NANOMETRICS INC
Form 10-K
February 25, 2019

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION

Washington, D.C. 20549

FORM 10-K

(Mark One)

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

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: 000-13470

NANOMETRICS INCORPORATED

(Exact name of registrant as specified in its charter)

Delaware	94-2276314
(State or other jurisdiction of incorporation or organization)	(I.R.S. Employer Identification Number)

1550 Buckeye Drive

Milpitas, California 95035

(Address of principal executive offices) (Zip Code)
Registrant's telephone number, including area code: (408) 545-6000

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Name of each exchange on which registered
Common Stock, $0.001 par value per share	The Nasdaq Stock Market LLC (Nasdaq Global Select 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 No .

Indicate by check mark if the Registrant is not required to file reports pursuant to Section 13 or Section 15(d) of the Act. Yes No .

Indicate by check mark whether the Registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 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 No .

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S-T (§ 232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No .

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 .

Indicate by check mark whether the Registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or 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	Accelerated filer
Non-accelerated filer	Smaller reporting company
	Emerging growth 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.

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

As of June 30, 2018, the last business day of the Registrant's most recently completed second fiscal quarter, the aggregate market value of the common stock of Registrant held by non-affiliates, based upon the closing sales price for the Registrant's common stock for such date, as quoted on the Nasdaq Global Select Market, was approximately $787.4 million. Shares of common stock held by each officer and director and by each person affiliated with an officer or director have been excluded because such persons may be deemed to be "affiliates" as that term is defined under the rules and regulations of the Exchange Act. This determination of affiliate status is not necessarily a conclusive determination for any other purpose.

The number of shares of the Registrant's common stock outstanding as of February 22, 2019 was 24,463,681.

DOCUMENTS INCORPORATED BY REFERENCE

The Registrant has incorporated by reference into Part III of this Annual Report on Form 10-K portions of its Proxy Statement for its 2019 Annual Meeting of Stockholders to be filed pursuant to Regulation 14A. The Proxy Statement will be filed within 120 days of Registrant's fiscal year ended December 29, 2018.

NANOMETRICS INCORPORATED

FORM 10-K

FOR THE FISCAL YEAR ENDED DECEMBER 29, 2018

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CAUTIONARY INFORMATION REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K for the year ended December 29, 2018, or “Form 10-K,” contains forward-looking statements concerning our business, operations, and financial performance and condition as well as our plans, objectives, and expectations for business operations and financial performance and condition. Any statements contained herein that speak to future events, performance, results or other matters may be deemed to be forward-looking statements. You can identify these statements by words such as “anticipate,” “believe,” “could,” “estimate,” “expect,” “intend,” “may,” “plan,” “should,” “will,” “would,” and other similar expressions that are predictions of or indicate f events and future trends. These forward-looking statements are based on current expectations, estimates, forecasts, and projections about our business and the industry in which we operate and management's beliefs and assumptions and are not guarantees of future performance or development and involve known and unknown risks, uncertainties, and other factors that are in some cases beyond our control. As a result, any or all of our forward-looking statements in this Form 10-K may turn out to be inaccurate. Factors that could materially affect our business operations and financial performance and condition include, but are not limited to, those risks and uncertainties described herein under “Item 1A - Risk Factors.” You are urged to consider these factors carefully in evaluating the forward-looking statements and are cautioned not to place undue reliance on the forward-looking statements. The forward-looking statements are based on information available to us as of the filing date of this Form 10-K. Unless required by law, we do not intend to publicly update or revise any forward-looking statements to reflect new information or future events or otherwise. You should, however, review the factors and risks we describe in the reports we will file from time to time with the Securities and Exchange Commission, or SEC, after the date of this Form 10-K.

PART I

ITEM 1. BUSINESS

Overview

Nanometrics Incorporated and its subsidiaries ("Nanometrics", the "Company", or "we") is a leading provider of advanced, high-performance process control metrology and inspection systems used primarily in the fabrication of semiconductors and other solid-state devices as well as industrial and scientific applications. Our automated and integrated metrology systems measure critical dimensions, device structures, topography, shape, and various thin film properties, including three-dimensional features and film thickness, as well as optical, electrical and material properties. Our process control solutions are deployed throughout the semiconductor fabrication process, from front-end-of-line substrate manufacturing, to high-volume production of semiconductors and other devices, to advanced three-dimensional wafer-level packaging and industrial applications. Our systems enable advanced process control for manufacturers, providing improved yield at reduced manufacturing cycle time, supporting accelerated product life cycles in the semiconductor, industrial and scientific markets.

We were incorporated in California in 1975 and reincorporated in Delaware in 2006. We have been publicly traded since 1984 (Nasdaq: NANO). We have an extensive installed base of thousands of systems in the majority of advanced semiconductor device production factories worldwide.

Additional information about us is available on our website at http://www.nanometrics.com. The information that can be accessed through our website, however, is not part of this Annual Report. The investor relations section of our website is located at http://www.nanometrics.com/investor.html. Our Annual Reports on Form 10-K, Quarterly Reports on Form 10-Q, Current Reports on Form 8-K and any amendments to those reports are available on the investor relations section of our website free of charge as soon as reasonably practicable after we electronically file or furnish such materials to the United States Securities and Exchange Commission ("SEC"). In addition, the reports and materials that we file with the SEC are available at the SEC's website (http://www.sec.gov).

Industry Background

We participate in the sale, design, manufacture, marketing and support of process control systems for optical critical dimension metrology, thin film metrology, wafer inspection, and advanced analytics used for semiconductor manufacturing as well as industrial applications and scientific research. Our principal market is semiconductors. Semiconductors, primarily packaged as integrated circuits within electronic devices, include consumer electronics, server and enterprise systems, mobile computing (including smart phones and tablets), data storage devices, and embedded automotive and control systems. Our core focus is the measurement and control of the structure, composition, and geometry of the devices as they are fabricated on silicon wafers to improve device performance and manufacturing yields. Our end customers manufacture many types of integrated circuits for a multitude of applications, each having unique manufacturing challenges. This includes integrated circuits to enable information processing and management (logic integrated circuits), memory storage (NAND, 3D-NAND, NOR, and DRAM), analog devices (e.g., Wi-Fi and 4G radio integrated circuits, power devices) MEMS sensor devices (accelerometers, pressure sensors, microphones), image sensors, and other end markets including components for hard disk drives, LEDs, and power management.

Demand for our products continues to be driven by our customers' desire for higher overall chip performance, including improvements in power efficiency, logic processing capability, data storage volume and manufacturing yield. To achieve these goals, our customers have increased their use of more complex materials and processing methods in their manufacturing flow. The primary paths for performance gains are geometric scaling, known as node shrinks, or scaling in three dimensions. In some cases, our customers are implementing new materials and methods in

high volume manufacturing, including materials and device architectures to reduce power consumption, and stacked devices. To shrink features, new methods, including multiple patterning lithography and extreme ultra-violet lithography (EUV), have been developed. To scale NAND memory a new 3D stacking architecture has been implemented with as many as 96 device layers for a device in production. Additional innovation continues in Data Storage, Power Devices, MEMS, and Image Sensors. We believe the use of these new materials and manufacturing methods has increased demand for our products.

Our Business

We offer a diverse line of process control products and technologies to address the manufacturing requirements of the semiconductor (and other solid-state device) manufacturing industry. Our metrology systems measure and characterize the physical dimensions, material composition, optical and electrical characteristics and other critical parameters of solid-state devices, from initial wafer substrate manufacturing through final packaging.

We are continually working to strengthen our competitive position by developing innovative technologies and products in our market segment. We have expanded our product offerings to address growing applications within the semiconductor manufacturing and adjacent industries. In pursuit of our goals, we have:

- Introduced new products, applications, and upgrades in every core product line and primary market served;
- Diversified our product line and strengthened our position with our top customers securing tool of record positions of one or more products in each of the top six customers (as defined by capital expenditures for wafer fab equipment), who combined represent a substantial majority of all wafer fab equipment expenditures;
- Acquired 4D Technology Corporation in November 2018, whose dynamic high-performance interferometric measurement and inspection systems will enable us to serve new markets in advanced process control metrology and inspection; and
- Continued development of new measurement and inspection technologies for advanced fabrication processes.

Nanometrics Products

We offer a diverse line of systems to address the broad range of process control requirements of the semiconductor device and industrial manufacturing markets. In addition, we believe that our product development and engineering expertise and strategic acquisitions will enable us to develop and offer advanced process control solutions that, in the future, should address industry advancement and trends.

Automated Systems

Our automated systems primarily consist of fully automated metrology systems that are employed in semiconductor production environments. The Atlas® family of products represent our line of high-performance metrology systems providing optical critical dimension ("OCD"), thin film metrology and wafer stress metrology for transistor and interconnect metrology applications. The thin film and OCD technology is supported by our NanoCD suite of solutions including our NanoDiffract® software, SpectraProbe™ software and NanoGen™ scalable computing engine that enables visualization, modeling, and analysis of complex structures.

Integrated Systems

Our integrated metrology ("IM") systems are installed directly onto wafer processing equipment to provide near real-time measurements for improved process control and maximum throughput. Our IM systems are sold directly to end user customers. The IMPULSE family of products include the latest technology for OCD, and thin film metrology, and have been successfully qualified on numerous independent Wafer Fabrication Equipment Suppliers' platforms. Our NanoCD suite of solutions is sold in conjunction with our IMPULSE systems.

Software

NanoDiffract® is a modeling, visualization and analysis software that takes signals from the metrology systems, providing critical dimension, thickness, and optical properties from in-line measurements. The software has an intuitive three-dimensional modeling interface to provide visualization of today's advanced and complex semiconductor devices. There are proprietary fitting algorithms in NanoDiffract that enable very accurate and very fast calculations for signal processing for high fidelity model-based measurements. SpectraProbe is a model-less fitting engine that enables fast time to solution for in-line excursion detection and control. SpectraProbe complements the high-fidelity modeling of NanoDiffract with a simple machine learning interface for rapid recipe deployment. The software is supported by NanoGen, an enterprise scale computing hardware system that is deployed to run the computing intensive analysis software. NanoGen leverages commercial server chips and networking architecture and is optimized to support the workload of NanoDiffract and SpectraProbe analysis.

Materials Characterization

Our materials characterization products include systems that are used to monitor the physical, optical, electrical and material characteristics of discrete electronic industry, opto-electronic, HB-LED (high brightness LEDs), solar PV (solar photovoltaics), compound semiconductor, strained silicon and silicon-on-insulator ("SOI") devices, including composition, crystal structure, layer thickness, dopant concentration, contamination and electron mobility.

We have a broad portfolio of products for materials characterization including photoluminescence mapping and Fourier-Transform Infrared ("FTIR") spectroscope in automated and manual systems for substrate quality and epitaxial thickness metrology. The NanoSpec® line supports thin film measurement across all applications in both low volume production and research applications.

Industrial, Scientific, and Research Markets: 4D Technology

In November of 2018 we acquired 4D Technology Corporation, based in Tucson Arizona. The 4D business unit offers a line of interferometry systems for the measurement and inspection of high precision surfaces. End markets include high precision optics surfaces and components, aerospace and defense components, and unique research and scientific instrumentation that requires the unique high-speed results of the 4D systems.

Customers

We sell our metrology and inspection systems worldwide to semiconductor manufacturers, producers of solid-state devices, wafer manufacturers and industrial and scientific research customers. We sell the majority of our systems to customers located in Asia and the United States

With respect to customer concentration, the following presents customers who represented 10% or more of total net revenue for any the years ended December 29, 2018, December 30, 2017 and December 31, 2016.

10% or more of total net revenues

	2018	2017	2016
Intel Corporation	*	*	*
Micron Technology, Inc.	^	*	*
Samsung Electronics Co. Ltd.	*	*	^
SK hynix	*	*	*
Taiwan Semiconductor Manufacturing Company Limited	^	^	*
Toshiba Corporation	*	*	^

* The customer accounted for more than 10% of total revenues during the period
^ The customer accounted for less than 10% of total revenues during the period

Product revenues represented 85%, 83%, and 84% of total net revenues in 2018, 2017 and 2016, respectively.

Sales and Marketing

We believe that the capability for direct sales and support is beneficial for developing and maintaining close customer relationships and for rapidly responding to changing customer requirements. We provide local direct sales, service and application support through our worldwide offices located in the United States, South Korea, Japan, Taiwan, China, Singapore and France, and work with selected dealers and sales representatives in Asia, in the United States and other countries. Our applications team is composed of technically experienced sales engineers who are knowledgeable in the use of metrology systems generally and the unique features and advantages of our specific products. Supported by our technical applications team, our sales and support teams work closely with our customers to offer cost-effective solutions to complex measurement and process problems.

Customer Service and Support

We believe that customer service and technical support for our systems are crucial factors that distinguish us from our competitors and are essential to building and maintaining close, long-term relationships with our customers. We provide a standard one-year warranty on non-consumable parts and labor for most of our products, under which we

provide the non-consumable parts and labor necessary to repair the systems during the warranty period. We provide system support to our customers through factory technical support and globally deployed field service personnel. The factory technical support operations provide customers with telephonic technical support access, direct training programs, operating manuals and other technical support information to enable effective use of our metrology and measurement instruments and systems. We have field service operations based in various locations throughout the United States, South Korea, Taiwan, China, Japan, Singapore, Israel, and other locations in Europe.

Service revenues, including sales of replacement parts, represented 15%, 17%, and 16% of total net revenues in 2018, 2017 and 2016, respectively.

Backlog

As of December 29, 2018, and December 30, 2017, our backlog was $36.4 million and $34.0 million, respectively. Backlog includes orders received and booked, both shipped and not yet recognized as revenue, and not shipped, for products, services and upgrades where written customer requests have been received and we expect to ship and/or recognize revenue within 12 months. Orders are subject to cancellation or delay by the customer subject to possible penalties. However, historically, order cancellations have not been significant. Because orders presently in backlog could be cancelled or rescheduled and some orders can be received and shipped within the same quarter, we do not believe that current backlog is an accurate indication of our future revenues or financial performance.

Competition

We offer various products for various semiconductor manufacturing process steps, and several of our products extend across the same process flow. However, for process control of each of these process steps, we have multiple established and potential competitors, some of whom may have greater financial, research, engineering, manufacturing and marketing resources than we have. We may also face future competition from new market entrants from other overseas and domestic sources. We expect our competitors to continue to improve the design and performance of their current products and processes, and to introduce new products and processes with improved price and performance characteristics. In order to remain competitive, we believe that we will require significant financial resources to offer a broad range of products, and to maintain customer service and support centers worldwide, and to invest in product research and development.

In every market in which we participate, the global semiconductor equipment industry is intensely competitive, and driven by rapid technological adoption cycles. Our ability to effectively compete depends upon our ability to continually improve our products, applications and services, and our ability to develop new products, applications and services that meet constantly evolving customer requirements.

In automated systems for the semiconductor industry, our principal competitors are KLA Corporation (“KLA”) and Nova Measuring Instruments Ltd. ("Nova") for thin film and critical dimension OCD metrology, and other suppliers for advanced packaging. Our primary competitor in integrated systems is Nova. The opto-electronics, discrete device and industrial and scientific markets are addressed primarily by our material characterization and 4D business unit systems, served by numerous competitors in which no single competitor or group of competitors has established a majority position.

We believe that our competitive position in each of our markets is based on the ability of our products and services to address customer requirements related to numerous competitive factors. Competitive selections are based on many factors involving technological innovation, productivity, total cost of ownership of the system, including impact on end of line yield, price, product performance and throughput capability, quality, reliability and customer support.

Manufacturing

Our manufacturing operations are in Milpitas California, Tucson Arizona, and at various contract manufacturers around the world. It is our strategy to outsource all assemblies that do not contain elements that we believe lead to a direct competitive advantage. Most of our automated and integrated products are currently manufactured at our Milpitas facility. We currently do not expect our manufacturing operations to require additional major investments in capital equipment.

We manufacture key modular assemblies and integrated tools and make reasonable efforts to ensure that externally purchased parts or raw materials are available from multiple suppliers, but this is not always possible. Certain components, subassemblies and services necessary for the manufacture of our systems are obtained either from a sole supplier or limited group of suppliers. We also have long-term supply agreements with strategic suppliers for the supply of key assemblies for use in our products.

Research and Development

We continue to invest in research and development ("R&D") to provide our customers with products that add value to their manufacturing processes and that provide a better and differentiated solution than our competitors so that our products stay in the forefront of current and future market demands. Whether it is for an advancement of current technology, yield and manufacturing improvement, enabling new end device technology, or the development of a new application in our core or emerging markets, we are committed to product excellence and longevity.

In our automated markets, our R&D efforts resulted in the successful product launch of the Atlas III product in the marketplace, our flagship product for OCD. In our integrated markets, the IMPULSE system has been further developed for which incorporates performance and productivity enhancements. Nano Diffract and SpectraProbe have regular semi-annual customer releases with a focus

on improved capability and performance. The materials characterization suite of products has had significant refresh and customization for customer needs including the latest FTIR for improved substrate metrology. 4D Technology has ongoing projects for the interferometry line of products including the recently launched InSpec for industrial shop floor inspection as well as new versions of the AccuFiz line for large aperture interferometers.

Patents and Intellectual Property

Our success depends in large part on the technical innovation of our products and protecting such innovations through a variety of methods. We actively pursue a program of filing patent applications to seek protection of technologically sensitive features of our metrology and inspection systems.

As of December 29, 2018, we had 181 patents, including foreign patents, with expiration dates ranging from 2019-2036. We believe that our success will depend to a great degree upon innovation, technological expertise and our ability to adapt our products to new technology. While we attempt to establish our intellectual property rights through patents and trademarks and protect intellectual property rights through non-disclosure agreements, we may not be able to fully protect our technology, and competitors may be able to develop similar technology independently. Others may obtain patents and assert them against us. In addition, the laws of certain foreign countries may not protect our intellectual property to the same extent as do the laws of the United States. From time to time we receive communications from third parties asserting that our metrology systems may contain design features that the third parties claim may infringe upon their proprietary rights.

Employees

At December 29, 2018, we employed 701 persons worldwide with sales, applications and service support in key geographic areas aligned with our customer locations. None of our employees are represented by a union and we have never experienced a work stoppage because of union actions. We consider our employee relations to be good. Many of our employees have specialized skills that are of value to us. Our future success will depend in large part upon our ability to attract, retain and motivate highly skilled scientific, technical and managerial personnel, who are in great demand in our industry.

Environmental Matters

Our operations are subject to various federal, state and local environmental protection regulations governing the use, storage, handling and disposal of hazardous materials, chemicals, and certain waste products. We believe that compliance with federal, state and local environmental protection regulations will not have a material adverse effect on our capital expenditures, earnings and competitive and financial position.

If we fail to comply with such laws and regulations, we could be liable for damages, penalties and fines. We further discuss the impact of environmental regulation under “Risk Factors- We are subject to various environmental laws and regulations that could impose substantial costs upon us and may harm our business, operating results and financial condition.” in Item 1A.

Executive Officers of the Registrant

The names of our executive officers and their ages, titles and biographies as of February 25, 2019, are set forth below:

Name	Age	Position

Dr. Pierre-Yves Lesaicherre	55	President, Chief Executive Officer and Director
Greg Swyt	58	Vice President, Finance (Principal Financial Officer)
Rollin Kocher	53	Sr. Vice President, Sales and Marketing
Kevin Heidrich	48	Sr. Vice President, Corporate Development
Janet Taylor	61	General Counsel
James Barnhart	56	Sr. Vice President, Operations

Dr. Pierre-Yves Lesaicherre joined Nanometrics as President and Chief Executive Officer in November 2017. From January 2012 to February 2017, Dr. Lesaicherre was Chief Executive Officer of Lumileds, an integrated manufacturer of LED components and Automotive Lighting Lamps, where he was responsible for all aspects of the company's business. Prior to being named Chief Executive Officer, Dr. Lesaicherre also held other management positions at Lumileds from 2006 to 2012. Before Lumileds, Dr. Lesaicherre was Senior Vice President and general manager of the Microcontrollers & Logic business lines at NXP Semiconductors, formerly Philips Semiconductors. He holds an MBA with a focus on international business and strategy from INSEAD and has MS and Ph.D. degrees in Material Science from the National Polytechnic Institute of Grenoble.

Greg Swyt assumed the role of Principal Financial Officer of Nanometrics from November 2017 to February 2018 and subsequently from June 2018. Mr. Swyt has served as the Vice President, Finance of Nanometrics from August 2016. Prior to joining Nanometrics, Mr. Swyt was Managing Director, Finance, at Intevac Corporation, a public company delivering thin film solutions, from May 2008 to July 2016, where he managed the Global Financial Planning and Analysis Organization, which also included Manufacturing Finance, Government Finance and Regional Finance. Mr. Swyt received an MBA and a BS in Finance from San Jose State University.

Rollin Kocher joined Nanometrics in March 2013 as Vice President, Global Sales. In September 2016, Mr. Kocher was promoted to Senior Vice President, Commercial Operations. He has assumed the role of Senior Vice President, Sales and Marketing in January 2018. Prior to joining Nanometrics, Mr. Kocher held several senior management positions over 17 years at KLA, including Global Sales for Films and Scatterometry, Sales for Taiwan, North America and Europe, and Senior Director of Sales for the Samsung Business Unit. His last position at KLA was General Manager of the Samsung Business Unit, and in that capacity, was responsible for Sales, Marketing, Applications, and Service. Mr. Kocher holds a B.S. degree in Electrical Engineering Technology from the University of North Texas.

Kevin Heidrich, Senior Vice President, Corporate Development, joined Nanometrics in 2006. Mr. Heidrich has participated in many functions, expanding his scope to include corporate marketing and business development. He assumed the role of Vice President, Marketing and Business Development in May 2009; Senior Vice President, Strategic Marketing and Business Development in September 2012; and Senior Vice President, Corporate Development in January 2018. Mr. Heidrich is now responsible for both corporate strategy and marketing, as Nanometrics expands its overall solution space within process control metrology. Prior to Nanometrics, Mr. Heidrich spent a decade at Intel Corporation in a variety of roles including process research and development at Intel’s Technology Development facility. Mr. Heidrich received B.S. and M.S. degrees from the Colorado School of Mines in Chemical Engineering.

Janet Taylor joined Nanometrics as General Counsel in July 2015. Ms. Taylor served as Senior Vice President, General Counsel and Company Secretary of STATS ChipPAC Ltd., from June 2005 to June 2015, where she was responsible for all legal matters, including corporate governance, intellectual property, litigation and securities compliance. Prior to joining STATS ChipPAC Ltd, Ms. Taylor was engaged in transactional practices at international law firms in New York, Singapore and London. Ms. Taylor was admitted to the Bar in New York in 1990 and in Singapore in 2010. Ms. Taylor holds a J.D. from the Harvard Law School and a B.A. in History from the University of Texas at Austin.

Jim Barnhart joined Nanometrics as Senior Vice President, Operations in March 2018. After completing U.S. Naval Nuclear Power postgraduate school, Mr. Barnhart joined Applied Materials where for 17 years he held progressively higher positions including Strategic Worldwide Account Operations General Manager, Chief Operating Officer of the etch products business group, and Managing Director of corporate asset services. Mr. Barnhart left Applied Materials in 2006 to serve in senior operational roles at Johnson & Johnson and AREVA Solar as Senior Vice President, Global Operations. Most recently, he served as Senior Vice President, Global Operations for Cymer Light Sources from April 2010 until joining Nanometrics. Mr. Barnhart holds a B.S. in Electrical Engineering from Washington State University and an MBA from the University of California at Berkeley, Walter A. Haas School of Business.

ITEM 1A. RISK FACTORS

In addition to the other information contained in this Annual Report on Form 10-K, we have identified the following risks and uncertainties that may have a material adverse effect on our business, financial condition or results of operations. Investors should carefully consider the risks described below before making an investment decision. The risks described below are not the only ones we face. Additional risks not currently known to us or that we currently believe are immaterial may also impair our business operations. Our business could be harmed by any of these risks. The trading price of our common stock could decline due to any of these risks and investors may lose all or part of their investment. This section should be read in conjunction with the Consolidated Financial Statements and Notes thereto, and Management's Discussion and Analysis of Financial Condition and Results of Operations contained in this Annual Report on Form 10-K.

The Global economic conditions and the cyclical nature of the semiconductor industry can affect demand for our products which in turn may negatively impact our financial performance.

Global economic conditions, and the cyclical nature of the semiconductor industry have impacted, and could in the future impact, customer demand for our products and our financial performance. Demand for our products is largely dependent on our customers' capital spending on semiconductor equipment, which depends, in large part, on consumer spending, required manufacturing capacity, and customer access to capital. Economic uncertainty, unemployment, higher interest rates, higher tax rates, fluctuations in foreign currency exchange rates, tariffs and other trade barriers, and other economic factors may lead to a decrease in consumer spending and may cause certain customers to cancel existing orders or delay placing orders. If we are unable timely and appropriately to adapt to changes resulting from unfavorable economic conditions, it may cause volatility in our operating results, business, and financial condition, and results of operations may be adversely affected.

In addition, demand for our products is highly inelastic which means we have little ability to control product revenues created by customer demand for more capacity. The market for our products is characterized by constant and rapid technological change, price erosion, product obsolescence, evolving standards, short product life cycles and significant volatility in supply and demand. Due to the inelastic nature of demand in the semiconductor industry, we may need to take actions to reduce costs in the future, which could reduce our ability to significantly invest in research and development at levels we believe are necessary. If we are unable to effectively align our cost structure with prevailing market conditions, our business, financial condition and results of operations may be materially and adversely affected.

We may also experience supplier or customer issues as a result of adverse macroeconomic conditions. If our customers have difficulties in obtaining capital or financing, this could result in lower sales. Customers with liquidity issues could also result in an increase in bad debt expense. These conditions could also affect our key suppliers, which could affect their ability to supply parts and result in delays of our customer shipments.

Our largest customers account for a substantial portion of our net revenues, and our net revenues would materially decline if one or more of these customers were to purchase significantly fewer of our systems.

Historically, a significant portion of our net revenues in each quarter and each year has been derived from sales to relatively few customers, and we expect this trend to continue. In fiscal year 2018, five customers represented a substantial majority of our total net revenues. There are only a limited number of large companies operating in the semiconductor manufacturing industry. Accordingly, we expect that we will continue to depend on a small number of large customers for a significant portion of our net revenues for the foreseeable future. If our current relationships with our large customers are impaired, or if we are unable to develop similar collaborative relationships with important customers in the future, our net revenues could decline significantly. In addition, because there are a limited number of customers, customers may seek concessions related to price, terms and conditions and intellectual property. Any of

these changes could negatively impact our financial performance and results of operations.

We rely on a limited number of outside suppliers and subcontractors to supply certain components and subassemblies, and on a single or a limited group of outside suppliers for certain materials for our products, which could result in a potential inability to obtain an adequate supply of required components due to the suppliers' failure or inability to provide such components in a timely manner, or at all, and reduced control over pricing and timely delivery of components and materials, any of which could adversely affect our results of operations.

Our manufacturing activities consist of integrating, assembling and testing components and subassemblies. We rely on a limited number of outside suppliers and subcontractors to manufacture certain components and subassemblies. We order one of the most critical components of our technology, the spectroscopic ellipsometer component incorporated into our advanced measurement systems, from external suppliers.

We procure some of our other critical systems' components, subassemblies and services from single suppliers or a limited group of outside suppliers to ensure overall quality and timeliness of delivery. Many of these components and subassemblies have significant production lead times. To date, we have been able to obtain adequate supplies of components and subassemblies for our systems in a timely manner. However, disruption or termination of certain of these sources could have a significant adverse impact on our ability to manufacture our systems. In addition, our failure to timely use components in our manufacturing processes due to delays or cancellation of orders may lead to write-downs of inventory. A disruption in supply or inventory window would, in turn, have a material adverse effect on our business, financial condition and results of operations. Our reliance on a sole supplier or a limited group of suppliers and our reliance on subcontractors involve several risks, including:

- a potential inability to obtain an adequate supply of required components due to the suppliers' failure or inability to provide such components in a timely manner, or at all; and
- reduced control over pricing and timely delivery of components.

Although the timeliness, yield and quality of deliveries to date from our subcontractors have been acceptable, manufacture of certain of these components and subassemblies is an extremely complex process, and long lead times are required. Any inability to obtain adequate deliveries or any other circumstance that would require us to seek alternative sources of supply or to manufacture such components internally could delay our ability to ship our products, which could damage relationships with current and prospective customers and have a material adverse effect on our business, financial condition and results of operations.

We are subject to risks associated with our competitors’ strategic relationships and their introduction of new products, and we may lack the financial resources or technological capabilities of certain of our competitors needed to capture increased market share.

We operate in the highly competitive semiconductor industry and expect to face significant competition from multiple current and future competitors. We believe that other companies are developing systems and products that are competitive to our products and are planning to introduce new products, which may affect our ability to sell our existing or future products. We face a greater risk if our competitors enter into strategic relationships with leading semiconductor manufacturers covering products similar to those we sell or may develop, as this could adversely affect our ability to sell products to those manufacturers.

Some of our competitors have greater financial, engineering, manufacturing, research and development, marketing and customer support resources than we do. As a result, our competitors may be able to respond more quickly to new or emerging technologies or market developments by devoting greater resources to the development, promotion and sale of products, which could impair sales of our products. Moreover, there has been merger and acquisition activity among our competitors and potential competitors. These transactions by our competitors and potential competitors may provide them with a competitive advantage over us by enabling them to rapidly expand their product offerings and service capabilities to meet a broader range of customer needs. Many of our customers and potential customers in the semiconductor industry are large companies that require global support and service for their metrology systems. Some of our larger or more geographically diverse competitors might be better equipped to provide this global support and service.

In addition, our competitors may provide innovative technology that may have performance advantages over systems we currently offer or may offer in the future. They may be able to develop products comparable or superior to those that we offer or may adapt more quickly to new technologies or evolving customer requirements. In particular, while we currently are developing additional product enhancements that we believe will address future customer requirements, we may fail in a timely manner to complete the development or introduction of these additional product

enhancements successfully, or these product enhancements may not achieve market acceptance or be competitive.

Further, customers that may otherwise desire to purchase our products from us and purchase other products from our competitors may nevertheless purchase competing products from our competitors rather than purchase our products due to a variety of reasons, including to gain favor or volume pricing from our competitors.

Because of the high cost of switching equipment vendors in our markets, it may be difficult for us to attract customers from our competitors even if our metrology systems are superior to theirs.

We believe that once a semiconductor customer has selected one vendor's metrology system, the customer generally relies upon that system and, to the extent possible, subsequent generations of the same vendor's system, for the life of the application. Once a vendor's metrology system has been installed, a customer must often make substantial technical modifications and may experience downtime to switch to another vendor's metrology system. Accordingly, unless our systems offer performance or cost advantages that outweigh a customer's expense of switching to our systems; it will be difficult for us to achieve significant sales from that customer once it has selected another vendor's system for an application.

Our integrated metrology systems are integrated onto systems sold independently by Wafer Fabrication Equipment Suppliers, and a decrease in sales by these suppliers, or the development of competing systems by these suppliers, could harm our business.

We believe that sales of integrated metrology systems will continue to be an important source of our net revenues. Sales of our integrated metrology systems depend upon the ability of a small number of Wafer Fabrication Equipment Suppliers to sell semiconductor manufacturing equipment products that are compatible with our metrology systems as components. If these suppliers, such as Applied Materials, Inc., Ebara Corporation, Lam Research Corporation and Tokyo Electron, are unable to sell such products, if they choose to focus their attention on products that do not integrate our systems, or if they choose to develop competing systems, our business could suffer.

We are subject to order and shipment uncertainties. Our profitability will decline if we fail to accurately forecast customer demand when managing inventory.

We typically plan production and inventory levels based on internal forecasts of customer demand, which can be highly unpredictable and can fluctuate substantially, which could lead to excess inventory write-downs and resulting negative impacts on gross margin and net income. We have limited visibility into our customers' inventories, future customer demand and the product mix that our customers will require, which could adversely affect our production forecasts and operating margins. In addition, innovation in our industry could render significant portions of our inventory obsolete. If we overestimate our customers' requirements, we may have excess inventory, which could lead to obsolete inventory and unexpected costs. Conversely, if we underestimate our customers' requirements, we may have inadequate inventory, which could lead to foregone revenue opportunities, loss of potential market share and damage to customer relationships as product deliveries may not be made on a timely basis, disrupting our customers' production schedules. In response to anticipated long lead times to obtain inventory and materials from outside suppliers and foundries, we periodically order materials in advance of customer demand. This advance ordering has in the past and may in the future result in excess inventory levels or unanticipated inventory write-downs if expected orders fail to materialize, or other factors make our products less saleable. In addition, any significant future cancellation or deferral of product orders could adversely affect our revenue and margins, increase inventory write-downs due to obsolete inventory, and adversely affect our operating results and stock price.

If we do not manage our supply chain effectively, our operating results may be adversely affected.

We need to continually evaluate our global supply chains and assess opportunities to reduce costs. We must also enhance quality, speed and flexibility to meet changing demand for our products and product mix and uncertain market conditions. Our success also depends in part on refining our cost structure and supply chains so that we have flexibility and can maintain and improve profitability. Although the current tariff environment has not had a material adverse effect on our costs to date, further deterioration in the tariff environment, or changes in suppliers, may cause our costs to increase, which if we are not able to offset by charging higher sales prices, will cause a decline in our margins. To improve our margins on a product, we will need to establish high volume supply agreements with our vendors. We cannot be certain that we will be able to timely negotiate vendor supply agreements on improved terms and conditions, or at all. Failure to achieve the desired level of cost reductions could adversely affect our financial results. Despite our efforts to control costs and increase efficiency in our facilities, changes in demand could still cause us to realize lower operating margins and profitability.

If we choose to acquire new and complementary businesses, or products or technologies instead of developing them ourselves, we may be unable to complete these acquisitions or may not be able to successfully integrate an acquired business in a cost-effective and non-disruptive manner.

Our success depends on our ability to continually enhance and broaden our product offerings in response to changing technologies, customer demands and competitive pressures. To achieve this, from time to time we have acquired complementary businesses, products, or technologies instead of developing them ourselves and may choose to do so in the future. For example, in November 2018 we acquired 4D Technology Corporation (“4D”), which we are currently in the process of integrating into Nanometrics. If we do identify suitable additional transactions in the future, we may not be able to complete them on commercially acceptable terms, or at all. We also face intense competition for acquisitions from other acquirers in our industry. These competing acquirers may have significantly greater financial and other resources than us, which may prevent us from successfully pursuing a transaction.

Potential risks associated with acquisitions, such as our acquisition of 4D, include, among other things:

- our inability to realize the benefits or cost savings that we expect to realize as a result of the acquisition;
- diversion of management's attention;

- our inability to successfully integrate our businesses with the business of the acquired company;
- motivating, recruiting and retaining executives and key employees; conforming standards, controls, procedures and policies, business cultures and compensation structures among our company and the acquired company;
- consolidating and streamlining sales, marketing and corporate operations;
- potential exposure to unknown liabilities of acquired companies;
- loss of key employees and customers of the acquired business; and
- managing tax costs or inefficiencies associated with integrating our operations following completion of the acquisitions.

If an acquisition is not successfully completed or integrated into our existing operations, our business, financial condition and results of operations could be adversely impacted.

In addition, to finance any acquisitions we may be required to raise additional funds through public or private equity or debt financings; however:

- to obtain such financing we may be forced to obtain financing on terms that are not favorable to us and, in the case of equity or convertible debt financing, the financing may result in dilution to our stockholders; or
- such financing may not be available to us at all, which could prevent us from entering or completing the acquisition.

Our success depends on the performance of key personnel, including our senior management and on our ability to identify, hire and retain key management personnel.

We believe our continued ability to recruit, hire, retain and motivate highly-skilled engineering, operations, sales, administrative and managerial personnel is key to our future success. Competition for these employees is intense, particularly with respect to attracting and retaining qualified technical and senior management personnel. We do not have employment agreements with key members of our technical staff and all of our senior management team. Further, we do not have key person life insurance on any of our executives and these individuals or other key employees may leave us. We have experienced turnover in our senior management team in the past. Our business may be harmed if we are unable to recruit, retain and effectively integrate our senior management into our business operations and our ability to implement our strategy could be compromised.

If we deliver systems with defects, our credibility will be harmed, revenue from, and market acceptance of, our systems will decrease, and we could expend significant capital and resources as a result of such defects.

Our products are complex and frequently operate in high-performance, challenging environments. Notwithstanding our internal quality specifications, our systems have sometimes contained errors, defects and bugs, when introduced. If we deliver systems with errors, defects or bugs, our credibility and the market acceptance and sales of our systems would be harmed. Further, if our systems contain errors, defects or bugs, we may be required to expend significant capital and resources to alleviate such problems and incur significant costs for product recalls and inventory write-offs. Defects could also lead to product liability lawsuits against us or against our customers. We have agreed to indemnify our customers in some circumstances against liability arising from defects in our systems. In the event of a successful product liability claim, we could be obligated to pay damages significantly in excess of our product liability insurance limits.

If we experience significant delays in shipping our products to our customers, our business and reputation may suffer.

Our products are complex and require technical expertise to design and manufacture properly. Various problems occasionally arise during the manufacturing process that may cause delays and/or impair product quality. Any significant delays stemming from the failure of our products to meet or exceed our internal quality specifications, or for any other reasons, would delay our shipments. Shipment delays could harm our business and reputation in the industry.

Net average selling prices of our products may decrease over time, which could have a material adverse effect on our revenues and profitability.

It is common in our industry for the average selling price of a given product to decrease over time as production volumes increase, competing products are developed or latest technologies featuring higher performance or lower cost emerge. To combat the negative effects that erosion of average selling prices have had in the past and may have in the future on our net revenues, we attempt to actively manage the prices of our existing products and regularly introduce new process technologies and products in the market

that exhibit higher performance, that are in demand, or that lower manufacturing cost. Failure to maintain our current prices or to successfully execute on our new product development strategy will cause our net revenues and gross margin to decline, which adversely affect our operating results and stock price.

Third party infringement claims could be costly to defend, and successful infringement claims by third parties could result in substantial damages, lost product sales and the loss of important intellectual property rights by us.

The semiconductor industry is generally subject to litigation regarding patents and other intellectual property rights. Our commercial success depends, in part, on our ability to avoid infringing or misappropriating patents or other proprietary rights owned by third parties. From time to time we may receive communications from third parties asserting that our metrology systems may contain design features which are claimed to infringe on their proprietary rights. Our new or current products may infringe valid intellectual property rights, but even if our products do not infringe, we may be required to expend significant sums of money to defend against infringement claims, or to actively protect our intellectual property rights through litigation. In the event that a claim is made and there is an adverse result of any intellectual property rights litigation, we could be required to pay substantial damages for infringement, expend significant resources to develop non-infringing technology, incur material liability for royalty payments or fees to obtain licenses to the technology covered by the litigation, or be subjected to an injunction, which could prevent us from selling our products and materially and adversely affect our net revenues and results of operations. We cannot be sure that we will be successful in any such non-infringing development or that any such license would be available on commercially reasonable terms, if at all. Any claims relating to the infringement of third-party proprietary rights, even if not meritorious, could result in costly litigation, lost sales or damaged customer relationships, and diversion of management's attention and resources.

Our intellectual property may be infringed by third parties despite our efforts to protect it, which could threaten our future success and competitive position and harm our operating results.

Our future success and competitive position depend in part upon our ability to obtain and maintain proprietary technology for our principal product families, and we rely, in part, on patent, trade secret and trademark law to protect that technology. If we fail to adequately protect our intellectual property, it will be easier for our competitors to sell competing products. We own or may license patents relating to our systems and have filed applications for additional patents. Any of our pending patent applications may be rejected, and we may not in the future be able to develop additional proprietary technology that is patentable. In addition, the patents we own, have been issued or licensed, may not provide us with competitive advantages and may be challenged by third parties. Third parties may also design around these patents.

In addition to patent protection, we rely upon trade secret protection for our confidential and proprietary information and technology. We routinely enter into confidentiality agreements with our employees. However, in the event that these agreements may be breached, we may not have adequate remedies. Our confidential and proprietary information and technology might also be independently developed by or become otherwise known to third parties.

We may be required to initiate litigation to enforce patents issued to or licensed by us, or to determine the scope or validity of a third party's patent or to enforce trade secret, confidentiality or other proprietary rights. Any such litigation, regardless of outcome, could be expensive and time consuming, and could subject us to significant liabilities or require us to re-engineer our product or obtain expensive licenses from third parties, any of which would adversely affect our business and operating results.

Despite our efforts to protect our proprietary rights, unauthorized parties may attempt to copy or otherwise obtain or use our products or technology. Our ability to enforce our patents and other intellectual property is limited by our financial resources and is subject to general litigation risks. If we seek to enforce our rights, we may be subject to

claims that the intellectual property rights are invalid, are otherwise not enforceable or are licensed to the party against whom we assert a claim. In addition, our assertion of intellectual property rights could result in the other party seeking to assert alleged intellectual property rights of its own against us, which is a frequent occurrence in such litigation.

Our efforts to protect our intellectual property may be less effective in some foreign countries where intellectual property rights are not as well protected as in the United States.

In 2018, 2017, and 2016, 91%, 87% and 86%, respectively, of our total net revenues were derived from sales to customers in foreign countries, including certain countries in Asia, such as Japan, South Korea, China, Singapore and Taiwan. The laws of some foreign countries do not protect our proprietary rights to as great an extent as do the laws of the United States, and many U.S. companies have encountered substantial problems in protecting their proprietary rights against infringement in these countries. If we fail to adequately protect our intellectual property in these countries, it would be easier for our competitors to sell competing products and our business would suffer.

Variations in the amount of time it takes for us to sell our systems may cause volatility in our operating results, which could cause our stock price to decline.

Variations in the length of our sales and product acceptance cycles could cause our revenues to fluctuate widely from period to period. Our customers generally take long periods of time to evaluate our metrology systems. We expend significant resources educating and providing information to our prospective customers regarding the uses and benefits of our systems. The length of time that it takes for us to complete a sale depends upon many factors, including:

- the efforts of our sales force and our independent sales representatives;
- the complexity of the customer's metrology needs;
- the internal technical capabilities and sophistication of the customer;
- the customer's budgetary constraints; and
- the quality and sophistication of the customer's current processing equipment.

Because of the number of factors influencing the sales process, the period between our initial contact with a customer and the time at which we recognize revenue from that customer, if at all, varies widely. Our sales cycles, including the time it takes for us to build a product to customer specifications after receiving an order, typically range from three to nine months. Occasionally our sales cycles can be much longer, particularly with customers in Asia who may require longer evaluation and acceptance periods. During the sales cycles, we commit substantial resources to our sales efforts in advance of receiving any revenue, and we may never receive any revenue from a customer despite our sales efforts.

If we do complete a sale, customers often purchase only one of our systems and then evaluate its performance for a lengthy period of time before purchasing additional systems. The purchases are generally made through purchase orders rather than through long-term contracts. The number of additional products that a customer purchases, if any, depends on many factors, including a customer's capacity requirements, and/or shifting to more and advanced manufacturing processes that require more or different products to control. If they change their rate of capacity or have technological change, we cannot compensate for this fluctuation in demand by adjusting the price of our products. The period between a customer's initial purchase and any subsequent purchases and acceptance is unpredictable and can vary from three months to a year or longer. Variations in the length of this period could cause fluctuations in our operating results, which could adversely affect our stock price.

Relatively small fluctuations in our system sales volume may cause our operating results to vary significantly each quarter.

During any quarter, a significant portion of our revenue is derived from the sale of a relatively small number of systems, which have a vast range of selling prices depending on the system. Accordingly, a slight change in the number or mix of systems that we sell could cause significant changes in our operating results.

We depend on new products and processes for our success. Consequently, we are subject to risks associated with rapid technological change.

Rapid technological changes in semiconductor manufacturing processes subject us to increased pressure to develop technological advances enabling such processes. We believe that our future success depends in part upon our ability to develop and offer new products with improved capabilities and to continue to enhance our existing products. We cannot make assurances if or when the products and solutions where we have focused our research and development expenditures will become commercially successful. If new products have reliability or quality problems, our performance could be impacted by reduced orders, higher manufacturing costs, and delays in acceptance or payment for new products, and additional service and warranty expenses. We might not be able to develop and manufacture new products successfully, or new products that we introduce may fail in the marketplace. Our failure to complete

commercialization of these new products in a timely manner could result in unanticipated costs and inventory obsolescence, which would adversely affect our financial results. Any significant delay in releasing new systems could adversely affect our reputation, give a competitor a first-to-market advantage or allow a competitor to achieve greater market share.

To develop new products and processes, we expect to continue to make significant investments in research and development and to pursue joint development relationships with customers, suppliers or other members of the industry. We must manage product transitions and joint development relationships successfully, as introduction of new products could adversely affect our sale of existing products.

If we are unable to adjust the scale of our business in response to rapid changes in demand in the semiconductor equipment industry, our operating results and our ability to compete successfully may be impaired.

The business cycle in the semiconductor equipment industry has historically been characterized by frequent periods of rapid change in demand that challenge our management to adjust spending and resources allocated to operating activities. During periods of growth or decline in demand for our products and services, we face significant challenges in maintaining adequate financial and business controls, management processes, information systems and procedures and in training, managing, and appropriately sizing our supply chain, our work force, and other components of our business on a timely basis. Our success will depend, to a significant extent, on the ability of our executive officers and other members of our senior management to identify and respond to these challenges, our gross margins and earnings may be impaired during periods of demand decline, and we may lack the infrastructure and resources to scale up our business to meet customer expectations and compete successfully during periods of demand growth.

We manufacture all of our systems at a limited number of facilities, and any prolonged disruption in the operations of those facilities could reduce our revenues.

We produce the majority of our systems in our manufacturing facilities located in Milpitas, California. We use contract manufacturers in China, Israel, Japan and the United States. Our manufacturing processes are highly complex and require sophisticated, costly equipment and specially designed facilities. As a result, any prolonged disruption in the operations of our manufacturing facilities, such as those resulting from acts of war, terrorism, political instability, health epidemics, fire, earthquake, flooding or other natural disaster could seriously harm our ability to satisfy our customer order deadlines.

We may outsource select manufacturing activities to third-party service providers, which decreases our control over the performance of these functions and may result in lower quality and functionality of our products.

We may outsource product manufacturing to third-party service providers. Outsourcing reduces our control over the performance of the outsourced functions. Dependence on outsourcing may also adversely affect our ability to bring new products to market. If we do not effectively manage our outsourcing strategy or if third party service providers do not perform as anticipated, we may experience operational difficulties, increased costs, manufacturing interruptions or inefficiencies in the operation of our supply chain, any or all of which could delay our delivery of products to our customers, and materially and adversely affect our business, financial condition, and results of operations.

If our network security measures are breached and unauthorized access is obtained to a customer's data, to our data, or to our information technology systems, we may incur significant legal and financial exposure and liabilities.

As part of our business, we store our data and certain data about our customers, vendors and employees in our information technology system. While we have security measures in place that are designed to protect this information and prevent data loss and other security breaches, if these measures are breached as a result of third-party action, employee error, malfeasance, break-ins or otherwise, and someone obtains unauthorized access to our customers', vendors' or employees' data, we could face loss of business, regulatory investigations or court orders, our reputation could be severely damaged, we could be required to expend significant capital and other resources to alleviate the problem, as well as incur significant costs and liabilities, including due to litigation, indemnity obligations, damages for contract breach, penalties for violation of applicable laws or regulations, and costs for remediation and other incentives offered to customers.

Cyber-attacks and other malicious internet-based activities continue to increase. Because the techniques used to obtain unauthorized access or sabotage systems change frequently and generally are not identified until they are launched against a target, we may be unable to anticipate these techniques or to implement adequate preventative measures. In

addition, third parties may attempt to fraudulently induce employees or users to disclose information to gain access to our data or our customers' data. If any of these events occur, our or our customers' and vendors' information could be accessed or disclosed improperly. Any or all of these issues could negatively affect our ability to attract new customers, cause existing customers to choose to purchase from our competitors, result in reputational damage or subject us to third-party lawsuits, regulatory fines or other action or liability, which could adversely affect our operating results.

The General Data Protection Regulation (GDPR) is a regulation in European Union (EU) law on data protection and privacy for all individuals within the EU and the European Economic Area (EEA). It also addresses the export of personal data outside the EU and EEA areas. We need to put in appropriate technical and organizational measures to implement these data protection principles. The GDPR requirements have been reviewed and are in the process of being implemented. We may also be subject to other data privacy laws in the United States and the other countries in which we operate.

Changes in our effective income tax rate could affect our results of operations.

We are subject to taxation in numerous U.S. states and territories. As a result, our effective tax rate is derived from a combination of applicable tax rates in the various places that we operate. In preparing our financial statements, we estimate the amount of tax that will become payable in each of such places. Our effective tax rate, however, may be different than experienced in the past due to numerous factors, including the passage of the Tax Cuts and Jobs Act, changes in the jurisdictions in which our profits are determined to be earned and taxed, increases in expenses not deductible for tax purposes, the results of examinations and audits of our tax filings, our inability to secure or sustain acceptable agreements with tax authorities, our utilization of net operating losses, changes in available tax credits, changes in accounting for income taxes, and changes in tax laws. Any of these factors could cause us to experience an effective tax rate significantly different from previous periods or our current expectations and may result in tax obligations in excess of amounts accrued in our financial statements.

On December 22, 2017, the President signed into law the Tax Cuts and Jobs Act that significantly reforms the Internal Revenue Code of 1986, as amended, or the Code. The Tax Cuts and Jobs Act, among other things, contains significant changes to corporate taxation, including reduction of the corporate tax rate from a top marginal rate of 35% to a flat rate of 21%, limitation of the tax deduction for interest expense to 30% of adjusted earnings (except for certain small businesses), limitation of the deduction of future net operating losses to 80% of current year taxable income and elimination of net operating loss carrybacks, one-time taxation of offshore earnings at reduced rates regardless of whether they are repatriated, elimination of U.S. tax on foreign earnings (subject to certain important exceptions), immediate deductions for certain new capital investments instead of deductions for depreciation expense over time, and modifying or repealing many business deductions and credits, including the deductibility of executive compensation. Notwithstanding the reduction in the corporate income tax rate, the overall impact of the Tax Cuts and Jobs Act is uncertain and our business and financial condition could be adversely affected. The Tax Act became law in December 2017, and interpretations of this legislation are being released by various regulatory agencies and it is possible that there could be significant changes in interpretations that we may not be yet aware of, and which could adversely impact our financial results.

We may incur impairments to goodwill or long-lived assets.

We review our long-lived assets, including goodwill and other intangible assets, for impairment annually or more frequently when events or changes in circumstances indicate that the carrying amount of these assets may not be recoverable or it becomes more likely than not that the fair value is reduced below the carrying value of the reporting unit. Our valuation methodology for assessing impairment requires management to make judgments and assumptions based on historical experience and to rely heavily on projections of future operating performance. As of December 29, 2018, the carrying value of our goodwill was $26.4 million, and the carrying value of our intangible assets, net, was $27.3 million. If we determine that any of our long-lived assets are impaired, we may be required to take a significant charge for the impairment, which could significantly and negatively affect our results of operations.

Our investment portfolio may suffer losses from changes in market interest rates and changes in market conditions, which could materially and adversely affect our financial condition and liquidity.

Our investment portfolio primarily comprises corporate debt securities, commercial paper, debt securities issued by U.S. governmental agencies and certificates of deposits. These investments are subject to general credit, liquidity, and market and interest rate risks. Substantially all of these securities are subject to interest rate and credit risk and will decline in value if interest rates increase or one or more of the issuers' credit ratings is reduced. As a result of any of the foregoing, we may experience a reduction in value or loss of liquidity of our investments, which may have a negative adverse effect on our results of operations, liquidity and financial condition. We follow an established investment policy and set of guidelines to monitor, manage and limit our exposure to interest rate and credit risk. The

policy sets forth credit quality standards and limits our exposure to any one issuer, as well as our maximum exposure to various asset classes.

Our operating results have varied in the past and probably will continue to vary significantly in the future, which will cause volatility in our stock price.

Our quarterly and annual operating results have varied significantly in the past and are likely to vary in the future, which volatility could cause our stock price to decline. Some of the factors that may influence our operating results and subject our stock to extreme price and volume fluctuations include:

- general economic growth or decline in the U.S. or foreign markets;
- changes in customer demand for our systems;
- the gain or loss of a key customer or significant changes in the financial condition or one or more key customers;
- economic conditions in the semiconductor industries;
- the timing, cancellation or delay of customer orders and shipments;

- the timing of customer acceptance due to delays or failure to meet required specifications;
- market acceptance of our products and our customers' products;