW BY ALL PERSONS BY THESE PRESENTS, that each of the undersigned whose signature appears below constitutes and appoints Shai Shahar and Jason Cohen, and each of them, the undersigned's true and lawful attorneys in-fact and agents with full power of substitution, for the undersigned and in the undersigned's name, place and stead, in any and all capacities, to sign any and all amendments to this Annual Report on Form 10-K and any other documents in connection therewith, and to file the same, with all exhibits thereto, with the Securities and Exchange Commission, granting unto said attorneys-in-fact and agents, and each of them, full power and authority to do and perform each and every act requisite and necessary to be done with respect to this Annual Report on Form 10-K, including amendments, as fully to all intents and purposes as the undersigned might or could do in person, hereby ratifying and confirming all that said attorneys-in-fact and agents, or his or their substitute or substitutes, may lawfully do or cause to be done by virtue hereof.

IN WITNESS WHEREOF, each of the undersigned has executed this Power of Attorney as of the date indicated below.

Pursuant to the requirements of the Securities Exchange Act of 1934, this report has been signed below by the following persons on behalf of the Registrant and in the capacities and on the dates indicated.

Signature	Title	Date
Principal Executive Officer: /s/ MICHAEL D. SLESSOR Michael D. Slessor	Chief Executive Officer and Director	February 26, 2019
Principal Financial Officer and Principal Accounting Officer: /s/ SHAI SHAHAR Shai Shahar	Chief Financial Officer	February 26, 2019

37

Signature	Title	Date
Additional Directors:		
/s/ LOTHAR MAIER Lothar Maier	Director	February 26, 2019
/s/ EDWARD ROGAS, JR Edward Rogas, Jr	Director	February 26, 2019
/s/ KELLEY STEVEN-WAISS Kelley Steven-Waiss	Director	February 26, 2019
/s/ MICHAEL W. ZELLNER Michael W. Zellner	Director	February 26, 2019
/s/ RAYMOND LINK Raymond Link	Director	February 26, 2019
/s/ RICHARD DELATEUR Richard DeLateur	Director	February 26, 2019
/s/ THOMAS ST. DENNIS Thomas St. Dennis	Director	February 26, 2019

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
FormFactor, Inc.:

Opinions on the Consolidated Financial Statements and Internal Control Over Financial Reporting
We have audited the accompanying consolidated balance sheets of FormFactor, Inc. and subsidiaries (the Company) as of December 29, 2018 and December 30, 2017, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the years in the three-year period ended December 29, 2018, and the related notes (collectively, the consolidated financial statements). We also have audited the Company's internal control over financial reporting as of December 29, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 29, 2018 and December 30, 2017, and the results of its operations and its cash flows for each of the years in the three-year period ended December 29, 2018, in conformity with U.S. generally accepted accounting principles. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 29, 2018, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission.
Change in Accounting Principle
As discussed in Note 18 to the consolidated financial statements, the Company has changed its method of accounting for revenue from contracts with customers for the year-ended December 29, 2018 due to the adoption of Accounting Standards Codification 606, Revenue from Contracts with Customers.
Basis for Opinions
The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying Management's Report on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express an opinion on the Company's consolidated financial statements and an opinion on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.
We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.
Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.
Definition and Limitations of Internal Control Over Financial Reporting

A company's internal control over financial reporting is a process designed to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles. A company's internal control over financial reporting includes those policies and procedures that (1) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (2) provide reasonable assurance that transactions are recorded as necessary to permit preparation of financial statements in accordance with generally accepted accounting principles, and that receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (3) provide reasonable assurance regarding prevention or timely detection of unauthorized acquisition, use, or disposition of the company's assets that could have a material effect on the financial statements.

Because of its inherent limitations, internal control over financial reporting may not prevent or detect misstatements. Also, projections of any evaluation of effectiveness to future periods are subject to the risk that controls may become inadequate because of changes in conditions, or that the degree of compliance with the policies or procedures may deteriorate.

/s/ KPMG LLP

We have served as the Company's auditor since 2013.
Portland, Oregon
February 26, 2019

FORMFACTOR, INC.
CONSOLIDATED BALANCE SHEETS

	December 29, 2018	December 30, 2017
	(In thousands, except share and per share data)	
ASSETS		
Current assets:		
Cash and cash equivalents	$98,472	$ 91,184
Marketable securities	50,531	48,988
Accounts receivable, net	95,333	81,515
Inventories, net	77,706	67,848
Restricted cash	849	372
Refundable income taxes	1,260	2,242
Prepaid expenses and other current assets	13,669	13,705
Total current assets	337,820	305,854
Restricted cash	1,225	1,170
Property, plant and equipment, net	54,054	46,754
Goodwill	189,214	189,920
Intangibles, net	67,640	97,484
Deferred tax assets	77,301	3,133
Other assets	968	2,259
Total assets	$728,222	$ 646,574
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$40,006	$ 35,046
Accrued liabilities	27,731	33,694
Current portion of term loan, net of unamortized issuance cost of $160 and $307	29,840	18,443
Deferred revenue	4,941	4,978
Total current liabilities	102,518	92,161
Term loan, less current portion, net of unamortized issuance cost of $29 and $272	34,971	87,228
Deferred tax liabilities	2,355	3,379
Deferred rent and other liabilities	8,214	5,169
Total liabilities	148,058	187,937
Stockholders' equity:		
Preferred stock, $0.001 par value:		
10,000,000 shares authorized; no shares issued and outstanding	—	—
Common stock, $0.001 par value:		
250,000,000 shares authorized; 74,139,712 and 72,532,176 shares issued and outstanding	74	73
Additional paid-in capital	862,897	843,116
Accumulated other comprehensive income	780	3,021
Accumulated deficit	(283,587)	(387,573)
Total stockholders' equity	580,164	458,637
Total liabilities and stockholders' equity	$728,222	$ 646,574

The accompanying notes are an integral part of these consolidated financial statements.

41

FORMFACTOR, INC.
CONSOLIDATED STATEMENTS OF OPERATIONS

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(In thousands, except per share data)		
Revenues	$529,675	$ 548,441	$ 383,881
Cost of revenues	319,336	332,844	281,199
Gross profit	210,339	215,597	102,682
Operating expenses:			
Research and development	74,976	73,807	57,453
Selling, general and administrative	99,094	94,679	73,444
Restructuring and impairment charges, net	160	810	19,692
Total operating expenses	174,230	169,296	150,589
Operating income (loss)	36,109	46,301	(47,907)
Interest income	1,356	548	327
Interest expense	(3,314)	(4,491)	(2,391)
Other expense, net	(224)	(152)	(224)
Income (loss) before income taxes	33,927	42,206	(50,195)
Provision (benefit) for income taxes	(70,109)	1,293	(43,638)
Net income (loss)	$104,036	$ 40,913	$ (6,557)
Net income (loss) per share:			
Basic	$1.42	$ 0.57	$ (0.10)
Diluted	$1.38	$ 0.55	$ (0.10)
Weighted-average number of shares used in per share calculations:			
Basic	73,482	72,292	64,941
Diluted	75,182	74,239	64,941

The accompanying notes are an integral part of these consolidated financial statements.

FORMFACTOR, INC.
CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
	(In thousands)		
Net income (loss)	$ 104,036	$ 40,913	$ (6,557)
Other comprehensive income (loss), net of tax:			
Foreign currency translation adjustments	(2,065)	6,764	(2,042)
Unrealized gains on the translation of deferred tax assets	163	—	—
Unrealized gains (losses) on available-for-sale marketable securities	(8)	(206)	29
Unrealized gains (losses) on derivative instruments	(331)	203	495
Other comprehensive income (loss), net of tax	(2,241)	6,761	(1,518)
Comprehensive income (loss)	$ 101,795	$ 47,674	$ (8,075)

The accompanying notes are an integral part of these consolidated financial statements.

FORMFACTOR, INC.
CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

	Common Stock		Additional Paid-in Capital	Accumulated Other Comprehensive Income (Loss)	Accumulated Deficit	Total
	Shares	Amount				
	(In thousands, except shares)					
Balances, December 26, 2015	58,088,969	$ 58	$718,904	$ (2,222)	$(422,059)	$294,681
Issuance of common stock pursuant to exercise of options for cash	232,190	—	2,003	—	—	2,003
Issuance of common stock pursuant to vesting of restricted stock units	1,579,218	2	—	—	—	2
Issuance of common stock under the Employee Stock Purchase Plan	557,281	1	3,740	—	—	3,741
Issuance of common stock pursuant to Cascade Microtech acquisition	10,450,189	10	97,069	—	—	97,079
Stock-based compensation	—	—	11,625	—	—	11,625
Other comprehensive loss	—	—	—	(1,518)	—	(1,518)
Net loss	—	—	—	—	(6,557)	(6,557)
Balances, December 31, 2016	70,907,847	71	833,341	(3,740)	(428,616)	401,056
Issuance of common stock pursuant to exercise of options for cash	1,473,389	1	13,836	—	—	13,837
Issuance of common stock pursuant to vesting of restricted stock units	1,364,612	1	—	—	—	1
Common stock withheld from vesting of restricted stock units for tax	(502,016)	—	(6,886)	—	—	(6,886