

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 (I.R.S. Employer
incorporation or organization) Identification Number)

1550 Buckeye Drive

Milpitas, California

95035

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(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

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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 future 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”) spectroscopy 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
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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:

- 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;

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- 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 of one or more key customers;
- economic conditions in the semiconductor industries;
- the timing, cancellation or delay of customer orders and shipments;

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- the timing of customer acceptance due to delays or failure to meet required specifications;
- market acceptance of our products and our customers' products;
- our ability to recover the higher costs associated with meeting our customers' increasing service demands;
- competitive pressures on product prices and changes in pricing by our customers or suppliers;
- the timing of new product announcements and product releases by us or our competitors and our ability to design, introduce and manufacture new products on a timely and cost-effective basis;
- fluctuations in foreign currency exchange rates, particularly the Japanese yen, the Korean won, European euro and the British pound sterling;
- the occurrence of trade wars or barriers, or the perception that trade wars or barriers will occur;
- the occurrence of tax valuation allowances;
- the occurrence of potential impairments of long-lived assets;
- the timing of acquisitions of businesses, products or technologies;
- the effects of war, natural disasters, acts of terrorism or political unrest;
- the loss of key personnel; and
- the levels of our fixed expenses, relative to our revenue level.

The foregoing factors are difficult to forecast, and these, as well as other factors, could materially and adversely affect our quarterly and annual operating results. If our operating results in any period fall below the expectations of securities analysts and investors, the market price of our common stock would likely decline.

We are highly dependent on international sales and operations, which exposes us to foreign political and economic risks.

A majority of our sales and operations are outside of the United States. As a result, we are subject to regulatory, geopolitical and other risks associated with doing business in foreign countries. We anticipate that international sales will continue to account for a significant portion of our revenues. International sales and operations carry inherent risks such as:

- regulatory limitations imposed by foreign governments;
- trade wars between the United States and other foreign countries where we sell our products;
- obstacles to the protection of our intellectual property, political, military and terrorism risks;
- foreign currency controls and currency exchange rate fluctuations;
- periodic local or international economic downturns;
- political instability, natural disasters, acts of war or terrorism in regions where we have operations;
- repatriation of cash earned in foreign countries;
- longer payment cycles and difficulties in collecting accounts receivable outside of the U.S.;
- disruptions or delays in shipments caused by customs brokers or other government agencies;
- uncertainty regarding liability under foreign laws;
- changes in regulatory requirements (including import and export requirements), tariffs, customs, duties and other trade barriers;
- difficulties in staffing and managing foreign operations;
- potentially adverse tax consequences resulting from changes in tax laws; and
- other challenges caused by distance, language and cultural differences.

On June 23, 2016, the U.K. held a referendum in which British citizens approved an exit from the European Union (EU), commonly referred to as "Brexit." We ship some spare parts from the EU to the U.K that would possibly be subject to some delays if

the trade agreements between the EU and the U.K. are not finalized, however the volume of these shipments is immaterial, and we have alternative shipment methods to meet the needs of our customers.

If any of these risks materialize and we are unable to manage them, our international sales and operations would suffer.

We are exposed to fluctuations in the foreign currency exchange rates.

As a global concern, we face exposure to adverse movements in foreign currency exchange rates. Our exposure to foreign currency exchange rate fluctuations arise in part from current intercompany accounts in which costs are charged between our U.S. headquarters and foreign subsidiaries. These exposures may change over time as business practices evolve and could have a material adverse impact on our financial results and cash flow.

We are exposed to risks related to our banking arrangements and accounts receivable factoring.

We maintain bank accounts with both domestic and foreign financial institutions, any one of the institutions may prove to not be financially viable. If any of these financial institutions experiences financial difficulties or otherwise are unable to honor our deposit arrangements, we may experience material financial losses due to lack of access to our funds which could have an adverse impact on our operating results, financial condition and cash flows. In addition, we enter into factoring arrangements with certain financial institutions to sell a certain portion of our trade receivables. If we were to stop entering into these factoring arrangements, our operating results, financial condition and cash flows could be adversely impacted by delays or failure to collect the trade receivables.

Anti-takeover provisions in our charter documents and Delaware law could discourage, delay or prevent a change in control of our company and may affect the trading price of our common stock.

The anti-takeover provisions of the Delaware General Corporation Law may discourage, delay or prevent a change in control of our company by limiting our ability to engage in a business combination with an interested stockholder, even if a change of control would be beneficial to our existing stockholders. In addition, our certificate of incorporation and bylaws may discourage, delay or prevent a change in our management or control over us that stockholders may consider favorable. Our certificate of incorporation and bylaws:

- authorize the issuance of “blank check” preferred stock that could be issued by our board of directors to thwart a takeover attempt;
- limit who may call special meetings of stockholders; and
- prohibit stockholder action by written consent, requiring all actions to be taken at a meeting of the stockholders.

We are exposed to various risks related to legal proceedings that could result in substantial costs and disruption to normal business operations.

From time to time, and in the future, we may be, involved in legal proceedings or claims that involve breach of contract, product liability, employment, possible infringement of patents and intellectual property rights of third parties or by third parties. It is difficult to predict the outcome of litigation matters, and there can be no assurance that we will prevail in any litigation. For example, in August 2017, we were named as a defendant in a complaint brought by Optical Solutions, Inc. alleging claims arising from a purported exclusive purchase contract between OSI and us pertaining to certain product. Adverse determinations in such litigation could result in loss of our property rights, subject us to significant liabilities, any of which could significantly and adversely affect our business, financial condition and results of operations.

We rely upon certain critical information systems for our daily business operations. Our inability to use or access our information systems at critical points in time could unfavorably impact our business operations.

Our global operations are dependent upon certain information systems, including telecommunications, the internet, our corporate intranet, network communications, email and various computer hardware and software applications. System failures or malfunctions could disrupt our operations and our ability to timely and accurately process and report key components of our financial results. Difficulties with our enterprise resource planning (“ERP”) system (whether in connection with the regular operation, periodic enhancements, modifications or upgrades, or the integration of an acquired business into such system), which is integral to our ability to accurately and efficiently maintain our books and records, record transactions, provide critical information to our management, and prepare our financial statements, could adversely affect our ability to complete important business processes, such as the evaluation of our internal controls over financial reporting pursuant to Section 404 of the Sarbanes-Oxley Act of 2002.

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.

Some of our operations use substances regulated under various federal, state, local, and international laws governing the environment, including those relating to the storage, use, discharge, disposal, labeling, and human exposure to hazardous and toxic materials. We could incur costs, fines and civil or criminal sanctions, third-party property damage or personal injury claims, or could be required to incur substantial investigation or remediation costs, if we were to violate or become liable under environmental laws. Liability under environmental laws can be joint and several and without regard to comparative fault. Compliance with current or future environmental laws and regulations could restrict our ability to expand our facilities or require us to acquire additional expensive equipment, modify our manufacturing processes, or incur other significant expenses. We may unintentionally violate environmental laws or regulations in the future as a result of human error, equipment failure or other causes.

We may be exposed to liabilities under the FCPA and other anti-corruption laws, and any determination that we violated these laws could have a material adverse effect on our business.

We are subject to the Foreign Corrupt Practice Act of 1977 ("FCPA"), and other laws that prohibit improper payments or offers of payments to foreign governments and their officials and political parties by U.S. persons and issuers as defined by the statute, for the purpose of obtaining or retaining business. Also, similar worldwide anti-bribery laws, such as the U.K. Bribery Act and Chinese anti-corruption laws, generally prohibit companies and their intermediaries from making improper payments to non-U.S. officials for the purpose of obtaining or retaining business. Some of our distribution partners are located in parts of the world that have experienced governmental corruption to some degree and, in certain circumstances, strict compliance with anti-bribery laws may conflict with local customs and practices. Although we have implemented policies and procedures to discourage these practices by our employees, our existing safeguards and any future improvements may prove to be less than effective, and our employees, consultants, sales agents or distributors may engage in conduct for which we might be held responsible. Violations of the FCPA or international anti-corruption laws may result in severe criminal or civil sanctions, and we may be subject to other liabilities, which could negatively affect our business, operating results and financial condition. In addition, the U.S. government may seek to hold us liable for successor liability FCPA violations committed by companies in which we invest or that we acquire. We cannot assure you that our internal control policies and procedures will protect us from reckless or negligent acts committed by our employees, distributors, partners, consultants or agents.

Regulations related to conflict minerals could adversely impact our business.

The Dodd-Frank Wall Street Reform and Consumer Protection Act contains provisions to improve transparency and accountability concerning the supply of tin, tantalum, tungsten and gold, known as conflict minerals, originating from the Democratic Republic of Congo, or DRC, and adjoining countries. As a result, in August 2012 the United States Securities and Exchange Commission, or SEC, adopted annual disclosure and reporting requirements for public companies that use conflict minerals mined from the DRC and adjoining countries in their products. We have determined that we use at least one of these conflict minerals in the manufacture of our products, although we have not yet determined the source of the minerals that we use. These disclosure requirements require us to use diligent efforts to determine which conflict minerals we use and the source of those conflict minerals and disclose the results of our findings. There have been and will continue to be costs associated with complying with these disclosure requirements, including those costs incurred in conducting diligent efforts to determine which conflict minerals we use, and the sources of conflict minerals used in our products. Further, the implementation of these rules could adversely affect the sourcing, supply and pricing of materials used in our products. As there may be only a limited number of suppliers offering conflict free minerals, we cannot be sure that we will be able to obtain necessary conflict free conflict minerals in sufficient quantities or at competitive prices. In addition, we may face reputational challenges if we determine that our products contain minerals not determined to be conflict free or if we are unable to sufficiently

verify the origins for all conflict minerals used in our products through the procedures we implement. If we determine it is necessary to redesign our products to not use conflict minerals, we would incur costs associated with doing so.

ITEM 1B. UNRESOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

At December 29, 2018, our owned or leased facilities included those described below:

		Square	
Type	Location	Footage	Use
Owned	Milpitas, California	134,158	Corporate headquarters, manufacturing and corporate housing
Leased	Taiwan	18,896	Sales and service
Leased	South Korea	24,742	Sales, service and corporate housing
Leased	United States	63,533	Engineering, sales and service
Leased	Japan	14,924	Sales, service and corporate housing
Leased	China	14,269	Sales and service
Leased	Singapore	9,795	Sales and service
Leased	France	828	Sales and service
	Total	281,145	

We believe that our existing facilities are suitable for their respective uses and adequate for our current needs and anticipated growth.

ITEM 3. LEGAL PROCEEDINGS

The information set forth under Note 10, Commitments and Contingencies, in the Notes to Consolidated Financial Statements is incorporated by reference here.

ITEM 4. MINE SAFETY DISCLOSURES

N/A.

PART II

ITEM 5. MARKET FOR REGISTRANT'S COMMON EQUITY, RELATED STOCKHOLDER MATTERS AND ISSUER PURCHASES OF EQUITY SECURITIES

Market for our Common Stock

Our common stock is quoted on the Nasdaq Global Select Market under the symbol "NANO."

Stockholders

On February 22, 2019, there were approximately 127 holders of record of our common stock. Because brokers and the institutions on behalf of stockholders hold many of our shares of common stock, we are unable to estimate the total number of stockholders represented by these record holders.

Dividend Policy

We have never declared or paid any cash dividends on our capital stock. We currently expect to retain future earnings, if any, for use in the operation, expansion of our business and repurchase of shares and do not anticipate paying any cash dividends in the foreseeable future.

Recent Sales of Unregistered Securities

On November 15, 2018, we closed our acquisition of 4D Technology Corporation ("4D"). As part of the consideration, we issued an aggregate of 125,117 shares of our common stock to James Wyant, James Millerd and Neal Brock, the three principal stockholders of 4D (the "Principal Stockholders"). Pursuant to the terms of the Stock Purchase Agreement and related Escrow Agreement, the shares of our common stock were placed in escrow to fund any post-closing adjustments to the purchase price and to secure the indemnification obligations of the Principal Stockholders to Nanometrics. The Principal Stockholders agreed to indemnify us for inaccuracies in the representations or the breach of the warranties or covenants made by 4D, and for certain other matters, subject to certain limitations. The shares of our common stock were issued to the Principal Stockholders in consideration for the shares of 4D common stock held by the Principal Stockholders and were sold in reliance on Section 4(a)(2) under the Securities Act of 1933, as amended, and Rule 506 of Regulation D promulgated thereunder, as the Principal Stockholders represented that they are "accredited investors" as defined in Regulation D.

Stock Performance Graph

The following graph presentation compares cumulative five-year stockholder returns on an indexed basis, assuming a \$100 initial investment and reinvestment of dividends, of Nanometrics Incorporated, a broad-based equity market index and an industry-specific index. The broad-based equity market index used is the Nasdaq Composite Index and the industry-specific index used is the PHLX Semiconductor Index.

This performance graph shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, as amended or otherwise subject to the liabilities under that Section and shall not be deemed to be incorporated by reference into any of our filings under the Securities Act of 1933, as amended or the Exchange Act.

	12/13	12/14	12/15	12/16	12/17	12/18
Nanometrics Incorporated	100.00	88.29	79.48	131.55	130.81	143.46
Nasdaq Composite	100.00	114.62	122.81	133.19	172.11	165.84
PHLX Semiconductor	100.00	129.03	120.80	159.29	223.53	203.91

ITEM 6. SELECTED FINANCIAL DATA

The selected consolidated financial data set forth below is not necessarily indicative of results of future operations and should not be relied upon as an indicator of our future performance. This data should be read in conjunction with “Management’s Discussion and Analysis of Financial Condition and Results of Operations” and the consolidated financial statements and related notes included elsewhere in this Annual Report on Form 10-K. Our fiscal years 2018, 2017, 2016, 2015, and 2014, as referred to below, refer to our fiscal years ended December 29, 2018, December 30, 2017, December 31, 2016, December 26, 2015 and December 27, 2014, respectively.

	Fiscal Year				
	2018 ⁽¹⁾	2017 ⁽²⁾	2016 ⁽³⁾	2015	2014 ⁽⁴⁾
(in thousands, except per share data)					
Consolidated Statement of Operations Data:					
Total net revenues	\$324,523	\$258,621	\$221,129	\$187,367	\$166,443
Gross profit	\$184,094	\$136,701	\$114,124	\$89,667	\$75,822
Income (loss) from operations	\$66,487	\$42,806	\$29,095	\$4,973	\$(11,653)
Net income (loss)	\$57,648	\$30,202	\$44,035	\$2,905	\$(31,118)
Basic net income (loss) per share	\$2.39	\$1.19	\$1.79	\$0.12	\$(1.30)
Diluted net income (loss) per share	\$2.34	\$1.17	\$1.75	\$0.12	\$(1.30)

⁽¹⁾Our net income included the impacts of the Tax Cuts and Jobs Act that was signed into law on December 22, 2017, including the impact resulting from additional guidance that was issued in 2018.

⁽²⁾Our net income included a \$2.9 million additional tax expense from the remeasurement of deferred tax assets relating to the Tax Cuts and Jobs Act that was signed into law on December 22, 2017.

⁽³⁾Our net income included a release of non-cash valuation allowance of \$27.4 million against a significant portion of our U.S. and foreign deferred tax assets.

⁽⁴⁾Our net loss included a non-cash valuation allowance of \$21.1 million on certain U.S. deferred tax assets.

	Fiscal Year Ended				
	2018	2017	2016	2015	2014
(in thousands)					
Consolidated Balance Sheet Data:					
Cash, cash equivalents and marketable securities	\$151,792	\$117,029	\$129,961	\$83,085	\$83,962
Working capital	\$211,108	\$196,019	\$174,353	\$132,903	\$119,797
Total assets	\$375,630	\$309,699	\$287,830	\$235,540	\$223,236
Long-term liabilities	\$3,005	\$3,221	\$2,030	\$3,001	\$5,497
Total stockholders’ equity	\$312,852	\$262,383	\$243,774	\$187,328	\$179,537

ITEM 7. MANAGEMENT'S DISCUSSION AND ANALYSIS OF FINANCIAL CONDITION AND RESULTS OF OPERATIONS

Overview

You should read the following discussion and analysis of our financial condition and results of operations together with "Selected Financial Data" and our consolidated financial statements and related notes appearing elsewhere in this Annual Report on Form 10-K. This discussion and analysis contains forward-looking statements that involve risks, uncertainties and assumptions. The actual results may differ materially from those anticipated in these forward-looking statements as a result of certain factors, including, but not limited to, those presented under "Risk Factors" in Item 1A and elsewhere in this Annual Report on Form 10-K. Please see "Cautionary Information Regarding Forward-Looking Statements" at the beginning of this Form 10-K for additional information you should consider regarding forward-looking statements.

We are an innovator in the field of optical metrology systems, optical inspection systems and advanced analytics for semiconductor manufacturing and other industries. Our systems and solutions are designed to precisely monitor optical critical dimensions, film thickness, and other parameters that are necessary to control the manufacturing process, identify defects, and detect manufacturing equipment anomalies that can affect production yields and device performance.

Principal factors that impact our revenue growth include capital expenditures by manufacturers of semiconductors to increase capacity and to enable their development of new technologies, and our ability to improve market share. The increasing complexity of the manufacturing processes for semiconductors is an important factor in the demand for our innovative metrology systems. Our strategy is to continue to innovate organically as well as to evaluate strategic acquisitions to address business challenges and opportunities.

In November of 2018 we acquired 4D Technology Corporation ("4D"), based in Tucson Arizona. The 4D business unit offers a line of interferometry systems for the measurement and inspection of high precision surfaces. 4D's solutions are used primarily in the manufacture of advanced aerospace and industrial systems as well as for scientific research and semiconductor applications.

We derive our revenues primarily from product sales but also from customer service and system upgrades for the installed base of our products. In 2018, we derived 85% of our total net revenues from product sales and 15% of our total net revenues from services.

Important Themes and Significant Trends

The semiconductor equipment industry is characterized by new manufacturing processes (node) coming to market every two to three years. At every new node, in the semiconductor industry our customers drive the need for metrology as a major component of device manufacturing. These trends include:

• **Proliferation of Optical Critical Dimension Metrology across Fabrication Processes.** Device dimensions must be carefully controlled during each step of processing. These patterned structures are measured at many subsequent production steps including Chemical Mechanical Polishing, Etch, and Thin Film processing, all driving broader OCD adoption. Our proprietary OCD systems can provide the critical process control of these circuit dimensions that is necessary for successful manufacturing of these state-of-the-art devices. Nanometrics OCD technology is broadly adopted across 3D-NAND, DRAM, and logic semiconductor manufacturing processes.

• **Proliferation of 3D Transistor Architectures.** Our end customers continue to improve device density and performance by scaling front-end-of-line transistor architectures. Many of these designs, including FinFET transistors, have buried features and high aspect ratio stacked features that enable improved performance and density. The advanced designs

require additional process control to manage the complex shapes and materials properties, driving additional applications of our systems.

• **Proliferation of High-Density 3D-NAND.** Our end customers have migrated to multi (many) layered high aspect ratio 3D-NAND devices. Many stacks of NAND cells are formed in parallel. This 3D-NAND architecture enables cost effective density scaling, removing the burden of density from lithography to deposition and etch processes. These devices require additional process control of deposition stacks, planarization processes, and critical high aspect ratio etch processes. Nanometrics thin films and OCD technologies are adopted across the 3D-NAND process including the periphery CMOS processing, NAND cell formation, and Interconnect of the devices.

• **Adoption of New Types of Thin Film Materials.** The need for ever increasing device circuit speed coupled with lower power consumption has pushed semiconductor device manufacturers to new materials and processing methods with single atom/sub nanometer control over these processes.

• **Need for Improved Process Control to Drive Process Efficiencies.** Competitive forces influencing semiconductor device manufacturers, such as price-cutting, shorter product life cycles and time to market, place pressure on

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manufacturers to rapidly achieve production efficiency. Device manufacturers are using our integrated and automated systems, as well as advanced metrology algorithms and analytics throughout the fabrication process to ensure that manufacturing processes scale rapidly, are accurate and can be repeated on a consistent basis.

Critical Accounting Policies

The preparation of our financial statements conforms to accounting principles generally accepted in the United States of America, which requires management to make estimates and judgments in applying our accounting policies that have an important impact on our reported amounts of assets, liabilities, revenue, expenses and related disclosures at the date of our financial statements. On an ongoing basis, management evaluates its estimates including those related to revenue, bad debts, inventory valuations, warranty obligations, impairment and income taxes. Management bases its estimates and judgments on historical experience and on various other factors that are believed 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 management's estimates. We believe that the application of the following accounting policies requires significant judgments and estimates on the part of management. For a summary of all of our accounting policies, including those discussed below, see Note 1 to our consolidated financial statements.

Revenue Recognition - We recognize revenue when control of a good or service has transferred to a customer. The amount of revenue recognized reflects the amount which we expect to be entitled to in exchange for the transfer of the goods or services in a contract with a customer. Revenue excludes amounts collected on behalf of third parties including taxes assessed by governmental authorities that are both imposed on and concurrent with a specific revenue producing transaction. Shipping and handling costs associated with outbound freight both before and after control over a product has transferred to a customer are accounted for as a fulfillment cost and are included in cost of revenues. We record revenue on a gross basis, rather than net, as we act as the principal in all of our contractual arrangements and not as an agent.

Accordingly, we follow a 5-Step process to evaluate our contracts with customers to determine the amount and timing of revenue recognition. This determination includes certain estimates and areas in which judgment is needed during each step of the process.

We first identify whether a legally enforceable contract with a customer exists. We evaluate the following criteria in our evaluation and if all criteria are not met, a contract does not exist and any revenue that otherwise would be recorded because a good or service had been transferred to a customer is deferred until such time that a contract exists: (1) both parties have approved the contract and are committed to perform, (2) we can identify each party's rights regarding the goods or services to be transferred, (3) we can identify the payment terms for the goods or services to be delivered, (4) the contract has commercial substance, and (5) it is probable that we will collect substantially all of the consideration to which we will be entitled in exchange for the goods or services that will be transferred to the customer. Historically, we have not experienced customer payment defaults that would lead us to conclude that we do not have a contract under the new standard.

Once the contract has been identified, we evaluate the promises in the contract to identify performance obligations. We apply judgement in evaluating whether the performance obligations are distinct; that is, have stand-alone value to the customer. Many of the contracts include more than one performance obligation – for example the delivery of a system generally includes the promise to install the system in the customer's facility. Additionally, a contract could include the purchase of multiple systems or the purchase of a system and an upgrade. Promises in contracts which do not result in the transfer of a good or service are not performance obligations, as well as those promises that are administrative in nature, or are immaterial in the context of the contract. Our determination of the number of performance obligations in a contract requires judgement and could impact the amount and timing of revenue recognition.

Once the performance obligations in the contract have been identified, we estimate the transaction price of the contract. The estimate includes amounts that are fixed as well as those that can vary based on contractual terms (e.g., performance bonuses/penalties, amounts payable to customers, rebates, prompt payment discounts, etc.) These variable consideration items are rare as most of our contracts include only fixed amounts. It is expected that estimates of variable consideration will be immaterial for us and would occur if customers did not meet their contractual purchase commitments and we would be entitled to recover additional contract consideration.

Once the transaction price of the contract has been identified, we allocate the transaction price to the identified performance obligations. This is done on a relative selling price basis using standalone selling prices (“SSP”). For most performance obligations, we do not have observable SSP’s as they are not regularly sold on a standalone basis however if a performance obligation does have an observable SSP it is used for allocation purposes. Without observable SSP’s, we estimate the SSP using a methodology which maximizes the use of observable inputs – namely a cost-plus gross margin approach. Our determination of the SSP requires judgment and could impact the amount and timing of revenue recognition.

Lastly, we record the amount allocated to each performance obligation as revenue when control of that good or service has transferred to the customer. We first evaluate whether a good or service is transferred over time, and if it is not, then it is recorded at a point in time. For service contracts, we record revenue based on its measurement of progress, and the best method to determine this is the percentage of the stand-ready obligation that is completed to date as this best reflects the value of the service transferred to the customer. The timing of satisfaction of the performance obligation to payment is dependent upon the negotiated payment terms but generally occurs within 30 to 60 days. We evaluate the following indicators to determine the point in time at which control transfers to the customer and may apply judgment in this evaluation based on present right to payment, legal title, physical possession, risk and rewards of ownership and customer acceptance. Typically, for new product introductions, we defer revenue recognition until formal customer acceptance is received from the customer. Additionally, for system shipments to Japan, revenue is deferred because typical contractual terms indicate that payment is not due, and title does not transfer until customer acceptance occurs.

We warrant our products against defects in manufacturing. In those instances, in which extended warranty services are separately quoted to the customer or if the warranty includes services beyond just an assurance that the product will work as intended, an additional performance obligation is created, and the associated revenue is deferred and recognized as service revenue ratably over the term of the extended warranty period. The portion of service contracts and extended warranty services agreements that are uncompleted at the end of any reporting period are included in deferred revenue.

Frequently, we deliver products and various services in a single transaction. Our deliverables consist of tools, installation, upgrades, billable services, spare parts, and service contracts. Our typical multi-element arrangements include a sale of one or multiple tools that include installation and standard warranty. Other arrangements consist of a sale of tools bundled with service elements or delivery of different types of services. Our tools, upgrades, and spare parts are generally delivered to customers within a period of up to six months from order date. Installation is usually performed soon after delivery of the tool. We defer the estimated portion of revenue associated with installation based on relative selling price and that revenue is recognized upon completion of the installation and receipt of final acceptance.

When performance obligations are not transferred to a customer at the end of a reporting period, the amount allocated to those performance obligations is deferred until control of these performance obligations is transferred to the customer. When we determine that performance obligations cannot be accounted for as separate units of accounting, we account for the entire arrangement as a single unit of accounting and we defer revenue until all elements are delivered and all revenue recognition requirements are met. The amount of revenue recognized in the twelve months ended December 29, 2018 that was included in the contract liability balance as of the beginning of the year was \$5.2 million. The impact of Topic 606 adoption on our financial statements is summarized in the Notes to the Consolidated Financial Statements and is incorporated herein by reference.

Business combinations - We account for business combinations under the acquisition method of accounting, which requires us to recognize separately from goodwill the assets acquired, and the liabilities assumed at their acquisition date fair values. While we use our best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as contingent consideration, where applicable, our estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, we record adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon the conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recognized in our consolidated statements of operations. Accounting for business combinations requires our management to make significant estimates and assumptions, especially at the acquisition date including our estimates for intangible assets, contractual obligations assumed, restructuring liabilities, pre-acquisition contingencies, and contingent consideration, where applicable.

Although we believe the assumptions and estimates we have made in the past have been reasonable and appropriate, they are based, in part, on historical experience and information obtained from the management of the acquired companies and are inherently uncertain. Critical estimates in valuing certain acquired intangible assets under the income approach include growth in future expected cash flows from product sales, customer contracts and acquired technologies, technology obsolescence rates, expected costs to develop in-process research and development, or IPR&D, into commercially viable products, estimated cash flows from the projects when completed and discount rates. Unanticipated events and circumstances may occur that may affect the accuracy or validity of such assumptions, estimates or actual results.

Allowance for Doubtful Accounts – We maintain allowances for estimated losses resulting from the inability of our customers to make their required payments. We establish credit limits through a process of reviewing the financial history and stability of our customers. Where appropriate and available, we obtain credit rating reports and financial statements of customers when determining or modifying their credit limits. We regularly evaluate the collectability of our trade receivable balances based on a combination of factors such as the length of time the receivables are past due, customary payment practices in the respective geographies and our historical collection experience with customers. We believe that our allowance for doubtful accounts adequately reflects our risk associated with our receivables. If the financial condition of a customer were to deteriorate, resulting in their inability to make payments, we would assess the necessity of recording additional allowances. This would result in additional general and administrative expenses being recorded for the period in which such determination was made

Inventories – Inventories are valued at standard costs, which approximates actual cost calculated on a first-in, first-out basis, not in excess of net realizable value. We apply judgment in determining standard rates for material burden, direct labor and overhead used in valuing inventory, and periodically review such rates to ensure that the rates result in an inventory valuation not in excess of net realizable value. We have established inventory reserves when conditions exist that suggest that our inventory may be in excess of anticipated demand or is obsolete based upon our assumptions about future demand for our products and market conditions. Once a reserve has been established, it is maintained until the part to which it relates is sold or is otherwise disposed of. Therefore, a sale of reserved inventory has a higher gross profit margin. We regularly evaluate our ability to realize the value of our inventory based on a combination of factors including the following: historical usage rates, forecasted sales of usage, product end-of-life dates, estimated current and future market values and new product introductions. Inventory includes evaluation tools placed at customer sites. For demonstration inventory, we also consider the age of the inventory and potential cost to refurbish the inventory prior to sale. We amortize demonstration inventory over its useful life and the amortization expense is included in total inventory write down on our statements of cash flows. When recorded, our reserves are intended to reduce the carrying value of our inventory to its net realizable value. If actual demand for our products deteriorates, or market conditions are less favorable than those that we project, additional reserves may be required, which would adversely affect gross margin and net income.

Product Warranties – We sell the majority of our products with a standard twelve-month repair or replacement warranty from the date of acceptance or shipment date. We provide an accrual for estimated future warranty costs based upon the historical relationship of warranty costs to the cost of products sold. The estimated future warranty obligations related to product sales are reported in the period in which the related revenue is recognized. The estimated future warranty obligations are affected by the warranty periods, sales volumes, product failure rates, material usage and labor and replacement costs incurred in correcting a product failure. If actual product failure rates, material usage, labor or replacement costs differ from our estimates, revisions to the estimated warranty obligations would be required. For new product introductions where limited or no historical information exists, we may use warranty information from other previous product introductions to guide us in estimating our warranty accrual. The warranty accrual represents the best estimate of the amount necessary to settle future and existing claims on products sold as of the balance sheet date. We periodically assess the adequacy of our recorded warranty reserve and adjust the amounts in accordance with changes in these factors.

Goodwill and Intangible Assets - Intangible assets with finite lives are amortized over their useful lives and are subject to an impairment assessment, as well as an evaluation of the appropriateness of their estimated useful lives, whenever events or changes in circumstances indicate that the carrying amount(s) may not be recoverable. During the annual impairment test performed on intangible assets, we will determine from the business owner as to whether the underlying technology is being utilized or have potential for further utilization. If it is deemed that the asset has no future benefit to the company, and it is fully amortized for both book and tax purposes, then it will be written off. Goodwill and indefinite lived assets are not amortized but tested annually for impairment. The goodwill impairment assessment involves three tests, Step 0, Step 1 and Step 2. The Step 0 test involves performing an initial qualitative assessment to determine whether it is more likely than not that the asset is impaired and thus whether it is necessary to proceed to Step 1 and calculate the fair value of the reporting unit. We may proceed directly to the Step 1 test without performing the Step 0 test. The Step 1 test involves measuring the recoverability of goodwill at the reporting unit level by comparing the reporting unit's carrying amount, including goodwill, to the fair value of the reporting unit.

We perform a Step 0 assessment of the goodwill during the fourth quarter of each fiscal year, or whenever events or circumstances occur which indicate that an impairment may have occurred. As part of this assessment, we consider the trading value of our stock, industry trends, and our sales forecast and products plans to determine if it is more likely than not that the fair value is higher than the carrying value of our reporting unit. If, after assessing the qualitative factors, we determine that it is not likely that the fair value of a reporting unit is less than its carrying value, then performing the two-step impairment test is unnecessary. However, if we conclude otherwise, then we are

required to perform the Step 1 of the two-step goodwill impairment test. The Step 1 test requires a comparison of the fair value of our reporting unit to its net book value. If the fair value of the reporting unit is greater than its net book value, then no impairment is deemed to have occurred. If the fair value is less, then the Step 2 must be performed to determine the amount, if any, of actual impairment.

The process of evaluating the potential impairment of goodwill is highly subjective and requires significant judgment. In estimating the fair value of goodwill at the reporting unit level, we make estimates and judgments about future revenues and cash flows for the reporting unit. To determine the fair value, our review process includes the income method and is based on a discounted future cash flow approach that uses estimates including the following for the reporting unit: estimated revenue, market segment growth rates and market share assumptions; estimated costs; and appropriate discount rates based on the reporting unit's weighted average cost of capital. Our estimates of market segment growth, our market segment share and costs are based on historical data, various internal estimates and certain external sources, and are based on assumptions that are consistent with the plans and estimates we are using to manage the underlying businesses. Our business consists of both established and emerging technologies and our forecasts for emerging technologies are based upon internal estimates and external sources rather than historical information. We also consider our market capitalization on the dates of our impairment tests in determining the fair value of the respective businesses. As

part of this assessment, we consider the trading value of our stock and our implied value, as compared to our net assets, as well as the valuation of our acquired businesses. If the carrying amount of the reporting unit exceeds its fair value as determined by these assessments, goodwill is considered impaired, and the Step 2 test is performed to measure the amount of impairment loss. As part of the Step 2 test to determine the amount of goodwill impairment, if any, we allocate the fair value of the reporting unit to all of its assets and liabilities as if the reporting unit had been acquired in a business combination and the fair value of the reporting unit was the price paid to acquire the reporting unit. The excess of the fair value of the reporting unit over the amount assigned to its assets and liabilities is the implied fair value of goodwill. When impairment is deemed to have occurred, we will recognize an impairment charge to reduce the carrying amount of our goodwill to its implied fair value.

Income Tax Assets and Liabilities – We account for income taxes such that deferred tax assets and liabilities must be recognized using enacted tax rates for the effect of temporary differences between the book and tax accounting for assets and liabilities. Also, deferred tax assets are reduced by a valuation allowance to the extent that management cannot conclude that it is more likely than not that a portion of the deferred tax asset will be realized in the future. We evaluate the deferred tax assets on a continuous basis throughout the year to determine whether or not a valuation allowance is appropriate. Factors used in this determination include future expected income and the underlying asset or liability which generated the temporary tax difference. The income tax provision is primarily impacted by federal statutory rates, state and foreign income taxes and changes in the valuation allowance.

Recent Accounting Pronouncements

See Note 2 of our consolidated financial statements for a description of recent accounting pronouncements, including the respective dates of adoption and effects on our results of operations and financial condition.

Results of Operations

Total net revenues

Our net revenues comprised the following (in thousands, except percentages):

	Fiscal Year			
	2018	2017	Change	
Total product revenue	\$275,286	\$214,877	\$60,409	28.1%
Service	49,237	43,744	5,493	12.6%
Total net revenues	\$324,523	\$258,621	\$65,902	25.5%

	Fiscal Year			
	2017	2016	Change	
Total product revenue	\$214,877	\$185,066	\$29,811	16.1%
Service	43,744	36,063	7,681	21.3%
Total net revenues	\$258,621	\$221,129	\$37,492	17.0%

In 2018, total net revenues increased by \$65.9 million from 2017. In 2018, the increase in product revenues was approximately \$60.4 million or 28.1% primarily due to significant increases in customer spending in memory, 3-D

NAND, DRAM and also driven by new product adoptions by our customers. Service revenue increased by \$5.5 million or 12.6% in 2018 principally due to an increase in sales of spare parts and service contracts as a result our increasing installed base, and a modest increase in sales of refurbishment systems.

In 2017, total net revenues increased by \$37.5 million from 2016. Customer spending trends for 3D-NAND, DRAM and Foundry primarily contributed to such year over year revenue growth. The increase of \$29.8 million or 16.1% in product revenues was fueled by the increase in new product adoption and gains in market share. Service revenue increased by \$7.7 million in 2017 principally due to an increase in sales of spare parts and service contracts because of our increasing installed base.

With a significant portion of the world's semiconductor manufacturing capacity located in Asia, a substantial portion of our revenues continue to be generated in that region. Significant fab expansions and customers moving into next generation technologies mainly in China and Japan contributed to the higher revenues in 2017 and 2018.

Gross margin

Our gross margin breakdown was as follows:

	Fiscal Year		
	2018	2017	2016
Products	58.9%	52.9%	53.1%
Service	44.5%	52.4%	44.1%

The calculation of product gross margin includes cost of products including related upgrades and amortization of intangibles. The gross margin on product revenue increased six percentage points from 52.9% in 2017 to 58.9% in 2018. The increase was due to a favorable product and customer mix, upgrade margins and lower warranty costs for our more established product lines. Inventory adjustments related to additional E&O reserves and the amortization of step up inventory valuation for 4D, negatively impacted product gross margins by 0.5 percent in 2018. The gross margin on our services business decreased to 44.5% in 2018 from 52.4% in 2017, reflecting a decrease of 7.9 percentage points. The decrease was due to lower labor utilization and higher fulfilment costs for service contracts resulting from a higher rate of field maintenance requests.

The gross margin on product revenue remained relatively flat in 2017 compared to 2016. However, the gross margin of our services business improved to 52.4% in 2017 from 44.1% in 2016, reflecting an increase of 8.3 percentage points. The increase in gross margin was due to increases in margin of service parts, a more favorable product mix and higher utilization of our service personnel.

Operating expenses

Our operating expenses comprise the following categories (in thousands, except percentages):

	Fiscal Year			
	2018	2017	Change	
Research and development	\$48,188	\$36,716	\$11,472	31.2%
Selling	37,528	30,839	6,689	21.7%
General and administrative	31,795	26,340	5,455	20.7%
Amortization of intangible assets	96	-	96	NA
Total operating expenses	\$117,607	\$93,895	\$23,712	25.3%

	Fiscal Year			
	2017	2016	Change	
Research and development	\$36,716	\$31,443	\$5,273	16.8%
Selling	30,839	30,181	658	2.2%
General and administrative	26,340	23,381	2,959	12.7%
Amortization of intangible assets	-	24	(24)	NA
Total operating expenses	\$93,895	\$85,029	\$8,866	10.4%

Research and development

Investments in research and development personnel and associated projects are part of our strategy to ensure our products remain competitive and meet customer's needs. In 2018, research and development costs increased by \$11.5 million or 31.2% compared to 2017 primarily due to additional headcount, higher variable compensation costs, consulting fees, new product development costs, incremental process improvement for customers and such costs associated with 4D since their acquisition date. We continue to invest in development of several new products to retain our competitive position and meet the advanced technology needs for our customers as they continue to improve the performance of their semiconductor devices.

In 2017, research and development costs increased by \$5.3 million or 16.8% compared to 2016 primarily due to additional headcount and higher material spending in program related expenses to support our research and development efforts.

Selling

Selling expenses increased by \$6.7 million or 21.7% in 2018 compared to 2017 primarily due to additional headcount, higher variable compensation costs, higher sales commission expenses, and such costs associated with 4D since their acquisition date. Higher

revenues of 25% resulted in higher sales commissions, and we also opened several new sales and service offices in Asia to better serve the needs of customer fab expansions at these locations.

Selling expenses increased slightly by \$0.7 million or 2.2% in 2017 compared to 2016. The slight increase was due to higher variable compensation, commission expense, and sales related costs, which was consistent with higher revenues in 2017 compared to 2016.

General and administrative

General and administrative expenses increased by \$5.5 million or 20.7% in 2018 compared to 2017. The increase was primarily due to executive transition and search costs, higher variable compensation costs, higher professional service fees, and such costs associated with 4D since their acquisition date. Our revenues and profitability exceeded the growth of the wafer fab equipment market and company targets resulting in higher compensation costs, and additional professional service fees for business development and acquisition activities during 2018. Acquisition costs of \$0.9 million were incurred in 2018 primarily for accounting and legal services.

General and administrative expenses increased by \$3.0 million or 12.7% in 2017 compared to 2016. The increase was primarily due to higher variable compensation costs, recruiting costs associated with our CEO search and higher professional services fees.

Amortization of intangible assets

Amortization of \$96,000 was recorded in 2018, representing one month of amortization of certain intangible assets acquired as a result of the 4D acquisition. We recorded no amortization of intangible assets in operating expenses in fiscal 2017 as prior intangible assets were fully amortized in 2016.

Other income (expense), net

Our other income (expense), net, consisted of the following items (in thousands, except percentages):

	Fiscal Year		
	2018	2017	Change
Interest income	\$10	\$8	\$2
Interest expense	(331)	(92)	(239)
Interest income (expense), net	\$(321)	\$(84)	\$(237)
Net gains on investments	1,379	1,311	68
Other gains (losses), net	(21)	(735)	714
Other income (loss), net	\$1,358	\$576	\$782
Total other income (expense), net	\$1,037	\$492	\$545

	Fiscal Year		
	2017	2016	Change
Interest income	\$8	\$35	\$(27)
Interest expense	(92)	(285)	193
Interest income (expense), net	\$(84)	\$(250)	\$166

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Net gains on investments	1,311	520	791
Other gains, net	(735)	(230)	(505)
Other income (loss), net	576	290	286
Total other income (expense), net	\$492	\$40	\$ 452

Total other income, net increased by \$0.5 million in 2018 compared to 2017. The increase was primarily due to gain of \$0.8 million on the sale of an asset, partially offset by unfavorable net revaluation of intercompany balances based on foreign currency fluctuations relative to the U.S. dollar, netted against hedging gains and losses and interest expense on factored receivables.

Total other income, net increased by \$0.5 million in 2017 compared to 2016, primarily due to higher net realized investment gains, which is in line with the higher cash and cash equivalents balance in 2017, partially offset by unfavorable net revaluation of intercompany balances based on foreign currency fluctuations relative to the U.S. dollar, netted against hedging gains and losses.

Provision for (benefit from) income taxes

We recorded an income tax provision of \$9.9 million in 2018, an income tax provision of \$13.1 million in 2017, and an income tax benefit of \$14.9 million in 2016. The decrease in the provision for 2018 from 2017 was primarily related to the lower statutory federal tax rates enacted by the Tax Cuts and Jobs Act of 2017. The increase in the provision for 2017 from 2016 was primarily related to the decreased benefit of our U.S. deferred tax assets from the Tax Cuts and Jobs Act of 2017 and increased profitability for the year ended 2017, offset by the release of a valuation allowance against a significant portion of our U.S. deferred tax assets for the year ended 2016.

Our provision for income taxes for 2018 of \$9.9 million reflects an effective tax rate of 14.6%. This rate differs from the federal statutory rate of 21% primarily due to foreign income taxed at lower rates, tax credits generated in the current year, and tax benefits associated with the settlement of equity options/awards, offset by an increase in valuation allowances for our California and Switzerland deferred tax assets.

Our provision for income taxes for 2017 of \$13.1 million reflects an effective tax rate of 30.2%. This rate differed from the then Federal statutory rate of 35.0% primarily due to foreign income taxed at lower rates, and tax credits generated in the current year, tax benefits associated with the settlement of equity options/awards, and a one-time benefit related to an entity classification change, offset by an additional provision for the tax effects of the Tax Cuts and Job Act of 2017.

Our benefit for income taxes for 2016 of \$14.9 million reflects an effective tax rate of negative 51.1%. This rate differs from the then Federal statutory rate of 35.0% primarily due to the release of a valuation allowance against a significant portion of our U.S. deferred tax assets which represented a \$23.9 million benefit, as well as foreign income taxed at lower rates, and tax credits generated in the current year, offset by equity compensation expenses for which no current tax deduction is available.

We maintain valuation allowances when it is likely that all or a portion of a deferred tax asset will not be realized. Changes in valuation allowances from period to period are included in our income tax provision in the period of change. In determining whether a valuation allowance is warranted, we take into account such factors as prior earnings history, expected future earnings, unsettled circumstances that, if unfavorably resolved, would adversely affect utilization of a deferred tax asset, carry-back and carry-forward periods, and tax strategies that could potentially enhance the likelihood of realization of a deferred tax asset. We currently maintain a valuation allowance against our deferred tax assets in California and Switzerland.

In December 2017, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (SAB 118), which allowed us to record provisional amounts during a measurement period not to extend beyond one year of the enactment date. As of December 29, 2018, we had finalized all provisional amounts related to the Tax Act. Finalizing provisional adjustments related to the Tax Act did not have a material impact on our consolidated financial statements as of December 29, 2018. We expect further guidance may be forthcoming from the Financial Accounting Standards Board and the Securities and Exchange Commission, as well as regulations, interpretations and rulings from federal and state tax agencies, which could result in additional impacts.

The 2017 Tax Act creates a new requirement that global intangible low-taxed income (“GILTI”) earned by controlled foreign corporations (“CFCs”) must be included currently in the gross income of the CFCs’ U.S. shareholder. Under U.S. GAAP, we are allowed to make an accounting policy choice of either (1) treating taxes due on future U.S. inclusions in taxable income related to GILTI as a current-period expense when incurred (the “period cost method”) or (2) factoring such amounts into a company’s measurement of its deferred taxes (the “deferred method”). Our selection of an accounting policy for 2018 with respect to the GILTI tax rules was to treat GILTI tax as a current period expense under the period cost method.

Liquidity and Capital Resources

Our principal sources of liquidity are cash and cash equivalents, marketable securities and cash flow generated from our operations. Our liquidity is affected by many factors, including those that relate to our specific operations and those that relate to the uncertainties of global and regional economies and the sectors of the semiconductor industry which we operate in. Although our cash requirements will fluctuate based on the timing and extent of these factors, we believe our existing cash, cash equivalents and

marketable securities, combined with cash currently projected to be generated from our operations, will be sufficient to meet our liquidity needs through at least the next twelve months.

The following table presents selected financial information and statistics as of and for the years ended December 29, 2018, December 30, 2017 and December 31, 2016 (in millions):

	December 29, 2018	December 30, 2017	December 31, 2016
Cash, cash equivalents and marketable securities	\$ 151.8	\$ 117.0	\$ 130.0
Working capital	\$ 211.1	\$ 196.0	\$ 174.4
Cash provided by operating activities	\$ 103.3	\$ 20.6	\$ 45.7
Cash used in investing activities	\$ (4.3)	\$ (6.7)	\$ (42.1)
Cash provided by (used in) financing activities	\$ (22.8)	\$ (25.6)	\$ 5.3

During 2018, the \$103.3 million cash provided by operating activities was a result of \$57.6 million of net income plus \$24.2 million net effect of non-cash adjustments to net income, plus \$21.5 million net change in operating assets and liabilities. The change in operating assets and liabilities is generally driven by the timing of our customer payments for accounts receivable and timing of our vendor payments for accounts payable, and additional inventory purchases related to the build of newer products. We expect that cash provided by operating activities may fluctuate due to several factors, including variations in our operating results, accounts receivable collections performance, inventory and supply chain management, vendor payment initiatives, tax benefits or charges from stock-based compensation, and the timing and amount of compensation and other payments. The \$82.7 million increase in cash provided from operating activities in 2018 compared to 2017 was primarily due to an increase in net income of \$27.4 million and an increase in cash from changes in assets and liabilities of \$55.3 million. The increase in net income of \$27.4 million was a result of a 25% increase in sales with a 4% increase in gross margins in 2018 compared to 2017, that was partially offset by additional investments in operating expenses especially in the development of new products. An increase in cash from working capital changes of \$56.3 million was primarily driven by significant improvement in days sales outstanding, relative improvement in inventory levels and inventory turns relative to the growth in volume, and favorable payment terms with our suppliers. Net cash used in investing activities of \$4.3 million during 2018 consisted primarily of cash used to acquire 4D of \$37.2 million and certain assets, property, plant and equipment of \$7.5 million, which was partially offset by cash provided from net sales and maturities of marketable securities of \$41.5 million. We sold a condominium, used to house travelling employees, for \$0.9 million. Cash used in investing activities was relatively unchanged in 2018 from 2017. Cash used in financing activities of \$22.8 million during 2018 consisted primarily of \$23.0 million of common stock repurchases and \$3.6 million of cash paid for taxes on net issuance of stock awards, partially offset by proceeds from issuance of common stock from the employee stock purchase program and the exercise of stock options of \$3.8 million. Cash used in financing activities were relatively unchanged in 2018 from 2017.

During 2017, the \$20.6 million cash provided by operating activities was a result of \$30.2 million of net income plus \$25.3 million net effect of non-cash adjustments to net income, offset by \$34.5 million net change in operating assets and liabilities. The change in operating assets and liabilities is generally driven by the timing of our customer payments for account receivable and timing of our vendor payments for accounts payable. The \$25.1 million decrease in cash from operating activities in fiscal 2017 compared to fiscal 2016 was primarily due to higher inventory levels at the end of the fiscal year and higher accounts receivable balance as a result of the record high revenue level in the

fourth quarter of the 2017 fiscal year. Cash used in investing activities of \$6.7 million during 2017, consisted primarily of cash used to acquire certain assets and property, plant and equipment of \$7.2 million, as sales and maturities of marketable securities were almost entirely offset by purchases of marketable securities. Cash used in financing activities of \$25.6 million during 2017 consisted primarily of \$27.0 million of common stock repurchases and \$4.2 million of cash paid for taxes on net issuance of stock awards, partially offset by proceeds from issuance of common stock from the employee stock purchase program and the exercise of stock options of \$5.6 million.

During 2016, cash provided by operating activities was a result of \$44.0 million of net income plus the net effect of non-cash adjustments to net income and net change in operating assets and liabilities. The increase in cash from operating activities in fiscal 2016 compared to fiscal 2015 was primarily due to improved working capital, higher revenue levels and higher net income. Cash used in investing activities of \$42.1 million during 2016, consisted primarily of \$82.9 million net purchases of marketable securities and cash used to acquire \$4.0 million of property, plant and equipment, partially offset by cash provided by maturities of marketable securities of \$38.8 million and cash received from sales of marketable securities of \$6.0 million. Cash provided by financing activities of \$5.3 million during 2016 consisted primarily of \$8.4 million in proceeds from issuance of common stock from the employee stock purchase program and the exercise of stock options, partially offset by cash paid for taxes on net issuance of stock awards of \$1.8 million, \$1.0 million of excess tax benefit from equity awards and royalty payments to Zygo of \$0.3 million.

We have evaluated and will continue to evaluate the acquisitions of products, technologies or businesses that are complementary to our business. These activities may result in product and business investments, which may affect our cash position and working capital balances. Some of these activities might require significant cash outlays.

We earn a portion of our operating income outside the United States, which is deemed to be indefinitely reinvested in foreign jurisdictions. As a result, \$29.2 million of our cash is held by foreign subsidiaries, a portion of which, would have to be repatriated to the United States. We believe our existing balances of cash, cash equivalents and marketable securities will be sufficient to satisfy our working capital needs, capital asset purchases, outstanding commitments and other liquidity requirements associated with our existing operations over the next twelve months.

Should we require more capital in the United States than is generated by our domestic operations, for example to fund significant discretionary activities such as business acquisitions and share repurchases, we could elect to repatriate future earnings from foreign jurisdictions or raise capital in the United States through debt or equity issuances. These alternatives could result in higher effective tax rates, increased interest expense, or dilution of our earnings.

Repurchases of Common Stock

On November 15, 2017 our Board of Directors authorized the repurchase of up to \$50.0 million of our common stock. This plan is referred to as the Stock Repurchase Plan.

During the three months ended March 31, 2018, the Stock Repurchase Plan was completed, after we repurchased 896,187 shares at an average purchase price of \$25.65 per share for a total of \$23.0 million, for a total repurchase against the approved plan of \$50.0 million. Accordingly, we did not repurchase any shares throughout the remainder of 2018.

Shares repurchased and retired in the fourth quarter of fiscal year 2017 and in the three months ended March 31, 2018 under the Stock Repurchase Plan, with the associated cost of repurchase and amount available for repurchase are as follows (in thousands, except number of shares and weighted average price per share):

	2018	2017
Number of shares of common stock repurchased	896,187	1,065,848
Weighted average price per share	\$25.65	\$25.33
Total cost of repurchase	\$22,987	\$26,999
Amount available for repurchase at end of period	\$—	\$23,001

Off-Balance Sheet Arrangements

We had no off-balance sheet arrangements or obligations as of December 29, 2018 and December 30, 2017.

Contractual Obligations

The following table summarizes our contractual cash obligations as of December 29, 2018, and the effect of such obligations.

	Payments due by period
Total	

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		Less than 1 year	1-3 years	4-5 years	More than 5 years
Purchase commitments - inventory ⁽¹⁾	\$42,807	\$40,838	\$1,969	\$—	\$—
Other long-term liabilities	219	1	32	13	173
Operating lease obligations	8,360	3,002	2,942	1,720	696
Total	\$51,386	\$43,841	\$4,943	\$1,733	\$869

⁽¹⁾We maintain certain open inventory purchase agreements with our suppliers to ensure a smooth and continuous supply availability for key components. Our liability under these purchase commitments is generally restricted to a forecasted time-horizon as mutually agreed upon between the parties. This forecasted time-horizon can vary among different suppliers. We estimate our open inventory purchase commitment as of December 29, 2018, was approximately \$42.8 million. Actual expenditures will vary based upon the volume of the transactions and length of contractual service provided. In addition, the amounts paid under these arrangements may be less if the arrangements are renegotiated or cancelled.

Excluded from the contractual obligation table above are \$4.6 million of future payments related to uncertain tax positions because we cannot reliably estimate the timing of the settlements with the respective tax authorities.

ITEM 7A. QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK

Foreign Currency Risk

A substantial part of our business consists of sales made to customers outside the United States: 91%, 87%, and 86% of sales in 2018, 2017, and 2016, respectively. 25%, 22%, and 18% of net revenues in 2018, 2017, and 2016, respectively, were denominated in currencies other than the U.S. dollar. Additionally, portions of our costs of net revenues and our operating expenses are incurred by our international operations and denominated in local currencies.

Our exposure to foreign currency exchange rate fluctuations arises in part from intercompany balances in which costs are charged between our U.S. headquarters and our foreign subsidiaries. On our consolidated balance sheet these intercompany balances are eliminated and thus no consolidated balances are associated with these intercompany balances; however, since each foreign entity's functional currency is generally its respective local currency, there is exposure to foreign exchange risk on a consolidated basis. Intercompany balances are denominated primarily in U.S. dollars and, to a lesser extent, other local currencies. The net intercompany balance, exposed to foreign currency risk, at December 29, 2018 was approximately \$7.3 million. A hypothetical change of 10% in the relative value of the US dollar versus local functional currencies could result in an increase or decrease of approximately \$730,000 in transaction gains or losses which would be included in our statement of operations. The net intercompany balance, exposed to foreign currency risk, at December 30, 2017, was approximately \$0.8 million. A hypothetical change of 10% in the relative value of the US dollar versus local functional currencies could result in an increase or decrease of approximately \$75,000 in transaction gains or losses which would be included in our statement of operations. The increase in exposure to foreign currencies was mainly due to increased business in Japan and higher cross charges from Taiwan and Korea for services performed.

To manage the level of exposure to the risk of foreign currency exchange rate fluctuations, we enter into foreign currency forward exchange contracts to protect against currency exchange risks associated with existing assets and liabilities. A foreign currency forward exchange contract acts as a hedge by increasing in value when underlying assets decrease in value or underlying liabilities increase in value due to changes in foreign exchange rates. Conversely, a foreign currency forward exchange contract decreases in value when underlying assets increase in value or underlying liabilities decrease in value due to changes in foreign exchange rates. These forward contracts are not designated as accounting hedges, so the unrealized gains and losses are recognized in other income, net, in advance of the actual foreign currency cash flows with the fair value of these forward contracts being recorded as accrued liabilities or other current assets.

We do not use forward contracts for trading purposes. Our forward contracts generally have maturities of 30 days or less. We enter into foreign currency forward exchange contracts based on estimated future asset and liability exposures, and the effectiveness of our hedging program depends on our ability to estimate these future asset and liability exposures. Recognized gains and losses with respect to our current hedging activities will ultimately depend on how accurately we are able to match the amount of foreign currency forward exchange contracts with actual underlying asset and liability exposures. The notional amount of the hedges we entered into was \$47.7 million as of December 29, 2018 and \$44.3 million as of December 30, 2017. The amounts are set forth in Note 4, of the Notes to the Consolidated Financial Statements, which information is incorporated herein by reference.

On June 23, 2016, the U.K. held a referendum in which British citizens approved an exit from the European Union (EU), commonly referred to as "Brexit." As a result of the referendum, there has been volatility in exchange rates versus the U.S. dollar which may continue as the U.K. negotiates its exit from the EU. The British pound is the functional currency for an insignificant percentage of our sales. In addition, for any contracts that are not denominated in the same currency as the functional currency (for example, contracts denominated in British pounds where the functional currency is the U.S. dollar), we enter into foreign currency forward contracts to hedge our risk related to foreign currency exchange rate fluctuations. As a result, we currently do not expect the U.K.'s exit from the EU to have a

material impact on our financial position, results of operations or liquidity.

For 2018, 2017 and 2016, foreign currency transactions resulted in losses of \$1.1 million, \$0.6 million, and \$0.4 million, respectively.

We actively monitor our foreign currency risks, but there is no guarantee that our foreign currency hedging activities will substantially offset the impact of fluctuations in currency exchange rates on our results of operations, cash flows and financial position. See “Note 4, Fair Value Measurement and Disclosures” in the Notes to Consolidated Financial Statements for more information regarding our derivatives and hedging activities.

Interest Rate Risk

Our exposure to market risk resulting from changes in interest rates relates primarily to our investment portfolio. At December 29, 2018, and December 30, 2017, we held \$40.8 million and \$82.1 million, respectively, in marketable securities. The fair value of our marketable securities could be adversely impacted due to a rise in interest rates. A hypothetical immediate and consistent increase

in interest rates by 100 basis points from levels as of December 29, 2018, the fair value of our marketable securities would have declined by \$0.2 million. Securities with longer maturities are subject to a greater interest rate risk than those with shorter maturities and as of December 29, 2018 and December 30, 2017, the average duration of our portfolio was less than nine months. We do not hold securities for trading purposes.

ITEM 8. FINANCIAL STATEMENTS AND
SUPPLEMENTARY DATA

The information required by Item 8 of Form 10-K is presented here in the following order:

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Report of Independent Registered Public Accounting Firm

To the Board of Directors and Stockholders of Nanometrics Incorporated

Opinions on the Financial Statements and Internal Control over Financial Reporting

We have audited the accompanying consolidated balance sheets of Nanometrics Incorporated and its subsidiaries (the “Company”) as of December 29, 2018 and December 30, 2017, and the related consolidated statements of operations, comprehensive income, stockholders’ equity, and cash flows for each of the three years in the period ended December 29, 2018, including the related notes and schedule of valuation and qualifying accounts for each of the three years in the period ended December 29, 2018 appearing under Item 15(a)(2) (collectively referred to as 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 (COSO).

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 three years in the period ended December 29, 2018 in conformity with accounting principles generally accepted in the United States of America. 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 COSO.

Change in Accounting Principle

As discussed in Note 2 to the consolidated financial statements, the Company changed the manner in which it accounts for revenues from contracts with customers in 2018.

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 Report of Management on Internal Control over Financial Reporting appearing under Item 9A. Our responsibility is to express opinions on the Company's consolidated financial statements and 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.

As described in the Report of Management on Internal Control over Financial Reporting, management has excluded 4D Technology, Inc. ("4D") from its assessment of internal control over financial reporting as of December 29, 2018, because it was acquired by the Company in a purchase business combination during 2018. We have also excluded 4D from our audit of internal control over financial reporting. 4D is a wholly-owned subsidiary whose total assets and total revenues excluded from management's assessment and our audit of internal control over financial reporting represent 3% and less than 1%, respectively, of the related consolidated financial statement amounts as of and for the year ended December 29, 2018.

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 (i) pertain to the maintenance of records that, in reasonable detail, accurately and fairly reflect the transactions and dispositions of the assets of the company; (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 receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) 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/PricewaterhouseCoopers LLP

San Jose, California

February 25, 2019

We have served as the Company's auditor since 2010.

NANOMETRICS INCORPORATED

CONSOLIDATED BALANCE SHEETS

(In thousands except share and per share amounts)

	As of	
	December 29, 2018	December 30, 2017
ASSETS		
Current assets:		
Cash and cash equivalents	\$ 110,951	\$ 34,899
Marketable securities	40,841	82,130
Accounts receivable, net of allowances of \$170 and \$126, respectively	50,854	62,457
Inventories	61,915	52,860
Inventories-delivered systems	180	1,534
Prepaid expenses and other	6,140	6,234
Total current assets	270,881	240,114
Property, plant and equipment, net	47,900	44,810
Goodwill	26,372	10,232
Intangible assets, net	27,326	2,206
Deferred income tax assets	2,569	11,924
Other assets	582	413
Total assets	\$375,630	\$ 309,699
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	\$ 16,540	\$ 13,857
Accrued payroll and related expenses	21,658	12,901
Deferred revenue	8,990	7,408
Other current liabilities	9,421	7,249
Income taxes payable	3,164	2,680
Total current liabilities	59,773	44,095
Deferred revenue	1,753	1,661
Income taxes payable	871	860
Deferred tax liability	162	179
Other long-term liabilities	219	521
Total liabilities	62,778	47,316
Commitments and contingencies (Note 10)		
Stockholders' equity:		
Preferred stock, \$0.001 par value; 3,000,000 shares authorized;		
no shares issued or outstanding	—	—
Common stock, \$0.001 par value, 47,000,000 shares authorized: 24,372,193		
and 24,628,722, respectively, issued and outstanding	24	26
Additional paid-in capital	247,983	255,368
Retained Earnings	67,402	9,113

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Accumulated other comprehensive income	(2,557)	(2,124)
Total stockholders' equity	312,852	262,383
Total liabilities and stockholders' equity	\$375,630	\$ 309,699

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF OPERATIONS

(In thousands except per share amounts)

	Fiscal Years Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
Net revenues:			
Products	\$275,286	\$ 214,877	\$ 185,066
Service	49,237	43,744	36,063
Total net revenues	324,523	258,621	221,129
Costs of net revenues:			
Cost of products	112,834	100,910	85,391
Cost of service	27,311	20,804	20,160
Amortization of intangible assets	284	206	1,454
Total costs of net revenues	140,429	121,920	107,005
Gross profit	184,094	136,701	114,124
Operating expenses:			
Research and development	48,188	36,716	31,443
Selling	37,528	30,839	30,181
General and administrative	31,795	26,340	23,381
Amortization of intangible assets	96	—	24
Total operating expenses	117,607	93,895	85,029
Income from operations	66,487	42,806	29,095
Other income (expense):			
Interest income	10	8	35
Interest expense	(331)	(92)	(285)
Other income, net	1,358	576	290
Total other income, net	1,037	492	40
Income before income taxes	67,524	43,298	29,135
Provision for (benefit from) income taxes	9,876	13,096	(14,900)
Net income	\$57,648	\$ 30,202	\$ 44,035
Net income per share:			
Basic	\$2.39	\$ 1.19	\$ 1.79
Diluted	\$2.34	\$ 1.17	\$ 1.75
Weighted average shares used in per share calculation:			
Basic	24,120	25,334	24,655
Diluted	24,600	25,919	25,153

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME

(In thousands)

	Fiscal Year Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
Net income (loss)	\$57,648	\$ 30,202	\$ 44,035
Other comprehensive income (loss):			
Change in foreign currency translation adjustment	(482)	4,170	(869)
Employee benefit plan adjustment	(259)	(160)	(17)
Net change on unrealized gains (losses) on available-for-sale investments	308	(88)	42
Other comprehensive income (loss):	(433)	3,922	(844)
Comprehensive income (loss)	\$57,215	\$ 34,124	\$ 43,191

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(In thousands, except share amounts)

	Accumulated					
	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Retained Earnings / (Accumulated Deficit)	Other Comprehensive Income	Total Stockholders' Equity
Balance as of December 26, 2015	24,224,286	\$ 24	\$ 258,715	\$ (66,209)	\$ (5,202)	\$ 187,328
Net income	-	-	-	44,035	-	44,035
Employee benefit plan adjustment	-	-	-	-	(17)	(17)
Foreign currency translation adjustments	-	-	-	-	(869)	(869)
Unrealized gain on investments, net of tax	-	-	-	-	42	42
Issuance of common stock under stock-based compensation plans	846,603	1	6,624	-	-	6,625
Stock-based compensation expense	-	-	7,666	-	-	7,666
Excess tax benefit related to stock options	-	-	(1,036)	-	-	(1,036)
Balance as of December 31, 2016	25,070,889	25	271,969	(22,174)	(6,046)	243,774
Net income	-	-	-	30,202	-	30,202
Adjustment due to adoption of ASU 2016-09 Improvements to Employee Share-Based Payment Accounting	-	-	139	1,085	-	1,224
Employee benefit plan adjustment	-	-	-	-	(160)	(160)
Foreign currency translation adjustments	-	-	-	-	4,170	4,170
Unrealized gain/(loss) on investments, net of tax	-	-	-	-	(88)	(88)
Issuance of common stock under stock-based compensation plans	623,681	1	1,440	-	-	1,441
Stock-based compensation expense	-	-	8,819	-	-	8,819
Repurchases and retirement of common stock under share repurchase plans	(1,065,848)	-	(26,999)	-	-	(26,999)
Balance as of December 30, 2017	24,628,722	26	255,368	9,113	(2,124)	262,383
Net income	-	-	-	57,648	-	57,648
Adjustment due to adoption of ASU 2014-09 Revenue from Contracts with Customers, net of tax	-	-	-	725	-	725
Employee benefit plan adjustment	-	-	-	-	(259)	(259)
	-	-	-	-	(482)	(482)

Foreign currency translation
adjustments

Unrealized gain/(loss) on investments, net of tax	-	-	-	-	308	308
Restructuring of foreign subsidiaries	-	-	-	(84)	-	(84)
Issuance of common stock under stock-based compensation plans	514,541	-	218	-	-	218
Stock-based compensation expense	-	-	11,382	-	-	11,382
Stock issued to acquire 4D Technology	125,117	-	4,000	-	-	4,000
Repurchases and retirement of common stock under share repurchase plans	(896,187)	(2)	(22,985)	-	-	(22,987)
Balance as of December 29, 2018	24,372,193	\$ 24	\$ 247,983	\$ 67,402	\$ (2,557)	\$ 312,852

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF CASH FLOWS

(In thousands)

	Fiscal Years Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
Cash flows from operating activities:			
Net income	\$ 57,648	\$ 30,202	\$ 44,035
Reconciliation of net income to net cash provided by operating activities:			
Depreciation and amortization	6,846	6,920	8,295
Stock-based compensation	11,382	8,819	7,666
Excess tax benefit from equity awards	1	—	1,036
(Gain) loss on disposal of fixed assets	(759)	631	478
Inventory write-down	3,012	2,020	2,110
Deferred income taxes	3,732	6,858	(16,783)
Changes in fair value of contingent payments to Zygo Corporation	—	—	(1,175)
Changes in assets and liabilities:			
Accounts receivable	15,156	(19,523)	(2,707)
Inventories	(8,962)	(18,037)	4,526
Inventories-delivered systems	1,354	923	399
Prepaid expenses and other	(407)	(230)	905
Accounts payable, accrued and other liabilities	11,438	1,049	2,462
Deferred revenue	2,399	(915)	(3,634)
Income taxes payable	496	1,886	(1,928)
Net cash provided by operating activities	103,336	20,603	45,685
Cash flows from investing activities:			
Payment for acquisition of certain assets	(2,000)	(2,000)	—
Payments to acquire 4D Technology, net of cash acquired	(37,163)	—	—
Sales of marketable securities	56,279	53,030	5,955
Maturities of marketable securities	38,700	77,250	38,775
Purchases of marketable securities	(53,523)	(129,766)	(82,864)
Purchases of property, plant and equipment	(7,486)	(5,204)	(3,999)
Proceeds from sale of property, plant and equipment	942	—	—
Net cash used in investing activities	(4,251)	(6,690)	(42,133)
Cash flows from financing activities:			
Payments to Zygo Corporation related to acquisition	—	—	(315)
Proceeds from sale of shares under employee stock option plans and purchase plan	3,826	5,576	8,447
Excess tax benefit from equity awards	—	—	(1,036)
Taxes paid on net issuance of stock awards	(3,609)	(4,135)	(1,822)
Repurchases of common stock under share repurchase plans	(22,987)	(26,999)	—
Net cash provided by (used in) financing activities	(22,770)	(25,558)	5,274
Effect of exchange rate changes on cash and cash equivalents	(263)	(518)	82
Net increase (decrease) in cash and cash equivalents	76,052	(12,163)	8,908

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Cash and cash equivalents, beginning of period	34,899	47,062	38,154
Cash and cash equivalents, end of period	\$ 110,951	\$ 34,899	\$ 47,062
Supplemental disclosure of cash flow information:			
Cash paid for income taxes, net	\$ 5,561	\$ 3,040	\$ 3,767
Supplemental disclosure of non-cash investing activities:			
Transfers between inventory and property, plant and equipment, net	\$ 1,147	\$ 2,451	\$ 2,345
Unpaid property, plant and equipment at year end	\$ 531	\$ 957	\$ 683

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS

Note 1. Nature of Business, Basis of Presentation and Significant Accounting Policies

Description of Business – Nanometrics Incorporated (“Nanometrics” or the “Company”) and its wholly-owned subsidiaries provide 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. Nanometrics' metrology systems precisely measure a wide range of film types deposited on substrates during manufacturing to control manufacturing processes and increase production yields in the fabrication of integrated circuits. The Company's OCD technology is a patented critical dimension measurement technology that is used to precisely determine the dimensions on the semiconductor wafer that directly control the resulting performance of the integrated circuit devices. The thin film metrology systems use a broad spectrum of wavelengths, high-sensitivity optics, proprietary software, and patented technology to measure the thickness and uniformity of films deposited on silicon and other substrates as well as their chemical composition. The overlay metrology systems are used to measure the overlay accuracy of successive layers of semiconductor patterns on wafers in the photolithography process. Nanometrics' inspection systems are used to find defects on patterned and unpatterned wafers at nearly every stage of the semiconductor production flow. The corporate headquarters of Nanometrics is in Milpitas, California.

Basis of Presentation – The consolidated financial statements include Nanometrics Incorporated and its wholly-owned subsidiaries. All significant intercompany accounts and transactions have been eliminated in consolidation.

Fiscal Year – The Company utilizes a 52/53 week fiscal year ending on the last Saturday of the calendar year. For the fiscal years ended December 29, 2018, December 30, 2017, and December 31, 2016, the period presented consisted of a 52-week year, 52-week year and 53-week year, respectively.

Use of Estimates – The preparation of financial statements in conformity with accounting principles generally accepted in the United States of America ("U.S. GAAP") requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reported period. Actual results could differ materially from those estimates. Estimates are used for, but not limited to, revenue recognition, the provision for doubtful accounts, the provision for excess, obsolete, or slow-moving inventories, valuation of intangible and long-lived assets, warranty accruals, income taxes, valuation of stock-based compensation, and contingencies.

Foreign Currency Translation – The assets and liabilities of foreign subsidiaries are translated from their respective local functional currencies at exchange rates in effect at the balance sheet date and income and expense accounts are translated at average exchange rates during the reporting period. Resulting translation adjustments are reflected in “Accumulated other comprehensive income,” a component of stockholders' equity. Foreign currency transaction gains and losses, as well as remeasurement of assets and liabilities denominated in a currency other than the functional currency are reflected in “Other income (expense)” in the consolidated statements of operations in the period incurred, and consist of losses of \$1.1 million, \$0.6 million, and \$0.4 million for the years ended December 29, 2018, December 30, 2017, and December 31, 2016, respectively.

Revenue Recognition – The Company derives revenue from the sale of process control metrology and inspection systems and related upgrades (“product revenue”) as well as spare part sales, billable service and service contracts (together “service revenue”). Upgrades are system software and hardware performance upgrades that extend the features and functionality of a product. Upgrades are included in product revenue, which consists of sales of complete, advanced process control metrology and inspection systems (the “system(s)”). Nanometrics’ systems consist of hardware and software components that function together to deliver the essential functionality of the system. Arrangements for sales of systems and upgrades often include defined customer-specified acceptance criteria.

The Company recognizes revenue when control of a good or service has transferred to a customer. The amount of revenue recognized reflects the amount which Nanometrics expects to be entitled to in exchange for the transfer of the goods or services in a contract with a customer. Revenue excludes amounts collected on behalf of third parties including taxes assessed by governmental authorities that are both imposed on and concurrent with a specific revenue producing transaction. Shipping and handling costs associated with outbound freight both before and after control over a product has transferred to a customer are accounted for as a fulfillment cost and are included in cost of revenues. Nanometrics records revenue on a gross basis, rather than net, as it acts as the principal in all its contractual arrangements and not as an agent.

Nanometrics follows a 5-Step process to evaluate its contracts with customers to determine the amount and timing of revenue recognition.

NANOMETRICS INCORPORATED

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Nanometrics first identifies whether a legally enforceable contract with a customer exists. A legally enforceable contract creates enforceable rights and obligations on both parties. Nanometrics evaluates the following criteria in its evaluation and if all criteria are not met, a contract does not exist and any revenue that otherwise would be recorded because a good or service had been transferred to a customer is deferred until such time that a contract exists: (1) both Nanometrics and the customer have approved the contract and are committed to perform, (2) Nanometrics can identify each party's rights regarding the goods or services to be transferred, (3) Nanometrics can identify the payment terms for the goods or services to be delivered, (4) the contract has commercial substance, and (5) it is probable that Nanometrics will collect substantially all of the consideration to which it will be entitled in exchange for the goods or services that will be transferred to the customer. Historically, the Company has not experienced Customer payment defaults that would lead it to conclude that it does not have a contract under the new standard. Nanometrics evidences all its contracts in writing and the identification of the contract may include (1) reference to a master agreement that governs for multiple years, (2) a Volume Purchase Agreement that generally governs for 12 months and is negotiated with the larger customers to establish pricing for a committed volume of business, or (3) purchase orders which often govern the purchase of a single system or service item.

Once the contract has been identified, Nanometrics evaluates the promises in the contract to identify performance obligations. Many of the contracts include more than one performance obligation – for example the delivery of a system generally includes the promise to install the system in the customer's facility. Additionally, a contract could include the purchase of multiple systems or the purchase of a system and an upgrade. Promises in contracts which do not result in the transfer of a good or service are not performance obligations, as well as those promises that are administrative in nature, or are immaterial in the context of the contract. Generally, Nanometrics performance obligations can be categorized as (1) systems – including refurbished systems, (2) installation obligations, (3) hardware upgrades, (4) non-operating system software options / upgrades, (5) spare parts, (6) service contracts, (7) billable services and (8) other miscellaneous service items.

Once the performance obligations in the contract have been identified, Nanometrics estimates the transaction price of the contract. The estimate includes amounts that are fixed as well as those that can vary based on contractual terms (e.g., performance bonuses/penalties, amounts payable to customers, rebates, prompt payment discounts, etc.) These variable consideration items are rare as most Nanometrics contracts include only fixed amounts. It is expected that estimates of variable consideration will be immaterial for Nanometrics and would occur if customers did not meet their contractual purchase commitments and Nanometrics is entitled to recover additional contract consideration.

Once the transaction price of the contract has been identified, Nanometrics allocates the transaction price to the identified performance obligations. This is done on a relative selling price basis using standalone selling prices ("SSP"). For most performance obligations, Nanometrics does not have observable SSP's as they are not regularly sold on a standalone basis however if a performance obligation does have an observable SSP it is used for allocation purposes (e.g. spares parts are sold using a standard price list and often sold separately). Without observable SSP's, Nanometrics estimates the SSP using a methodology which maximizes the use of observable inputs – namely a cost-plus gross margin approach.

Lastly, Nanometrics records the amount allocated to each performance obligation as revenue when control of that good or service has transferred to the customer. Nanometrics first evaluates whether a good or service is transferred over time, and if it is not, then it is recorded at a point in time. For service contracts, Nanometrics records revenue based on its measurement of progress, and the best method to determine this is the percentage of the stand-ready obligation that is completed to date as this best reflects the value of the service transferred to the customer. All other

items at Nanometrics are recorded at a point in time other than the service contracts with customers. The timing of satisfaction of the performance obligation to payment is dependent upon the negotiated payment terms but generally occurs within 30 to 60 days. Nanometrics evaluates the following indicators to determine the point in time at which control transfers to the Customer, and may apply judgment in this evaluation: (1) whether Nanometrics has a present right to payment, (2) whether the customer has legal title, (3) whether the customer has physical possession, (4) whether the customer has significant risks and rewards of ownership, and (5) whether customer acceptance is a formality (i.e., whether customer acceptance of the tool is reasonably assured). Typically, for new product introductions, Nanometrics defers revenue recognition until formal customer acceptance is received from the customer. In almost all other situations, there is little, or no significant judgment applied by Nanometrics in determining if control of a good or service has transferred to a customer. Additionally, for system shipments to Japan, revenue is deferred because typical contractual terms indicate that payment is not due, and title does not transfer until customer acceptance occurs.

The Company warrants its products against defects in manufacturing. Upon recognition of product revenue, this assurance-type warranty is recorded as a liability for anticipated warranty costs. On occasion, customers request a warranty period longer than the Company's standard warranty. In those instances, in which extended warranty services are separately quoted to the customer or if the warranty includes services beyond just an assurance that the product will work as intended, an additional performance obligation is created, and the associated revenue is deferred and recognized as service revenue ratably over the term of the extended warranty period. The portion of service contracts and extended warranty services agreements that are uncompleted at the end of any reporting period are included in deferred revenue.

NANOMETRICS INCORPORATED

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Frequently, the Company delivers products and various services in a single transaction. The Company's deliverables consist of tools, installation, upgrades, billable services, spare parts, and service contracts. The Company's typical multi-element arrangements include a sale of one or multiple tools that include installation and standard warranty. Other arrangements consist of a sale of tools bundled with service elements or delivery of different types of services. The Company's tools, upgrades, and spare parts are generally delivered to customers within a period of up to six months from order date. Installation is usually performed soon after delivery of the tool. The portion of revenue associated with installation is deferred based on relative selling price and that revenue is recognized upon completion of the installation and receipt of final acceptance. Billable services are billed on a time and materials basis and performed as requested by customers. Under service contract arrangements, services are provided as needed over the fixed arrangement term, with terms normally up to twelve months. The Company does not grant its customers a general right of return or any refund terms and may impose a penalty on orders cancelled prior to the scheduled shipment date. Consideration received from customers for cancelled orders is rare as orders are typically not cancelled once placed.

When performance obligations are not transferred to a customer at the end of a reporting period, the amount allocated to those performance obligations is deferred until control of these performance obligations is transferred to the customer. If performance obligations cannot be accounted for as separate units of accounting, the entire arrangement is accounted for as a single unit of accounting and revenue is deferred until all elements are delivered and all revenue recognition requirements are met. These liabilities arising from contracts with customers are reported as Deferred Revenue in the consolidated balance sheet. The amount of revenue recognized in the twelve months ended December 29, 2018 that was included in the contract liability balance as of the beginning of the year was \$5.2 million. Generally, all contracts have expected durations of one year or less. Accordingly, Nanometrics applies the practical expedient allowed for in U.S. GAAP and does not disclose information about remaining performance obligations that have original expected durations of one year or less.

Nanometrics incurs costs related to the acquisition of its contract with customers in the form of sales commissions. Sales commissions are paid to the internal direct sales team as well as to third-party representatives, and distributors. Contractual agreements, with each of these parties, outline commissions structures and rates to be paid. Generally, the contracts are all individual procurement decisions by the customers and are not for significant periods of time, nor do they include renewal provisions. As such, most of the contracts have an economic life of significantly less than a year, although some volume purchase agreements might extend beyond 12 months (the capitalization and amortization of commission costs for contracts that extend beyond one year is immaterial for Nanometrics). Accordingly, the Company expenses these contract acquisition costs in accordance with the practical expedient outlined in U.S. GAAP when the underlying contract asset is less than one year.

Nanometrics does not incur any costs to fulfill the contracts with customers that is not already reported in compliance with another applicable standard (for example, inventory or plant, property and equipment). Given the nature of the systems, the Company does not have costs which are separately identifiable to just a particular contract (for example, dedicated labs).

Nanometrics records accounts receivable when revenue has been recorded and the amount due from the customer is reasonably assured and unconditionally due. In certain situations, Nanometrics may record revenue because goods or services have been transferred to the customer, but the amount is not unconditionally due. In these situations, a contract asset is reflected in the consolidated balance sheet (Unbilled A/R). This amount is subsequently reported as accounts receivable when the condition that made the amount conditional is resolved (for example, when the final

installation obligation is completed, and Nanometrics has recorded revenue for the delivery of the system in an amount larger than what has been invoiced). The balance of contract assets included in Accounts Receivable upon adoption of ASC 606 at December 30, 2017 and at December 29, 2018 was \$4.3 million and \$2.2 million respectively. The decrease was primarily driven by changes in customer mix and timing of customer acceptance.

The following tables summarize the impacts of Topic 606 adoption on the Company's financial statements for the twelve months ended December 29, 2018 (in thousands, except per share data):

	Twelve Months Ended December 29, 2018		
	Balances		
	As Reported	Without Adoption of ASC 606	Effect of Change Higher/(Lower)
Net Revenue	\$324,523	\$320,968	\$ 3,555
Net Income	\$57,648	\$55,413	\$ 2,235
Net income per share:			
Basic	\$2.39	\$2.30	\$ 0.09
Diluted	\$2.34	\$2.25	\$ 0.09

NANOMETRICS INCORPORATED

NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Cash, Cash Equivalents and Marketable Securities – The Company considers all highly liquid investments with original maturities of three months or less, when purchased, to be cash equivalents. Marketable securities are classified as “available-for-sale” and are reported at fair value with unrealized gains and losses reported in stockholders' equity as a component of other comprehensive income. The cost of securities sold is based on the specific identification method. The Company classifies its investments as current based on the nature of the investment and their availability for use in current operations. The Company reviews its investment portfolio quarterly to determine if any securities may be other-than-temporarily impaired due to increased credit risk, changes in industry or sector of a certain instrument or ratings downgrades.

Fair Value of Financial Instruments – Financial instruments include cash and cash equivalents, accounts receivable and accounts payable. Cash equivalents are stated at fair market value based on quoted market prices. The carrying values of accounts receivable and accounts payable approximate their fair values because of the short-term maturity of these financial instruments.

Derivatives – The Company enters into foreign currency forward exchange contracts to protect against currency exchange risks associated with existing assets and liabilities. A foreign currency forward exchange contract acts as a hedge by increasing in value when underlying assets decrease in value or underlying liabilities increase in value due to changes in foreign exchange rates. Conversely, a foreign currency forward exchange contract decreases in value when underlying assets increase in value or underlying liabilities decrease in value due to changes in foreign exchange rates. These forward contracts are not designated as accounting hedges, so the unrealized gains and losses are recognized in other income, net, in advance of the actual foreign currency cash flows with the fair value of these forward contracts being recorded as accrued liabilities or other current assets. The Company does not use forward contracts for trading purposes.

Allowance for Doubtful Accounts – The Company maintains allowances for estimated losses resulting from the inability of its customers to make required payments. Credit limits are established through a process of reviewing the financial history and stability of its customers. Where appropriate and available, the Company obtains credit rating reports and financial statements of customers when determining or modifying their credit limits. The Company regularly evaluates the collectability of its trade receivable balances based on a combination of factors such as the length of time the receivables are past due, customary payment practices in the respective geographies and historical collection experience with customers. The Company believes that its allowance for doubtful accounts adequately reflects the risk associated with its receivables. If the financial conditions of a customer were to deteriorate, resulting in their inability to make payments, the Company may need to record additional allowances, which would result in additional general and administrative expenses being recorded for the period in which such determination was made.

Inventories – Inventories are valued at standard costs, which approximates actual cost calculated on a first-in, first-out basis, not in excess of net realizable value. The Company applies judgment in determining standard rates for material burden, direct labor and overhead used in valuing inventory, and periodically reviews such rates to ensure that the rates result in an inventory valuation not in excess of net realizable value. The Company is exposed to a number of economic and industry factors that could result in portions of inventory becoming either obsolete or in excess of anticipated usage, or saleable only for amounts that are less than their carrying amounts. These factors include, but are not limited to, technological changes in the market, the Company’s ability to meet changing customer requirements, competitive pressures in products and prices, and the availability of key components from suppliers. The Company

has established inventory reserves when conditions exist that suggest that inventory may be in excess of anticipated demand or is obsolete based upon assumptions about future demand for the Company's products and market conditions. Once a reserve has been established, it is maintained until the part to which it relates is sold or is otherwise disposed of. The Company regularly evaluates its ability to realize the value of inventory based on a combination of factors including the following: historical usage rates, forecasted sales of usage, product end-of-life dates, estimated current and future market values and new product introductions. For demonstration inventory, the Company also considers the age of the inventory and potential cost to refurbish the inventory prior to sale. Demonstration inventory is amortized over its useful life and the amortization expense is included in total inventory write down on the statements of cash flows. When recorded, reserves are intended to reduce the carrying value of the Company's inventory to its net realizable value. If actual demand for the Company's products deteriorates, or market conditions are less favorable than those that the Company projects, additional reserves may be required.

Inventories – delivered systems – The Company reflects the cost of systems that were invoiced upon shipment but deferred for revenue recognition purposes separate from its inventory held for sale as “Inventories – delivered systems.”

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Property, Plant and Equipment – Property, plant and equipment are stated at cost. Depreciation and amortization is computed using the straight-line method over the following estimated useful lives of the assets:

Building and Improvements	5-40 years
Machinery and equipment	3-10 years
Furniture and fixtures	3-10 years
Software	3-7 years

Business combinations - We account for business combinations under the acquisition method of accounting, which requires us to recognize separately from goodwill the assets acquired and the liabilities assumed at their acquisition date fair values. While we use our best estimates and assumptions to accurately value assets acquired and liabilities assumed at the acquisition date as well as contingent consideration, where applicable, our estimates are inherently uncertain and subject to refinement. As a result, during the measurement period, which may be up to one year from the acquisition date, we record adjustments to the assets acquired and liabilities assumed with the corresponding offset to goodwill. Upon the conclusion of the measurement period or final determination of the values of assets acquired or liabilities assumed, whichever comes first, any subsequent adjustments are recognized in our consolidated statements of operations. Accounting for business combinations requires our management to make significant estimates and assumptions, especially at the acquisition date including our estimates for intangible assets, contractual obligations assumed, restructuring liabilities, pre-acquisition contingencies, and contingent consideration, where applicable. Although we believe the assumptions and estimates we have made in the past have been reasonable and appropriate, they are based, in part, on historical experience and information obtained from the management of the acquired companies and are inherently uncertain. Critical estimates in valuing certain acquired intangible assets under the income approach include growth in future expected cash flows from product sales, customer contracts and acquired technologies, technology obsolescence rates, expected costs to develop in-process research and development, or IPR&D, into commercially viable products, estimated cash flows from the projects when completed and discount rates. Specific events and circumstances may occur thus affecting the accuracy or validity of such assumptions, estimates or actual results.

Goodwill and Intangible Assets – Goodwill is initially recorded when the purchase price paid for an acquisition exceeds the estimated fair value of the net identified tangible and intangible assets acquired. Intangible assets with finite lives are amortized over their respective useful lives on a straight-line basis and are also evaluated annually for impairment or whenever events or circumstances occur which indicate that those assets might be impaired. Goodwill and indefinite lived assets are not amortized but tested annually for impairment. The Company’s impairment review process is completed during the fourth quarter of each year or whenever events, or circumstances occur which indicate that an impairment may have occurred. The Company assesses qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value. If, after assessing the qualitative factors, the Company determines that it is not likely that the fair value of a reporting unit is less than its carrying value, then performing the two-step impairment test is unnecessary. However, if the Company concludes otherwise, then it is required to perform the first step of the two-step goodwill impairment test. The first step requires a comparison of the fair value of Nanometrics’ reporting unit to its net book value. If the fair value of the reporting unit

is greater than its carrying value, then no impairment is deemed to have occurred. If the fair value is less, then the second step must be performed to determine the amount, if any, of actual impairment. Amortization of intangible assets with finite lives is computed using the straight-line method over the following estimated useful lives of the assets:

Developed technology	9-10 years
Customer relationships	9 years
Trade name	15 years
Backlog	< 1 year

Long-Lived Assets – The Company evaluates its long-lived assets for impairment whenever events or changes in circumstances indicate that the carrying amount of an asset may not be recoverable. When the sum of the undiscounted future net cash flows expected to result from the use of the asset and its eventual disposition is less than its carrying amount, impairment may exist. To determine the amount of impairment, the Company compares the fair value of the asset to its carrying value. If the carrying value of the asset exceeds its fair value, an impairment loss equal to the difference is recognized. See Note 8, "Goodwill and Intangible Assets" for further details.

Income Tax Assets and Liabilities – The Company accounts for income taxes such that deferred tax assets and liabilities must be recognized using enacted tax rates for the effect of temporary differences between the book and tax accounting for assets and

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

liabilities. Also, deferred tax assets are reduced by a valuation allowance to the extent that management cannot conclude that it is more likely than not that a portion of the deferred tax asset will be realized in the future. The Company evaluates the deferred tax assets on a continuous basis throughout the year to determine whether or not a valuation allowance is appropriate. Factors used in this determination include future expected income and the underlying asset or liability which generated the temporary tax difference. The income tax provision is primarily impacted by federal statutory rates, state and foreign income taxes and changes in the valuation allowance.

Product Warranties – The Company sells most of its products with a twelve-month repair or replacement warranty from the date of acceptance, which generally represents the date of shipment. The Company provides an accrual for estimated future warranty costs based upon the historical relationship of warranty costs to the cost of products sold. The estimated future warranty obligations related to product sales are reported in the period in which the related revenue is recognized. The estimated future warranty obligations are affected by the warranty periods, sales volumes, product failure rates, material usage and labor and replacement costs incurred in correcting a product failure. If actual product failure rates, material usage, labor or replacement costs differ from the Company's estimates, revisions to the estimated warranty obligations would be required. For new product introductions where limited or no historical information exists, the Company may use warranty information from other previous product introductions to guide it in estimating the warranty accrual. The warranty accrual represents the best estimate of the amount necessary to settle future and existing claims on products sold as of the balance sheet date. The Company periodically assesses the adequacy of its recorded warranty reserve and adjusts the amounts in accordance with changes in these factors.

Defined Employee Benefit Plans – The Company maintains a defined benefit pension plan in Taiwan for which current service costs are charged to operations as they accrue based on services rendered by employees during the year. Pension benefit obligations are determined by using management's actuarial assumptions, including discount rates, assumed asset rates of return, compensation increases and employee turnover rates.

Net Income Per Share - Basic net income per share excludes dilution and is computed by dividing net income by the number of weighted average common shares outstanding for the period. Diluted net income per share reflects the potential dilution from outstanding dilutive stock options (using the treasury stock method), restricted stock units subject to vesting and shares issuable under the employee stock purchase plan. In applying the treasury stock method 0.5 million, 0.6 million and 0.5 million stock option shares for fiscal year 2018, 2017 and 2016, respectively, were included in the calculation of diluted shares.

Certain Significant Risks and Uncertainties – Financial instruments that potentially subject us to a concentration of credit risk consist of cash, cash equivalents, marketable securities, and accounts receivable. The Company's cash and cash equivalents are primarily invested in deposit accounts and money market accounts with large financial institutions. At times, these deposits and securities may exceed federally insured limits; however, the Company has not experienced any losses on such accounts. The Company invests its cash not required for use in operations in high credit quality securities based on the Company's investment policy. The Company's investment policy provides guidelines and limits regarding credit quality, investment concentration, investment type, and maturity that the Company believes will provide liquidity while reducing risk of loss of capital. Investments are of a short-term nature and include investments in commercial paper, corporate debt securities, asset-backed securities, U.S. Treasury, U.S. Government, and U.S. Agency debt.

The Company sells its products primarily to end users in the United States, Asia and Europe and, generally, does not require its customers to provide collateral or other security to support accounts receivable. Management performs

ongoing credit evaluations of its customers' financial condition and maintains an allowance for estimated potential bad debt losses. The Company's customer base is highly concentrated and historically, a relatively small number of customers have accounted for a significant portion of its revenues. Aggregate revenue from the Company's top five largest customers in 2018, 2017 and 2016 consisted of 70%, 73% and 73%, respectively, of its total net revenues. The Company participates in a dynamic high technology industry and believes that changes in any of the following areas could have a material adverse effect on its future financial position, results of operations or cash flows: advances and trends in new technologies and industry standards; competitive pressures in the form of new products or price reductions on current products; changes in product mix; changes in the overall demand for products offered; changes in third-party manufacturers; changes in key suppliers; changes in certain strategic relationships or customer relationships; litigation or claims against the Company based on intellectual property, patent, product, regulatory or other factors; fluctuations in foreign currency exchange rates; risk associated with changes in domestic and international economic and/or political regulations; availability of necessary components or sub-assemblies; disruption of manufacturing facilities; and its ability to attract and retain employees necessary to support its growth.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Certain components and sub-assemblies used in the Company's products are purchased from a sole supplier or a limited group of suppliers. The Company currently purchases its spectroscopic ellipsometer and robotics used in its advanced measurement systems from a sole supplier or a limited group of suppliers located in the United States. Any shortage or interruption in the supply of any of the components or sub-assemblies used in its products or its inability to procure these components or sub-assemblies from alternate sources on acceptable terms could have a material adverse effect on its business, financial condition and results of operations.

Note 2. Recent Accounting Pronouncements

Recently Adopted Accounting Standards

In October 2016, the Financial Accounting Standards Board ("FASB") issued an accounting standard update which requires the recognition of the income tax consequences of an intra-entity transfer of an asset, other than inventory, when the transfer occurs. The Company adopted this standard in the first quarter of 2018 using a modified retrospective approach. The adoption did not have a material impact on the financial statements.

In August 2016, the FASB issued an accounting standard which addresses eight specific cash flow classification issues. This update is effective for public companies for fiscal years beginning after December 15, 2017 and interim periods within those fiscal years. Early adoption is permitted, including in an interim period. The standard is to be applied through a retrospective transition method to each period presented. If it is impracticable to apply retrospectively for some of the issues, the amendments for those issues would be applied prospectively as of the earliest date practicable. The adoption of this guidance did not have a significant impact on the Company's consolidated statement of cash flows.

In May 2014, the FASB issued an accounting standard update which requires an entity to recognize the amount of revenue to which it expects to be entitled to for transferring promised goods or services to customers. The Company applied Topic 606 using the modified retrospective method by recognizing the cumulative effect of initially applying Topic 606 as an adjustment that increased the opening balance of equity at December 31, 2017 by \$0.9 million, which resulted from a decrease of \$1.6 million to the opening balance of current deferred revenue, partially offset by a decrease of \$0.7 million to the opening balance of inventories – delivered systems. This modified retrospective method was chosen due to the Company's inability to review all necessary contract information to adopt the standard using the full retrospective method. Both methods are allowed per U.S. GAAP. Therefore, the comparative information has not been adjusted and continues to be reported under Topic 605.

Recently Issued Accounting Standards

In August 2018, the FASB issued an accounting standard update to provide additional guidance on the accounting for costs of implementation activities performed in a cloud computing arrangement. The amendments in this update align the requirements for capitalizing implementation costs incurred in a hosting arrangement that is a service contract with the requirements for capitalizing implementation costs incurred to develop or obtain internal-use software and hosting arrangements that include an internal-use software license. The accounting for the service element of a hosting

arrangement that is a service contract is not affected by the amendments in this update. The amendments in this update are effective for public business entities for fiscal years beginning after December 15, 2019, and interim periods within those fiscal years. Early adoption is permitted. The amendments in this update should be applied retrospectively or prospectively to all implementation costs incurred after the date of adoption. The Company is currently evaluating the effect of this update on its consolidated financial condition and results of operations.

In August 2018, the FASB issued an accounting standard update which improves the effectiveness of fair value measurement disclosures in the notes to the financial statements. The update is effective for fiscal years beginning after December 15, 2019, including interim periods within those fiscal years. Certain amendments within the update should be applied prospectively for only the most recent interim or annual period presented in the initial fiscal year of adoption. All other amendments should be applied retrospectively to all periods presented upon their effective date. Early adoption is permitted. Entities are permitted to early adopt any removed or modified disclosures upon issuance of this update and delay adoption of the additional disclosures until their effective date. The adoption of this guidance is not expected to have a significant impact on the Company's consolidated results of operations or consolidated statement of cash flows.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

In June 2018, the FASB issued an accounting standard update which simplifies the accounting for nonemployee share-based payment transactions. The accounting for share-based payments to nonemployees and employees will be substantially aligned because of this update. The standard is effective for public companies for fiscal years beginning after December 15, 2018, including interim periods within that fiscal year. Early adoption is permitted, but no earlier than an entity's adoption date of Topic 606. The adoption of this guidance is not expected to have a significant impact on the Company's consolidated results of operations or consolidated statement of cash flows.

In January 2017, the Financial Accounting Standards Board (the "FASB") issued an accounting standard update which simplifies the subsequent measurement of goodwill and removes step 2 from the goodwill impairment test. Instead, an entity should record an impairment charge based on excess of a reporting unit's carrying amount over its fair value. The standard is effective for public companies for fiscal years beginning after December 15, 2019. Early adoption is permitted for interim or annual goodwill impairment tests performed on testing dates after January 1, 2017. The adoption of this guidance is not expected to have a significant impact on the Company's consolidated financial condition and results of operations.

In June 2016, the FASB issued an accounting standard which requires measurement and timely recognition of expected credit losses for financial assets. The update is effective for fiscal years beginning after December 15, 2019, including interim periods within those fiscal years. Early adoption is permitted as of the fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. The standard is to be applied through a cumulative-effect adjustment to retained earnings as of the beginning of the first reporting period in which the guidance is effective. The Company is currently evaluating the effect of this update on its consolidated financial condition and results of operations.

In February 2016, the FASB issued an accounting standard update which requires lessees to record a right-of-use asset and a corresponding lease liability on the balance sheet (with the exception of short-term leases). For lessees, leases will continue to be classified as either operating or financing in the income statement. The standard is effective for public companies for annual reporting periods beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted. The Company generally does not finance purchases of equipment or other capital assets but does lease some equipment and facilities. The Company established a cross-functional implementation team to evaluate and identify the impact of this update on its financial position, results of operations and cash flows. The Company has determined that it will elect all practical expedients permitted within the new standard which will allow it to not reassess whether any expired or existing contracts are or contain leases, not reassess the lease classification for any expired or existing lease, apply hindsight in determining the lease term, chose to treat separate lease components and nonlease components associated with the lease component as a single lease component, and to not reassess the initial direct costs for any existing lease. Also, the Company expects to make an accounting policy election to not recognize a lease liability or right-to-use asset for leases with a term of twelve months or less and recognize such lease payments in its Consolidated Statement of Operations as incurred. Additionally, the Company has determined that it will adopt the optional transition practical expedient thus allowing it to initially apply the new standard at the adoption date, which for the Company will be December 30, 2018. The Company anticipates recording lease liabilities and assets between \$10.5 million and \$12.5 million on its Consolidated Balance Sheet with no material impact to its Consolidated Statements of Operations. The Company does not anticipate any material impact to its cash flow, although the new standard does require that lease payments now be reported as a financing activity on its Consolidated Statement of Cash Flows instead of as an operating activity.

Note 3. Acquisition

On November 15, 2018, the Company acquired 4D Technology Corporation (“4D”), a supplier of high-performance interferometric measurement inspection systems. Pursuant to the Stock Purchase Agreement (“SPA”) entered into between 4D, each of 4D’s stockholders and the Company, the Company acquired all the outstanding stock of 4D for total consideration of (a) cash of \$38.7 million (\$37.2 million net of cash acquired); (b) 125,117 shares of the Company’s common stock, par value \$0.001 per share, valued at approximately \$4 million, subject to adjustment based on the amount of cash, working capital, indebtedness, and transaction expenses of 4D (collectively, the “Purchase Price”).

4D’s Dynamic Interferometry® solutions are used in a variety of industries to provide accurate shape and surface measurement data, which provides feedback to customers of optical quality, machine finish, and surface defectivity, to improve manufacturing yield and performance. The addition of 4D’s technology will add unique technology to the Company’s portfolio, expanding its served markets with new applications in the scientific research, aerospace, industrial and optics manufacturing markets.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The following table summarizes the allocation of the total purchase consideration to the initial estimated fair values of the assets acquired and liabilities assumed at the acquisition date (in thousands):

	November 15, 2018
Cash and cash equivalents	\$ 1,414
Accounts receivable, net	4,156
Inventories	4,563
Prepaid and other current assets	104
Property and equipment	145
Accounts payable	(702)
Accrued liabilities	(760)
Deferred revenue	(197)
Deferred tax liabilities	(5,408)
Total assets acquired/liabilities assumed	3,315
Developed technology	15,500
In-process research and development	1,400
Customer relationships	4,600
Order backlog	500
Trade name	1,500
Total identified intangible assets	23,500
Total identifiable net assets	26,815
Goodwill	15,762
Total purchase consideration	\$ 42,577

The fair value of accounts receivable, net, consisted of gross contractual accounts receivable reduced by approximately \$161 thousand for receivables not expected to be collected as of the acquisition date. The inventory acquired consisted primarily of work in process, for which fair value was measured based on determining its net realizable value as such value represents an exit price in an orderly transaction between market participants. Factors that required a significant amount of judgment in determining the net realizable value for the inventory included determining estimated selling prices, cost to complete, costs to dispose, operating profit, and discount rates, among others.

Goodwill represents the excess of the consideration transferred over the preliminary estimated fair values of the assets acquired and liabilities assumed and is primarily attributable to intangible assets which are not separately recognizable, such as an assembled workforce, and anticipated synergies such as certain costs savings, operating efficiencies, and other strategic benefits projected to be achieved as a result of the 4D acquisition. Goodwill is not deductible for tax purposes.

Developed technology relates to 4D's product family and was valued using the multi-period excess earnings method under the income approach. This method reflects the present value of the projected cash flows that are expected to be generated by the developed technology less charges representing the contribution of other assets to those cash flows. The average estimated useful life of developed technologies was determined to be 9 years and was based on the technology cycle related to each developed technology, as well as the cash flows over the respective forecast period.

The fair value of the in-process research and development ("IPRD") was determined using the multi-period excess earnings method under the income approach. Such method reflects the present value of the projected cash flows that are expected to be generated by the IPRD, less costs to complete the development and charges representing the contribution of other assets to those cash flows.

Customer relationships represent the fair value of future projected revenue that will be derived from sales of products to new and existing customers and was valued using the incremental cash flow method. This method reflects the present value of projected revenues to be derived from such customers less charges representing the contribution of other assets to those cash flows. The estimated useful life of the customer relationships was determined to be 9 years and was based on historical customer turnover rates.

Order backlog represents the fair value of future projected revenue that will be derived from outstanding orders from customers that have not yet been shipped and was valued using the incremental cash flow method, which reflects the present value of such outstanding orders less charges representing the contribution of other assets to those cash flows. The estimated useful life of the order backlog was determined to be less than one year and was based on historical order fulfillment rates.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Trade name relates to the “4D Technology” trade name and was fair valued by applying the relief-from-royalty method under the income approach. This method is based on the application of a royalty rate to forecasted revenue under the trade name. The estimated useful life of the tradename was determined to be 15 years and was based on the expected life of the trade name and the cash flows anticipated over the forecast period.

Factors that required a significant amount of judgment in determining the fair value for the acquired intangible assets included estimating future cash flows, revenue and gross margin assumptions, technology lives, future operating expenses, and discount rates, among others.

Finite-lived intangible assets totaled \$22.1 million and have a weighted average estimated useful life of 9.25 years. The Company has determined that the estimated useful life of the acquired in-process research and development is currently indeterminant; thus, it has been categorized as indefinite and will be reviewed annually for impairment, along with the Company’s other long-lived assets with indefinite lives, unless its estimated useful life is known.

The Company believes the amounts of purchased intangible assets recorded above represent the fair values of and approximate the amounts a market participant would pay for such assets as of the 4D acquisition date.

The results of operations of 4D are reported in the Company’s consolidated financial statements from the date of acquisition and include \$2.1 million of total net sales and \$0.4 million of operating loss for the year ended December 29, 2018.

The following unaudited pro forma financial information presents the combined results of operations as if the 4D acquisition had occurred at the beginning of fiscal year 2017 and is presented for informational purposes only. These results may not necessarily reflect the actual results of operations that would have been achieved, nor are they necessarily reflective of future results of operations (in thousands, except per share data).

	(Unaudited)	
	Years Ended	
	December 29, 2018	December 30, 2017
Pro forma net revenue	\$ 338,919	\$ 271,966
Pro forma net income	57,672	29,302

Pro forma net income per share - basic	\$	2.39	\$	1.16
Pro forma net income per share - diluted		2.34		1.13

The pro forma results include adjustments for depreciation and amortization, income taxes, and the incremental shares issued in connection with the acquisition. For the years ended December 29, 2018 and December 30, 2017, the pro forma results also include material nonrecurring adjustments of \$3.5 million and \$1.7 million, respectively, in net revenue and net income, related to sales to the Company and costs associated with those sales. The Company incurred \$0.9 million of acquisition-related costs that were expensed as incurred during fiscal 2018.

Note 4. Fair Value Measurements and Disclosures

The Company determines the fair values of its financial instruments based on the fair value hierarchy established in FASB Accounting Standards Codification ("ASC") 820, Fair Value Measurement, which requires an entity to maximize the use of observable inputs and minimize the use of unobservable inputs when measuring fair value. The classification of a financial asset or liability within the hierarchy is based upon the lowest level input that is significant to the fair value measurement. The fair value hierarchy prioritizes the inputs into the following three levels that may be used to measure fair value:

Level 1 — Quoted prices in active markets for identical assets or liabilities.

Level 2 — Inputs other than Level 1 that are observable, either directly or indirectly, such as quoted prices for similar assets and liabilities in active markets or inputs that are observable for the asset or liability, either directly or indirectly through market corroboration, for substantially the full term of the financial instrument.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Level 3 — Unobservable inputs that are supported by little or no market activity and are significant to the fair value of the assets or liabilities. Such unobservable inputs include an estimated discount rate used in the Company's discounted present value analysis of future cash flows, which reflects the Company's estimate of debt with similar terms in the current credit markets. As there is currently minimal activity in such markets, the actual rate could be materially different.

Fair value is defined as the price that would be received upon the sale of an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. The standard assumes that the transaction to sell the asset or transfer the liability occurs in the principal or most advantageous market for the asset or liability and establishes that the fair value of an asset or liability shall be determined based on the assumptions that market participants would use in pricing the asset or liability.

The following tables present the Company's assets and liabilities measured at estimated fair value on a recurring basis, excluding accrued interest components, categorized in accordance with the fair value hierarchy (in thousands), as of the following dates:

	December 29, 2018				December 30, 2017			
	Fair Value				Fair Value			
	Measurements Using				Measurements Using			
	Input Types				Input Types			
	Level	Level	Level	Total	Level	Level	Level	Total
	1	Level 2	3	Total	1	Level 2	3	Total
Assets:								
Cash equivalents:								
Money market funds	\$113	\$—	\$ —	\$113	\$256	\$—	\$ —	\$256
Commercial paper	—	1,993	—	1,993	—	—	—	—
Total cash equivalents	113	1,993	—	2,106	256	—	—	256
Marketable securities:								
U.S. Government agency debt securities	—	—	—	—	—	1,495	—	1,495
Certificate of deposits	—	9,497	—	9,497	—	14,497	—	14,497
Commercial paper	—	7,932	—	7,932	—	7,949	—	7,949
Corporate debt securities	—	15,730	—	15,730	—	47,968	—	47,968
Asset backed securities	—	7,682	—	7,682	—	10,221	—	10,221
Total marketable securities	—	40,841	—	40,841	—	82,130	—	82,130
Total⁽¹⁾	\$113	\$42,834	\$ —	\$42,947	\$256	\$82,130	\$ —	\$82,386

⁽¹⁾Excludes \$108.8 million and \$34.6 million held in operating accounts as of December 29, 2018, and December 30, 2017, respectively.

The fair values of the marketable securities that are classified as Level 1 in the table above were derived from quoted market prices for identical assets or liabilities in active markets that the Company can access. The fair value of marketable securities that are classified as Level 2 in the table above were derived from non-binding market consensus

prices that were corroborated by observable market data, quoted market prices for similar instruments, or pricing models, such as discounted cash flow techniques with all significant inputs derived from or corroborated by observable market data. There were no transfers of instruments between Level 1, Level 2 and Level 3 during the financial periods presented.

Derivatives

The Company uses foreign currency forward contracts to mitigate variability in gains and losses generated from the re-measurement of certain monetary assets and liabilities denominated in foreign currencies. These derivatives are carried at fair value with changes recorded in other income, net in the consolidated statements of operations. Changes in the fair value of these derivatives are largely offset by re-measurement of the underlying assets and liabilities. The derivatives have maturities of approximately 30 days.

The settlement result of forward foreign currency contracts included in the fiscal year ended December 29, 2018, and December 30, 2017 was a loss of \$2.5 million and a gain of \$1.4 million, respectively, and these balances are included in other income, net, in the consolidated statements of operations.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The following table summarizes the Company's outstanding derivative instruments on a gross basis:

	December 29, 2018		December 30, 2017		
	Notional Amount	Fair Value	Notional Amount	Fair Value	
	(in millions)	Asset Liability	(in millions)	Asset	Liability
Undesignated Hedges:					
Forward Foreign Currency Contracts					
Purchase	\$25.9	—	\$27.5	—	\$ 0.1
Sell	\$21.8	—	\$16.8	\$0.1	—

Note 5. Cash and Investments

The following table presents cash, cash equivalents, and available-for-sale investments as of the following dates (in thousands):

	December 29, 2018			Estimated Fair Market Value
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	
Cash	\$108,845	\$ —	\$ —	\$108,845
Cash equivalents:				
Money market funds	113	—	—	113
Commercial paper	1,993	—	—	1,993
Marketable securities:				
Certificates of deposits	9,500	—	(3)	9,497
Commercial paper	7,933	—	(1)	7,932
Corporate debt securities	15,788	—	(58)	15,730
Asset-backed securities	7,706	—	(24)	7,682
Total cash, cash equivalents, and marketable securities	\$151,878	\$ —	\$ (86)	\$151,792
	December 30, 2017			Estimated Gross Cost
	Amortized Cost	Gross	Gross	

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		Unrealized Gains	Unrealized Losses	Fair Market Value
Cash	\$34,643	\$ —	\$ —	\$34,643
Cash equivalents:				
Money market funds	256	—	—	256
Marketable securities:				
U.S. Government agency securities	1,500	—	(5)	1,495
Certificates of deposits	14,498	—	(1)	14,497
Commercial paper	7,952	—	(3)	7,949
Corporate debt securities	48,073	—	(105)	47,968
Asset-backed securities	10,240	—	(19)	10,221
Total cash, cash equivalents, and marketable securities	\$117,162	\$ —	\$ (133)	\$117,029

Available-for-sale marketable securities, readily convertible to cash, with maturity dates of 90 days or less are classified as cash equivalents, while those with maturity dates greater than 90 days are classified as marketable securities within short-term assets. All marketable securities as of December 29, 2018 and December 30, 2017, were available-for-sale and reported at fair value based on the estimated or quoted market prices as of the balance sheet date. Gross realized gains and losses on sale of securities are recorded in other income, net, in the Company's statement of operations. Net realized gains for fiscal 2018, 2017, and 2016 was \$1.4 million, \$1.3 million and \$0.5 million, respectively.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Unrealized gains or losses, net of tax effect, are recorded in accumulated other comprehensive income (loss) within stockholders' equity. Both the gross unrealized gains and gross unrealized losses for the fiscal years ended December 29, 2018, and December 30, 2017 were insignificant and no marketable securities had other than temporary impairment. All marketable securities as of December 29, 2018 and December 30, 2017, had effective maturity dates of less than three years.

Note 6. Accounts Receivable

The Company maintains arrangements under which eligible accounts receivable in Japan are sold without recourse to unrelated third-party financial institutions. These receivables were not included in the consolidated balance sheets as the criteria for sale treatment had been met. After a transfer of financial assets, an entity stops recognizing the financial assets when control has been surrendered. The agreement met the criteria of a true sale of these assets since the acquiring party retained the title to these receivables and had assumed the risk that the receivables will be collectible. The Company pays administrative fees as well as interest ranging from 0.62% to 1.48% based on the anticipated length of time between the date the sale is consummated, and the expected collection date of the receivables sold. The Company sold \$64.3 million and \$18.6 million of receivables during fiscal years ended December 29, 2018 and December 30, 2017, respectively. There were no material gains or losses on the sale of such receivables. There were no amounts due from such third-party financial institutions at December 29, 2018 and December 30, 2017.

Note 7. Financial Statement Components

The following tables provide details of selected financial statement components as of the following dates (in thousands):

	At	
	December 29, 2018	December 30, 2017
Inventories:		
Raw materials and sub-assemblies	\$31,434	\$ 32,187
Work in process	22,383	13,498
Finished goods	8,098	7,175
Inventories	61,915	52,860
Inventories-delivered systems	180	1,534
Total inventories	\$62,095	\$ 54,394

Property, plant and equipment, net: ⁽¹⁾		
Land	\$15,571	\$ 15,573
Building and improvements	21,354	20,880
Machinery and equipment	39,898	36,380
Furniture and fixtures	2,551	2,420
Software	10,116	9,558
Capital in progress	6,027	4,418
Total property, plant and equipment, gross	95,517	89,229
Accumulated depreciation and amortization	(47,617)	(44,419)
Total property, plant and equipment, net	\$47,900	\$ 44,810

⁽¹⁾ Total depreciation and amortization expense for the years ended December 29, 2018, December 30, 2017 and December 31, 2016 was \$6.5 million, \$6.7 million, and \$6.8 million, respectively.

Other Current Liabilities:

Accrued warranty	\$4,379	\$ 4,863
Accrued taxes	1,738	813
Customer deposits	293	—
Accrued professional services	448	534
Third party commissions	1,382	76
Other	1,181	963
Total other current liabilities	\$9,421	\$ 7,249

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Components of Accumulated Other Comprehensive Income (Loss)

	Years Ended		Unrealized Income (Loss)	Accumulated Other Comprehensive Income
	Foreign Currency Translation	Defined Benefit Pension Plans		
Balance as of December 31, 2016	\$(5,817)	\$ (227)	\$ (2)	\$ (6,046)
Current period change	4,170	(160)	(88)	3,922
Balance as of December 30, 2017	(1,647)	(387)	(90)	(2,124)
Current period change	(482)	(259)	308	(433)
Balance as of December 30, 2018	\$(2,129)	\$ (646)	\$ 218	\$ (2,557)

The items above, except for unrealized income (loss) on investment, did not impact the Company's income tax provision. The amounts reclassified from each component of accumulated other comprehensive income into income statement line items were insignificant.

Note 8. Goodwill and Intangible Assets

The following table summarizes the activity in the Company's goodwill during the years ended December 29, 2018 and December 30, 2017, respectively (in thousands):

	Amounts
Balance as of December 31, 2016	\$ 8,940
Foreign currency movements	1,292
Balance as of December 30, 2017	10,232
Foreign currency movements	378
4D acquisition	15,762
Balance as of December 29, 2018	\$ 26,372

There were no business acquisitions made by the Company during fiscal years 2017 and 2016.

Impairment - Goodwill and Long-lived Assets

The Company's impairment review process is completed during the fourth quarter of each year, or whenever events or circumstances occur that indicate that an impairment may have occurred. The goodwill impairment assessment involves three tests, Step 0, Step 1 and Step 2. The Company performs a Step 0 test, which involves an initial qualitative assessment to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying value. If, after assessing the qualitative factors, the Company determines that it is more likely than not that the fair value of a reporting unit is less than its carrying value, then performing the two-step impairment test is necessary. Otherwise, no further testing is necessary.

The Company completed its annual goodwill impairment assessment during the fourth quarter of 2018 by first performing a Step 0 qualitative assessment. As part of this assessment, the Company considered the trading value of the Company's stock, the industry trends, and the Company's sales forecast and products plans. The Company concluded that it was more likely than not that the fair value was more than the carrying values of the Company's reporting unit and therefore did not proceed to the Step 1 goodwill impairment test.

The process of evaluating the potential impairment of long-lived assets is highly subjective and requires significant judgment. In estimating the fair value of these assets, the Company made estimates and judgments about future revenues and cash flows. The Company's forecasts were based on assumptions that are consistent with the plans and estimates the Company is using to manage its business. Changes in these estimates could change the Company's conclusion regarding impairment of the long-lived assets and potentially result in future impairment charges for all or a portion of their balance at December 29, 2018. The Company did not record any impairment charges related to goodwill in fiscal year 2018.

The Company assesses if there have been triggers that may require it to evaluate the reasonableness of the remaining estimated useful lives of its intangible assets. No such triggers were identified during fiscal year 2018.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Intangible assets are recorded at cost, less accumulated amortization. The Company recorded \$23.5 million of intangible assets in conjunction with its acquisition of 4D in 2018 (See Note 3 – Acquisition). Intangible assets as of December 29, 2018 and December 30, 2017 consisted of the following (in thousands):

	December 29, 2018		Net carrying amount
	Adjusted cost	Accumulated amortization	
Developed technology	\$35,954	\$ (16,532)	\$ 19,422
Customer relationships	6,531	(1,519)	5,012
In-Process research and development	1,400	—	1,400
Trade name	1,500	(8)	1,492
Total	\$45,385	\$ (18,059)	\$ 27,326

	December 30, 2017		Net carrying amount
	Adjusted cost	Accumulated amortization	
Developed technology	\$18,887	\$ (16,681)	\$ 2,206
Customer relationships	9,438	(9,438)	—
Brand names	1,927	(1,927)	—
Patented technology	2,252	(2,252)	—
Trade name	80	(80)	—
Total	\$32,584	\$ (30,378)	\$ 2,206

The amortization of finite-lived intangibles is computed using the straight-line method. Estimated lives of finite-lived intangibles range from two to fifteen years. Total amortization expense for the fiscal years ended December 29, 2018, December 30, 2017 and December 31, 2016, was \$0.4 million, \$0.2 million and \$1.5 million, respectively.

There were no impairment charges related to intangible assets recorded during either the year ended December 29, 2018 or December 30, 2017. During 2018, the Company retired \$16.1 million of intangible assets that had been fully amortized for both book and tax purposes that were deemed to have no future utility to the Company.

The estimated future amortization expense of finite intangible assets as of December 29, 2018, is as follows (in thousands):

Fiscal Years

Amounts

2019	2,997
2020	2,905
2021	2,905
2022	2,905
2023	2,905
Thereafter	11,309
Total future amortization expense	25,926

In-Process research and development of \$1.4 million acquired in the 4D acquisition has been omitted from the above table as its estimated useful life is indeterminant at December 29, 2018. It will be tested for impairment, along with Goodwill, until its estimated useful life becomes finite.

Note 9. Warranties

Product Warranty – The Company sells the majority of its products with a 12 months repair or replacement warranty from the date of acceptance or shipment date. The Company provides an accrual for estimated future warranty costs based upon the historical relationship of warranty costs to the cost of products sold. The estimated future warranty obligations related to product sales are recorded in the period in which the related revenue is recognized. The estimated future warranty obligations are affected by the warranty periods, sales volumes, product failure rates, material usage, and labor and replacement costs incurred in correcting a product failure. If actual product failure rates, material usage, labor or replacement costs were to differ from the Company’s estimates, revisions to the estimated warranty obligations would be required. For new product introductions where limited or no historical information exists, the Company may use warranty information from other previous product introductions to guide it in estimating its

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

warranty accrual. The warranty accrual represents the best estimate of the amount necessary to settle future and existing claims on products sold as of the balance sheet date. The Company periodically assesses the adequacy of its reported warranty reserve and adjusts such amounts in accordance with changes in these factors.

Components of the warranty accrual, which were included in the accompanying consolidated balance sheets with other current liabilities, were as follows (in thousands):

	Years Ended	
	December	
	29,	December 30,
	2018	2017
Balance as of beginning of period	\$4,863	\$ 3,838
Accruals for warranties issued during period	4,914	5,247
Settlements during the period	(5,871)	(4,222)
Addition of 4-D Warranty reserves	473	-
Balance as of end of period	\$4,379	\$ 4,863

Note 10. Commitments and Contingencies

Intellectual Property Indemnification Obligations – The Company will, from time to time, in the normal course of business, agree to indemnify certain customers, vendors or others against third party claims that Nanometrics' products, when used for their intended purpose(s), or the Company's intellectual property, infringe the intellectual property rights of such third parties or other claims made against parties with whom it enters into contractual relationships. It is not possible to determine the maximum potential amount of liability under these indemnification obligations due to the limited history of prior indemnification claims and the unique facts and circumstances that are likely to be involved in each particular claim. Historically, the Company has not made payments under these obligations and believes that the estimated fair value of these agreements is immaterial. Accordingly, no liabilities have been recorded for these obligations in the accompanying consolidated balance sheets as of December 29, 2018 and December 30, 2017.

Contractual Obligations – The Company maintains certain open inventory purchase agreements with its suppliers to ensure a smooth and continuous supply availability for key components. The Company's liability under these purchase commitments is generally restricted to a forecasted time-horizon as mutually agreed upon between the parties. This forecasted time-horizon can vary among different suppliers. The Company estimates its open inventory purchase commitment as of December 29, 2018 was approximately \$42.8 million. Actual expenditures will vary based upon the volume of the transactions and length of contractual service provided. In addition, the amounts paid under these arrangements may be less in the event that the arrangements are renegotiated or cancelled.

The Company leases facilities and certain equipment under non-cancelable operating leases. Rent expense, which is recorded on a straight-line basis over the term of the respective lease, for 2018, 2017 and 2016 was approximately \$2.1 million, \$1.8 million and \$1.8 million, respectively. Future minimum lease payments under its operating leases are as follows (in thousands):

	Operating Leases
2019	3,002
2020	1,891
2021	1,051
2022	970
2023	750
Thereafter	696
Total	\$ 8,360

Legal Proceedings – From time to time, the Company is subject to various legal proceedings or claims arising in the ordinary course of business.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

On August 2, 2017, the Company was named as defendant in a complaint filed in New Hampshire Superior Court (“Complaint”). The Complaint, brought by Optical Solutions, Inc. (“OSI”), alleges claims arising from a purported exclusive purchase contract between OSI and the Company pertaining to certain product. On September 18, 2017, the Company removed the action to the United States District Court for the District of New Hampshire. On September 25, 2017, the Company moved to transfer the Complaint to the District Court for the Northern District of California. On December 20, 2017, the Company filed its complaint against OSI in the California Superior Court for the County of Santa Clara alleging claims arising from OSI’s breach of certain purchase orders. The Company’s complaint was later removed by OSI to the Northern District of California. On May 29, 2018, the District Court of New Hampshire issued an order granting the Company’s motion to transfer OSI’s Complaint to the Northern District of California and denying the Company’s motion to dismiss the Complaint without prejudice. On June 14, 2018, OSI’s Complaint was consolidated with the Company’s complaint against OSI. On August 9, 2018, OSI filed an Amended Complaint. On September 19, 2018, the Company filed a motion to dismiss OSI’s Amended Complaint for failure to state a claim. The Company’s motion to dismiss is set to be heard on February 28, 2019. Trial has been set for May 16, 2022.

The Company records a provision for a loss when it believes that it is both probable that a loss has been incurred and the amount can be reasonably estimated. Based on current information, the Company believes it does not have any probable and reasonably estimable losses related to any current legal proceedings and claims. Although it is difficult to predict the outcome of legal proceedings, the Company believes that any liability that may ultimately arise from the resolution of these ordinary course matters will not have a material adverse effect on the business, financial condition and results of operations.

Note 11. Net Income Per Share

The Company presents both basic and diluted net income per share on the face of its consolidated statements of operations. Basic net income per share excludes the effect of potentially dilutive shares and is computed by dividing net income by the weighted-average number of shares of common stock outstanding for the period. Diluted net income per share is computed using the weighted-average number of shares of common stock outstanding for the period plus the effect to all potentially dilutive common shares outstanding during the period, including contingently issuable shares and certain stock options, calculated using the treasury stock method. A reconciliation of the share denominator of the basic and diluted net income per share computations is as follows (in thousands):

	Years Ended December		
	29, 2018	December 30, 2017	December 31, 2016
Weighted average common shares outstanding used in			
basic net income per share calculation	24,120	25,334	24,655
Potential dilutive common stock equivalents,			
using treasury stock method	480	585	498

Weighted average shares used in diluted net income			
per share calculation	24,600	25,919	25,153

For the year ended December 29, 2018, December 30, 2017, and December 31, 2016, the Company had securities outstanding which could potentially dilute basic earnings per share in the future. For the years ended December 29, 2018, December 30, 2017 and December 31, 2016, the weighted average common share equivalents consisting of stock options and restricted stock units included in the calculation of diluted net income per share were 0.5 million, 0.6 million and 0.5 million shares, respectively.

Note 12. Stockholders' Equity and Stock-Based Compensation

Stockholders' Equity

Preferred and Common Stock

The authorized capital stock of Nanometrics consists of 47,000,000 shares of common stock, par value \$0.001 per share, and 3,000,000 shares of preferred stock, par value \$0.001 per share.

Repurchases of Common Stock

On November 15, 2017 the Company's Board of Directors authorized the repurchase of up to \$50.0 million of its common stock. This plan is referred to as the Stock Repurchase Plan. The Stock Repurchase Plan was completed in February 2018.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Shares repurchased and retired in the years ended December 29, 2018 and December 30, 2017 under the Stock Repurchase Plan, with the associated cost of repurchase and amount available for repurchase were as follows (in thousands, except number of shares and weighted average price per share):

	Fiscal Year 2018	Fiscal Year 2017
Number of shares of common stock repurchased	896,187	1,065,848
Weighted average price per share	\$25.65	\$25.33
Total cost of repurchase	\$22,987	\$26,999
Amount available for repurchase at end of period	—	\$23,001

Stock Option Plans

The Nanometrics option plans are as follows:

Plan Name	Participants	Shares Authorized
2005 Equity Incentive Plan	Employees, consultants and directors	8,292,594
2000 Employee Stock Option Plan	Employees and consultants	2,450,000
2000 Director Stock Option Plan	Non-employee directors	250,000
Accent Optical Technologies, Inc. Stock Incentive Plan	Employees and consultants	205,003

Employee Stock Purchase Plan

Under the 2003 Employee Stock Purchase Plan (“ESPP”), eligible employees can elect to have salary withholdings of up to 10% of their base compensation to purchase shares of common stock at a price equal to 85% of the lower of the market value of the stock at the beginning or end of each six-month offering period, subject to an annual statutory limitation. As of December 29, 2018, the Company had 443,694 shares remaining for issuance under the ESPP. Shares purchased under the ESPP were 70,214 shares, 122,298 shares and 212,619 shares in 2018, 2017 and 2016 at a weighted average price of \$21.46, \$21.19 and \$14.29, respectively.

Stock-based Compensation

The Company measures and recognizes compensation expense for all share-based payment awards made to employees and directors including employee stock options, restricted stock units and employee stock purchases related to the Employee Stock Purchase Plan (collectively “Employee Stock Purchases”) based on estimated fair values. The fair value of share-based payment awards is estimated on the date of grant using an option-pricing model. The value of the portion of the award that is ultimately expected to vest is recognized as expense over the requisite service periods in the Company's consolidated statement of operations.

Valuation and Expense Information

The fair value of stock-based awards to employees is calculated using the Black-Scholes option pricing model, which requires subjective assumptions, including future stock price volatility and expected time to exercise. The expected life was calculated using the simplified method allowed by the SAB 107. The risk-free rates were based on the U.S Treasury rates in effect during the corresponding period. The expected volatility was based on the historical volatility of the Company's stock price. The dividend yield reflects that the Company has not paid any cash dividends since inception and does not intend to pay any cash dividends in the foreseeable future. Forfeitures are recognized upon occurrence. These factors could change in the future, which would affect the stock-based compensation expense in future periods.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The weighted-average fair value of stock-based compensation to employees is based on the single option valuation approach. The estimated fair value of stock-based compensation awards to employees is amortized over the vesting period. The weighted-average fair value calculations are based on the following average assumptions:

	Fiscal Year 2018	Fiscal Year 2017	Fiscal Year 2016
Employee Stock Purchase Plan:			
Expected life	0.5 years	0.5 years	0.5 years
Volatility	52.46%	37.2%	38.7%
Risk free interest rate	2.14%	0.91%	0.44%
Dividends	—	—	—

Stock Options and Restricted Stock Units (“RSUs”)

Stock Options

No stock options were granted in fiscal years 2018, 2017 and 2016. A summary of activity of stock options is as follows:

	Number of Shares Outstanding (Options)	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term (Years)	Aggregate Intrinsic Value (in Thousands)
Options				
Outstanding at December 31, 2016	440,545	\$ 15.06	2.12	\$ 4,405
Exercised	(223,364)	13.35		
Cancelled/Forfeited	(855)	16.63		
Outstanding at December 30, 2017	216,326	16.82	1.76	\$ 1,752
Exercised	(132,932)	17.46		
Cancelled/Forfeited	-	-		
Outstanding at December 29, 2018	83,394	\$ 15.80	1.19	\$ 988
Exercisable at December 29, 2018	83,394	\$ 15.80	1.19	\$ 988

The aggregate intrinsic value in the above table represents the total pretax intrinsic value, based on the Company's closing stock price of \$27.65 as of December 29, 2018, which would have been received by the option holders had all option holders exercised their options as of that date. The total intrinsic value of options exercised during 2018, 2017 and 2016 was \$2.5 million, \$3.1 million and \$2.7 million, respectively. The fair value of options vested during 2018 was negligible and during 2017 and 2016 was \$0.3 million and \$0.7 million, respectively.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The following table summarizes ranges of outstanding and exercisable options as of December 29, 2018.

Exercise Prices	Options Outstanding		Options Exercisable		
	Number	Weighted Average Remaining Contractual Life (Years)	Weighted Average Exercise Price	Number	Weighted Average Exercise Price
\$12.98 - \$14.59	1,694	1.58	\$ 14.03	1,694	\$ 14.03
\$14.95 - \$14.95	1,025	1.49	14.95	1,025	14.95
\$15.00 - \$15.00	10,000	0.62	15.00	10,000	15.00
\$15.61 - \$15.61	2,500	1.09	15.61	2,500	15.61
\$15.65 - \$15.65	3,375	1.21	15.65	3,375	15.65
\$15.85 - \$15.85	60,000	1.20	15.85	60,000	15.85
\$16.00 - \$16.00	100	1.72	16.00	100	16.00
\$17.33 - \$17.33	2,500	1.87	17.33	2,500	17.33
\$18.22 - \$18.22	1,200	2.16	18.22	1,200	18.22
\$18.79 - \$18.79	1,000	2.24	18.79	1,000	18.79
	83,394			83,394	

As of December 29, 2018, the total unrecognized compensation costs related to unvested stock options was negligible.

Restricted Stock Units (“RSUs”)

Each RSU counts against the Company’s “2005 Equity Incentive Plan” at a ratio of one and seven tenths shares for each unit granted but represents an amount equal to the fair value of one share of the Company’s common stock. The Company granted 484,087 and 454,600 RSUs during the years ended December 29, 2018 and December 30, 2017, respectively, to key employees with vesting periods up to three years.

A summary of activity for RSUs is as follows:

Summary of activity for RSUs	Number of RSUs	Weighted Average Fair
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		Value
Outstanding RSUs as of December 31, 2016	819,785	\$ 16.79
Granted	454,600	27.12
Released	(387,592)	16.81
Cancelled	(96,494)	19.01
Outstanding RSUs as of December 30, 2017	790,299	22.46
Granted	484,087	36.57
Released	(362,762)	20.79
Cancelled	(142,621)	26.44
Outstanding RSUs as of December 29, 2018	769,003	\$ 31.39

As of December 29, 2018, the total unrecognized compensation costs related to RSU's was \$12.5 million and is expected to be recognized as an expense over a weighted average remaining amortization period of 1.75 years.

Market-Based Performance Stock Units (“PSUs”)

In addition to granting RSUs that vest on the passage of time only, the Company granted PSUs to certain executives. The PSUs will vest in tranches over one, two, and three years based on the relative performance of the Company's stock during those periods, compared to the performance of a peer group over the same period. If target stock price performance is achieved, 66.7% of the shares of the Company's stock subject to the PSUs will vest, and up to a maximum of 100% of the shares subject to the PSUs will vest if the maximum stock price performance is achieved for each tranche. For certain shares granted in fiscal 2018, 62,500 shares are the cumulative maximum number of shares that may vest for all measurement periods.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

A summary of activity for PSUs is as follows:

Summary of activity for PSUs	Number of PSUs	Weighted Average Fair Value
Outstanding PSUs as of December 31, 2016	107,500	\$ 9.94
Granted	122,050	20.51
Released	(38,500)	10.41
Cancelled	(61,100)	19.41
Outstanding PSUs as of December 30, 2017	129,950	15.60
Granted	63,133	24.45
Released	(47,929)	12.10
Cancelled	(32,991)	24.52
Outstanding PSUs as of December 29, 2018	112,163	\$ 22.37

Valuation of PSUs

On the date of grant, the Company estimated the fair value of PSUs using a Monte Carlo simulation model. The assumptions for the valuation of PSUs are summarized as follows:

	2018 Award	2017 Award	2016 Award
Grant Date Fair Value Per Share	\$20.73-\$25.18	\$14.57-\$26.75	\$ 8.52
Weighted-average assumptions/inputs:			
Expected Dividend	—	—	—
Range of risk-free interest rates	2.39%-2.63%	1.74%-1.84%	0.92%
Range of expected volatilities for peer group	22%-66%	22%-66%	22%-93%

The number of RSUs granted during fiscal year 2018 was 484,087, which counted as 822,948 shares against the 2005 Equity Incentive Plan, and the number of PSUs granted during fiscal year 2018 was 63,133, which counted as 107,327 shares against the 2005 Equity Incentive Plan. The number of RSUs cancelled during fiscal year 2018 was 142,621, which counted as 242,456 shares against the 2005 Equity Incentive Plan, and the number of PSUs cancelled during fiscal 2018 was 32,991, which counted as 56,085 shares against the 2005 Equity Incentive Plan.

The number of RSUs granted during fiscal year 2017 was 454,600, which counted as 772,820 shares, and PSUs granted during fiscal year 2017 was 122,050, which counted as 207,485 against the 2005 Equity Incentive Plan. The number of RSUs cancelled during fiscal year 2017 was 96,494, which counted as 164,040 shares, and PSUs cancelled during fiscal year 2017 was 61,100, which counted as 103,870, against the 2005 Equity Incentive Plan. Each RSU represents an amount equal to the fair value of one share of the Company's common stock.

A summary of activity under the Company's stock option plans including options, RSUs and PSUs during fiscal year 2018, 2017 and 2016 and shares available for grant as of the respective period end dates, is as follows:

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	Fiscal Year 2018	Fiscal Year 2017	Fiscal Year 2016
Shares available for grant at beginning of fiscal year	1,874,765	1,334,581	1,916,589
Additional Shares Authorized	—	1,000,000	—
Options - cancelled	—	855	176,587
Options - expired plan shares	—	—	(116,192)
RSUs - granted	(822,948)	(772,820)	(810,334)
RSUs - cancelled	242,456	164,040	92,230
RSUs - shares issued to satisfy tax withholding obligations	-	251,724	179,117
PSUs - granted	(107,327)	(207,485)	(114,750)
PSUs - cancelled	56,085	103,870	11,334.00
Shares available for grant at end of fiscal year	1,243,031	1,874,765	1,334,581

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

Stock-based Compensation Expense

Stock-based compensation expense recognized during the period is based on the value of the portion of share-based payment awards that is ultimately expected to vest during the period. Effective January 1, 2017, because of the adoption of ASU No. 2016-09 “Improvements to Employee Share-Based Payment Accounting”, the Company has elected to account for forfeitures as they occur. Refer to Note 2. Recent Accounting Pronouncements for further discussion on the adoption. As such, for fiscal year ended December 30, 2017, stock-based compensation expense is recognized in the consolidated statement of operations, net of actual forfeitures during the period. Prior to the adoption of ASU No. 2016-09, the Company estimated forfeitures at the time of grant, based on historical forfeiture experience, and revised if necessary in subsequent periods if actual forfeitures differed from estimates. Stock-based compensation expense recognized in the consolidated statement of operations for the year ended December 31, 2016, has been reduced for estimated forfeitures.

Tax benefits resulting from tax deductions in excess of the compensation cost recognized for those options are required to be separately classified in the consolidated statements of cash flows. The Company recognized \$1.0 million of excess tax benefits in fiscal year 2016, and immaterial amounts in both fiscal years 2018 and 2017, respectively.

Stock-based compensation expense for all share-based payment awards made to the Company’s employees and directors pursuant to the employee stock option and employee stock purchase plans by function were as follows (in thousands):

	Fiscal Year 2018	Fiscal Year 2017	Fiscal Year 2016
Cost of products	\$704	\$842	\$403
Cost of service	772	616	509
Research and development	2,450	1,720	1,408
Selling	2,786	2,323	2,046
General and administrative	4,670	3,318	3,300
Total stock-based compensation expense related to employee stock options and employee stock purchases	\$11,382	\$8,819	\$7,666

Note 13. Defined Benefit Pension Plan

Nanometrics sponsors a statutory government mandated defined benefit pension plan (the “Benefit Plan”) in Taiwan for its local employees. The fair value of plan assets was \$0.3 million for fiscal year ended 2018, and \$0.3 million for each of fiscal years 2017 and 2016, respectively; and the net funding deficiency of the Benefit Plan was \$0.2 million, \$0.5 million, and \$0.4 million for the fiscal years ended December 29, 2018, December 30, 2017, and December 31,

2016, respectively. Based on the nature and limited extent of the pension plan, we determined this pension plan was not material for separate disclosure.

Note 14. Income Taxes

Income Tax Assets and Liabilities - The Company accounts for income taxes whereby deferred tax assets and liabilities are recognized using enacted tax rates for the effect of temporary differences between the book and tax accounting for assets and liabilities. Also, deferred tax assets are reduced by a valuation allowance to the extent that management cannot conclude that it is more likely than not that a portion of the deferred tax asset will be realized in the future. The Company evaluates the deferred tax assets on a continuous basis throughout the year to determine whether or not a valuation allowance is appropriate. Factors used in this determination include future expected income and the underlying asset or liability which generated the temporary tax difference. The income tax provision is primarily impacted by federal statutory rates, state and foreign income taxes, and changes in the valuation allowance.

Income (loss) before provision for income taxes consists of the following (in thousands):

	Years Ended		
	December		
	29, 2018	December 30, 2017	December 31, 2016
Domestic	\$52,836	\$ 34,238	\$ 25,372
Foreign	14,688	9,060	3,763
Income (loss) before income taxes	\$67,524	\$ 43,298	\$ 29,135

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The provision (benefit) for income taxes consists of the following (in thousands):

	Years Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
Current:			
Federal	\$616	\$ 3,250	\$ 697
State	142	9	85
Foreign	5,054	2,998	2,111
	5,812	6,257	2,893
Deferred:			
Federal	3,875	6,314	(16,641)
State	(18)	53	(320)
Foreign	207	472	(832)
	4,064	6,839	(17,793)
Provision (benefit) for income taxes	\$9,876	\$ 13,096	\$ (14,900)

Significant components of the Company's deferred tax assets and liabilities are as follows (in thousands):

	At	
	December 29, 2018	December 30, 2017
Deferred tax assets:		
Reserves and accruals	\$5,704	\$ 5,797
Deferred revenue	241	240
Shared-based compensation	1,644	1,483
Tax credit carry-forwards	6,920	9,669
Net operating losses	6,022	9,755
Depreciation & amortization	(7,528)	(1,525)
Other	532	207
Total deferred tax assets	13,535	25,626
Less: Valuation allowance	(10,966)	(13,702)
Total deferred tax assets net of valuation allowance	2,569	11,924
Deferred tax liabilities:		
Depreciation & amortization	(13)	(12)
Other	(149)	(167)
Total deferred tax liabilities	(162)	(179)

Net deferred tax assets	\$2,407	\$ 11,745
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As of December 29, 2018, the Company had net operating loss carryforwards of \$23.5 million in California, \$1.7 million in other states, and \$18.3 million in foreign countries, which begin to expire in 2018.

As of December 29, 2018, the Company had available carryforward Federal and California R&D tax credits of \$5.4 million and \$10.2 million, respectively. Federal R&D tax credit carryforwards begin to expire in 2034. State R&D tax credits carryforward indefinitely.

During the years ended December 29, 2018, and December 30, 2017, the change in valuation allowances was (\$2.7) million and \$1.5 million, respectively. The decrease in the valuation allowance in 2018 was primarily related to a \$4.8 million decrease from the dissolution of Nanda Technologies, a Germany based subsidiary. This amount was offset by an increase net benefit of the California deferred tax assets of \$0.5 million and a \$1.6 million increase from deferred tax assets in the Company's Switzerland subsidiary. The realization of deferred tax assets is primarily dependent on the Company generating sufficient U.S. and foreign taxable income in future fiscal years. The Company regularly assesses the need for a valuation allowance against its deferred tax assets. In making that assessment, the Company considers both positive and negative evidence related to the likelihood of realization of the deferred tax assets to determine, based on the weight of available evidence, whether it is more-likely-than-not that some or all the deferred tax assets will not be realized.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

The Company continues to maintain valuation allowances against its California and Switzerland deferred tax assets as a result of uncertainties regarding the realization of the assets due to cumulative losses and uncertainty of future taxable income. The Company will continue to assess the realizability of the deferred tax assets in each of the applicable jurisdictions and maintain the valuation allowances until sufficient positive evidence exists to support a reversal. In the event the Company determines that the deferred tax assets are realizable, an adjustment to the valuation allowances will be reflected in the tax provision for the period such determination is made.

Differences between income taxes computed by applying the statutory federal income tax rate to income (loss) before income taxes and the provision (benefit) for income taxes consist of the following (in thousands):

	Years Ended		
	December		
	29, 2018	December 30, 2017	December 31, 2016
Income taxes computed at U.S. statutory rate	\$14,180	\$ 15,153	\$ 10,197
State income taxes	379	227	223
Foreign tax rate differential	(2,382)	794	3,502
Change in valuation allowance	3,037	1,490	(25,738)
Non-deductible equity compensation	(1,241)	(1,803)	380
Tax credits	(3,876)	(2,336)	(3,191)
Domestic production activities deduction	-	(608)	(354)
Liabilities for uncertain tax positions	12	18	67
Other, net	(233)	161	14
Provision (benefit) for income taxes	\$9,876	\$ 13,096	\$ (14,900)

As of December 29, 2018, The Company has provided U.S income taxes on all its foreign earnings. The Company continues to permanently reinvest the cash held offshore to support its working capital needs. Accordingly, no additional foreign withholding taxes that may be required from certain jurisdictions in the event of a cash distribution have been provided thereon.

In December 2017, the SEC staff issued Staff Accounting Bulletin No. 118, Income Tax Accounting Implications of the Tax Cuts and Jobs Act (SAB 118), which allowed the Company to record provisional amounts during a measurement period not to extend beyond one year of the enactment date. As of December 29, 2018, the Company had finalized all provisional amounts related to the Tax Act. Finalizing provisional adjustments related to the Tax Act did not have a material impact on the Company's consolidated financial statements as of December 29, 2018. The Company expects further guidance may be forthcoming from the Financial Accounting Standards Board and the Securities and Exchange Commission, as well as regulations, interpretations and rulings from federal and state tax agencies, which could result in additional impacts.

The 2017 Tax Act creates a new requirement that global intangible low-taxed income ("GILTI") earned by controlled foreign corporations ("CFCs") must be included currently in the gross income of the CFCs' U.S. shareholder. Under U.S. GAAP, the Company is allowed to make an accounting policy choice of either (1) treating taxes due on future U.S.

inclusions in taxable income related to GILTI as a current-period expense when incurred (the “period cost method”) or (2) factoring such amounts into a company’s measurement of its deferred taxes (the “deferred method”). The Company’s selection of an accounting policy for 2018 with respect to the GILTI tax rules was to treat GILTI tax as a current period expense under the period cost method.

The Company recognizes tax liabilities for uncertain tax positions and adjusts these liabilities when its judgment changes as a result of the evaluation of new information not previously available. Due to the complexity of some of these uncertainties, the ultimate resolution may result in a payment that is materially different from the Company's current estimate of the tax liabilities. These differences will be reflected as increases or decreases to income tax expense in the period in which they are determined.

The accounting for uncertainty in income taxes recognized in an enterprise's financial statements prescribes a recognition threshold and measurement attribute for the financial statement recognition and measurement of a tax position taken or expected to be taken on a tax return, and the derecognition of tax benefits, classification on the balance sheet, interest and penalties, accounting in interim periods, disclosure, and transition.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

A reconciliation of the beginning and ending amount of unrecognized tax benefits is as follows (in thousands):

	At		
	December		
	29,	December 30,	December 31,
	2018	2017	2016
Unrecognized tax benefits - beginning of the period	\$7,151	\$ 6,477	\$ 6,961
Gross increases-tax positions in prior period	132	32	23
Gross decreases-tax positions in prior period	—	—	(1,193)
Gross increases-current-period tax positions	1,000	723	686
Lapse of statute of limitations	(175)	(81)	—
Unrecognized tax benefits - end of the period	\$8,108	\$ 7,151	\$ 6,477

The unrecognized tax benefit at December 29, 2018, was \$8.1 million, of which \$4.6 million would impact the effective tax rate if recognized. The Company accrues interest and penalties related to unrecognized tax benefits in its provision for income taxes. The total amount of penalties and interest were not material as of December 29, 2018, December 30, 2017, and December 31, 2016. The Company does not expect a material change in its unrecognized tax benefits within the next 12 months.

The Company is subject to taxation in the U.S. and various states including California, and the foreign jurisdictions of Korea, Japan, Taiwan, China, Singapore, Germany, France, United Kingdom, Switzerland, and Israel. Due to tax attribute carry-forwards, the Company is subject to examination for tax years 2003 forward for U.S. tax purposes. The Company was also subject to examination in various states for tax years 2002 forward. The Company is subject to examination for tax years 2010 forward for various foreign jurisdictions.

Note 15. Segment, Geographic, and Significant Customer Information

The Company has one operating segment, which is the sale, design, manufacture, marketing and support of thin film and optical critical dimension systems. The Chief Executive Officer has been identified as the Chief Operating Decision Maker (“CODM”) because he has the final authority over resource allocation decisions and performance assessment. The CODM does not receive discrete financial information about individual components of the Company's business. For the years ended December 29, 2018, December 30, 2017, and December 26, 2016, the Company recorded revenue from customers primarily in the United States, Asia and Europe. The following tables summarize total net revenues and long-lived assets (excluding intangible assets) attributed to significant countries (in thousands):

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	Years Ended		
	December 29, 2018	December 30, 2017	December 31, 2016
Total net revenues ⁽¹⁾ :			
South Korea	\$ 108,938	\$ 94,082	\$ 44,735
China	72,305	29,826	43,460
Japan	64,252	41,979	26,604
United States	29,415	33,983	29,887
Singapore	22,167	21,810	37,096
Taiwan	14,012	20,147	27,189
Other	13,434	16,794	12,158
Total net revenues	\$ 324,523	\$ 258,621	\$ 221,129

⁽¹⁾Net revenues are attributed to countries based on the customer's deployment and service locations of systems.

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NOTES TO CONSOLIDATED FINANCIAL STATEMENTS – (Continued)

	Years Ended	
	December	
	29, 2018	December 30, 2017
Long-lived tangible assets:		
United States	\$46,325	\$ 43,427
Taiwan	275	510
South Korea	420	576
Japan	59	60
Singapore	618	92
All Other	203	145
Total long-lived tangible assets	\$47,900	\$ 44,810

With respect to customer concentration, Samsung Electronics Co. Ltd., SK hynix, Toshiba Corporation, and Intel Corporation each accounted for more than 10% of total sales for the year ended December 29, 2018, and Samsung Electronics Co. Ltd., SK hynix, Micron Technology, Inc., Intel Corporation, and Toshiba Corporation each accounted for more than 10% of total sales for the year ended December 30, 2017, and Micron Technology, Inc., Intel Corporation, SK hynix, and Taiwan Semiconductor Manufacturing Company Limited each accounted for more than 10% of total sales for the year ended December 31, 2016.

With respect to accounts receivable concentration, Toshiba Corporation and SK hynix each accounted for more than 10% of total receivables as of December 29, 2018, and Samsung Electronics Co. Ltd., Micron Technology, Inc., and Intel Corporation each accounted for more than 10% of accounts receivable as of December 30, 2017.

SUPPLEMENTAL FINANCIAL INFORMATION

Selected Quarterly Financial Results (Unaudited)

The following table sets forth selected consolidated quarterly results of operations for the years ended December 29, 2018 and December 30, 2017 (in thousands, except per share amounts):

	Quarters Ended			
	December 29, 2018	September 29, 2018	June 30, 2018	March 31, 2018
Total net revenues	\$77,016	\$ 76,590	\$88,604	\$82,313
Gross profit	\$42,038	\$ 43,634	\$50,891	\$47,531
Income from operations	\$10,868	\$ 14,271	\$20,784	\$20,564
Net income	\$12,024	\$ 11,568	\$17,675	\$16,381
Net income per share:				
Basic	\$0.50	\$ 0.48	\$0.74	\$0.68
Diluted	\$0.49	\$ 0.47	\$0.72	\$0.67
Shares used in per share computations:				
Basic	24,131	24,059	23,953	24,063
Diluted	24,481	24,466	24,442	24,483

	Quarters Ended			
	December 30, 2017	September 30, 2017	July 1, 2017	April 1, 2017
Total net revenues	\$78,205	\$ 56,675	\$64,427	\$59,314
Gross profit	\$43,973	\$ 30,660	\$33,621	\$28,447
Income from operations	\$19,162	\$ 7,484	\$10,652	\$5,508
Net income ⁽¹⁾	\$10,798	\$ 5,764	\$8,288	\$5,352
Net income per share:				
Basic	\$0.43	\$ 0.23	\$0.33	\$0.21
Diluted	\$0.42	\$ 0.22	\$0.32	\$0.21
Shares used in per share computations:				
Basic	25,378	25,494	25,307	25,133
Diluted	25,819	25,932	25,906	25,833

⁽¹⁾Our net income included a \$2.9 million additional tax expense from the remeasurement of deferred tax assets relating to the Tax Cuts and Jobs Act that was signed into law on December 22, 2017

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

We maintain disclosure controls and procedures that are designed to ensure that information required to be disclosed in our reports that we file or submit under the Securities Exchange Act of 1934 (“Exchange Act”), as amended, is recorded, processed, summarized and reported within the time periods specified in the SEC’s rules and forms, and that such information is accumulated and communicated to management, including our Chief Executive Officer (“CEO”) and our Vice President, Finance (who is our Principal Financial Officer (“PFO”)), as appropriate, to allow timely decisions regarding required disclosure. Our management, with participation by our CEO and PFO, has evaluated the effectiveness of our disclosure controls and procedures as of December 29, 2018, the end of the period covered by this Annual Report on Form 10-K.

Based on the evaluation of our disclosure controls and procedures, our CEO and PFO have concluded that as of the end of the period covered by this report, our disclosure controls and procedures were effective as of such date.

Report of Management 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, as amended. Our internal control over financial reporting was designed to provide reasonable, not absolute, assurance regarding the reliability of our financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles.

Internal control over financial reporting includes those policies and procedures that (i) pertain to the maintenance of records that in reasonable detail accurately and fairly reflect the transactions and dispositions of the assets of the company; (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 receipts and expenditures of the company are being made only in accordance with authorizations of management and directors of the company; and (iii) 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.

Under the supervision and with the participation of our management, including our CEO and PFO, we assessed the effectiveness of our internal control over financial reporting as of December 29, 2018. In making this assessment, we used the criteria established in Internal Control – Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (“COSO”).

Based on our assessment, which was conducted based on the COSO criteria, our management, including our CEO and PFO have concluded our internal control over financial reporting was effective, as of December 29, 2018.

We excluded 4D Technology Corporation (“4D”) from our assessment of internal controls over financial reporting as of December 29, 2018 because we acquired 4D in a purchase business combination on November 15, 2018. The total assets and total revenues of 4D represent 3% and less than 1% of the related consolidated financial statement amounts as of and for the year ended December 29, 2018.

The effectiveness of our internal control over financial reporting as of December 29, 2018, has been audited by PricewaterhouseCoopers LLP, an independent registered public accounting firm, as stated in their report which appears under Item 8.

Changes in Internal Control over Financial Reporting

There has been no change in our internal control over financial reporting that occurred during the fourth quarter ended December 29, 2018, that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. OTHER INFORMATION

None.

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PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this Item is incorporated by reference to our Proxy Statement for our 2019 Annual Meeting of Stockholders (the "Proxy Statement") to be filed with the SEC not later than 120 days after the end of our fiscal year ended December 29, 2018, specifically:

Information regarding our directors and any persons nominated to become a director, as well as with respect to some other required board matters, is set forth under Proposal 1 entitled "Election of Directors" and under "Corporate Governance."

Information regarding our audit committee and our designated "audit committee financial expert" is set forth under the caption "Corporate Governance."

Information on our code of business conduct and ethics for directors, officers and employees is set forth under the caption "Code of Ethics" under "Corporate Governance."

Information regarding Section 16(a) beneficial ownership reporting compliance is set forth under the caption "Section 16(a) Beneficial Ownership Reporting Compliance."

Information regarding procedures by which stockholders may recommend nominees to our board of directors is set forth under the caption "Nominating and Governance Committee" under "Corporate Governance."

Information regarding our executive officers is set forth at the end of Item I, Part 1 of this Annual Report on Form 10-K under the caption "Executive Officers of the Registrant."

ITEM 11. EXECUTIVE COMPENSATION

Information regarding compensation of our named executive officers is set forth under the caption "Executive Compensation" in the Proxy Statement, which information is incorporated herein by reference.

Information regarding compensation of our directors is set forth under the caption "Compensation of Directors" in the Proxy Statement, which information is incorporated herein by reference.

Information regarding compensation committee interlocks is set forth under the caption "Compensation Committee Interlocks and Insider Participation" in the Proxy Statement, which information is incorporated herein by reference.

The Compensation Committee Report is set forth under the caption "Compensation Committee Report" in the Proxy Statement, which report is incorporated herein by reference.

ITEM 12. SECURITY OWNERSHIP OF CERTAIN BENEFICIAL OWNERS AND MANAGEMENT AND RELATED STOCKHOLDER MATTERS

Information regarding security ownership of certain beneficial owners, directors and executive officers is set forth under the caption "Security Ownership of Certain Beneficial Owners and Management" in the Proxy Statement, which information is incorporated herein by reference.

Equity Compensation Plan Information

The following table gives information about the common stock that may be issued under all our existing equity compensation plans as of December 29, 2018.

Plan category	Number of securities to be issued upon exercise of outstanding options, warrants and rights	Weighted-average exercise price of outstanding options	Number of securities remaining available for future issuance under equity compensation plans (excluding securities reflected in first column)
	Equity compensation plans approved by security holders ⁽¹⁾	83,394	\$ 15.80
Equity plans not approved by security holders	—	—	—
Total	83,394	\$ 15.80	1,411,835

⁽¹⁾Consists of shares issuable under the company's Accent Optical Technologies, Inc. Stock Incentive Plan, 2000 Employee Stock Option Plan, 2000 Director Stock Option Plan, 2003 Employee Stock Purchase Plan and 2005 Equity Incentive Plan ("ESPP"). As of December 29, 2018, a total of 443,694 shares of our common stock remained available for issuance under the ESPP, and up to a maximum of 66,658 shares of our common stock may be purchased in the current purchase period. The shares issuable pursuant to our ESPP are not included in the number of shares to be issued pursuant to rights outstanding and the weighted-average exercise price of such rights as of December 29, 2018, as those numbers are not known. The weighted-average exercise price does not take into account 881,166 shares issuable upon vesting of outstanding awards of restricted stock units and performance-based shares, which have no exercise price.

ITEM 13. CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS AND DIRECTOR INDEPENDENCE

Information regarding certain relationships and related transactions is set forth under the caption "Related Person Transaction Policy" under the caption "Corporate Governance" in the Proxy Statement, which information is incorporated herein by reference.

Information regarding director independence is set forth under the caption "Board of Directors Meetings and Committees" under "Corporate Governance" in the Proxy Statement, which information is incorporated herein by reference.

ITEM 14. PRINCIPAL ACCOUNTING FEES AND SERVICES

Information regarding principal auditor fees and services is set forth under the proposal entitled “Ratification of Appointment of Independent Registered Public Accounting Firm” in the Proxy Statement, which information is incorporated herein by reference.

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PART IV

ITEM 15. EXHIBITS, FINANCIAL STATEMENT SCHEDULES

(a) The following documents are filed as part of this report on Form 10-K:

(1) Consolidated Financial Statements.

See Index to Consolidated Financial Statements in Item 8 on page 38 of this Annual Report on Form 10-K.

(2) Consolidated Financial Statement Schedule.

The following consolidated financial statement schedule of Nanometrics Incorporated is filed as part of this Annual Report on Form 10-K and should be read in conjunction with the Consolidated Financial Statements:

Schedule

II - Valuation and Qualifying Accounts as of and for the years ended December 29, 2018, December 30, 2017 and December 31, 2016

Our allowance for doubtful accounts receivable consists of the following (in thousands):

	Balance at			Balance
	beginning	Additions	Charges	at end
Year Ended	of period	to	Utilized/Write-offs	of period
		Allowance		
December 29, 2018	\$ 126	\$ 129	\$ (85)	\$ 170
December 30, 2017	\$ 73	\$ 78	\$ (25)	\$ 126
December 31, 2016	\$ 150	\$ —	\$ (77)	\$ 73

Our valuation allowance for deferred tax assets consists of the following (in thousands):

	Balance at			Balance
	beginning	Additions	Charges	at end
Year Ended	of period	to	Utilized/Write-offs	of period
		Allowance		
December 29, 2018	\$ 13,702	\$ 470	\$ (3,206)	\$ 10,966
December 30, 2017	\$ 10,980	\$ 2,984	\$ (262)	\$ 13,702
December 31, 2016	\$ 36,786	\$ 1,643	\$ (27,449)	\$ 10,980

Schedules not listed above have been omitted because they are not applicable or are not required or the information required to be set forth therein is included in the Consolidated Financial Statements or notes thereto.

(3) Exhibits.

See Exhibit Index under part (b) below.

(b) Exhibit Index

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Exhibit No.	Exhibit Description	Form	File Number	Date of First Filing	Appendix Reference	Exhibit Number/
3.(i)	Certificate of Incorporation					
3.1	<u>Certificate of Incorporation of the Registrant</u>	8-K	000-13470	10/5/2006	3.1	
3.(ii)	Bylaws					
3.2	<u>Bylaws of the Registrant</u>	8-K	000-13470	4/12/2012	3.1	
4	Instruments Defining the Rights of Security Holders, Including Indentures					
4.1	<u>Form of Common Stock Certificate</u>	10-Q	000-13470	11/9/2006	4.1	
10	Material Contracts					
	Management Contracts, Compensatory Plans, Contracts or Arrangements					
10.1	<u>Registrant's 2000 Employee Stock Option Plan and form of Stock Option Agreement</u>	S-8	333-40866	7/6/2000	4.2	
10.2	<u>Form of Subscription Agreement Under the Registrant's Amended and Restated 2003 Employee Stock Purchase Plan</u>	S-8	333-40866	9/3/2003	4.1	
10.3	<u>Registrant's 2000 Director Stock Option Plan and form of Stock Option Agreement</u>	10-K	000-13470	3/13/2008	10.2	
10.4	<u>Registrant's Amended and Restated 2005 Equity Incentive Plan forms of Stock Option and Restricted Stock Unit Agreements</u>	10-K	000-13470	3/13/2008	10.8	
10.5	<u>Form of Indemnification Agreement between the Registrant and each of its directors and executive officers</u>	8-K	000-13470	2/20/2013	10.1	
10.6	<u>Form of Performance-Based Restricted Stock Unit Agreement</u>	8-K	000-13470	3/24/2015	99.1	
10.7	<u>General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Timothy J. Stultz, Ph.D., dated May 19, 2015</u>	8-K	000-13470	5/22/2015	10.1	
10.8	<u>General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Kevin Heidrich, dated May 19, 2015</u>	8-K	000-13470	5/22/2015	10.4	
10.9	<u>General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Janet Taylor, dated August 27, 2015</u>	10-Q	000-13470	10/30/2015	10.1	
10.10	<u>Registrant's Amended and Restated 2003 Employee Stock Purchase Plan</u>	DEF 14A	000-13470	4/4/2016	App 1	
10.11	<u>Compensation Arrangement with Non-Employee Directors</u>	10-Q	000-13470	7/28/2016	10.3	
10.12	<u>General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Rollin Kocher, dated November 10, 2016</u>	10-K	000-13470	3/3/2017	10.22	
10.13	<u>Registrant's Amended and Restated 2005 Equity Incentive Plan</u>	DEF 14A	000-13470	4/4/2017	App B	
10.14	<u>Nanometrics Incorporated 2017 Executive Performance Bonus Plan</u>	DEF 14A	000-13470	4/4/2017	App A	
10.15		8-K	000-13470	8/11/2017	10.1	

	<u>Transition and Consulting Agreement, dated as of August 9, 2017, between Nanometrics Incorporated and Timothy J. Stultz.</u>				
10.16	<u>Employment Agreement between the Registrant and Pierre-Yves Lesaichere, dated November 27, 2017</u>	10-K	000-13470	2/26/2018	10.20
10.17	<u>Separation Agreement between Registrant and S. Mark Borowicz, dated January 8, 2018</u>	10-K	000-13470	2/26/2018	10.21
10.18	<u>Independent Contractor Agreement between Registrant and S. Mark Borowicz, dated January 8, 2018</u>	10-K	000-13470	2/26/2018	10.22
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10.19	<u>Retention Bonus Agreement between Registrant and Greg Swyt, dated December 18, 2017</u>	10-K 000-134702/26/2018	10.23
10.20	<u>Relocation Agreement between Registrant and Rollin Kocher, dated December 16, 2016</u>	10-K 000-134702/26/2018	10.24
10.21	<u>Compensation Arrangements with Named Executive Officers</u>	8-K 000-134703/1/2018	5.02
10.22	<u>Separation Agreement between Registrant and Jonathan Chou, dated June 25, 2018</u>	10-Q 000-134708/2/2018	10.1
10.23	<u>Retention Bonus Agreement between Registrant and Greg Swyt, dated June 25, 2018</u>	8-K 000-1347011/26/2018	10.1
	All Other Material Contracts		
10.24	<u>Stock Purchase Agreement by and among Registrant, 4D Technology Corporation and Dr. James Wyant, James Millerd and Neal Brock, dated October 26, 2018</u>	- - - -	
21	Subsidiaries		
21.1	<u>Subsidiaries of the Registrant</u>	- - - -	
23	Consents of Experts and Counsel		
23.1	<u>Consent of PricewaterhouseCoopers LLP Independent Registered Public Accounting Firm</u>	- - - -	
31	Rule 13a-14(a)/15d-14(a) Certifications		
31.1	<u>Certification of Pierre-Yves Lesaicherre, principal executive officer of the Registrant, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002</u>	- - - -	
31.2	<u>Certification of Greg Swyt, principal financial officer of the Registrant, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002</u>	- - - -	
32	Section 1350 Certifications		
32.1*	<u>Certification of Pierre-Yves Lesaicherre, principal executive officer of the Registrant, and Greg Swyt, principal financial officer of the Registrant pursuant to Section 906 of the Sarbanes-Oxley Act of 2002. This Certification accompanies this report and shall, not, except to the extent required by the Sarbanes-Oxley Act of 2002, be deemed filed for purposes of §18 of the Securities Exchange Act of 1934, as amended.</u>	- - - -	
100.INS	XBRL Instance Document		
100.SCH	XBRL Taxonomy Extension Schema Document		
100.CAL	XBRL Taxonomy Extension Calculation Linkbase Document		
100.DEF	XBRL Taxonomy Extension Definition Linkbase Document		
100.LAB	XBRL Taxonomy Extension Label Linkbase Document		
100.PRE	XBRL Taxonomy Extension Presentation Linkbase Document		

Documents previously filed in the table above are incorporated by reference.

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.

Dated: February 25, 2019

NANOMETRICS INCORPORATED

By: /S/ Pierre-Yves Lesaicherre

Pierre-Yves Lesaicherre

President and Chief Executive Officer

(Duly Authorized Officer and Principal Executive Officer)

Pursuant to the requirements of the Securities Exchange Act of 1934, this Report on Form 10-K 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
/S/ Pierre-Yves Lesaicherre Pierre-Yves Lesaicherre	President, Chief Executive Officer and Director (Principal Executive Officer)	February 25, 2019
/S/ Greg Swyt Greg Swyt	Vice President, Finance (Principal Financial Officer and Principal Accounting Officer)	February 25, 2019
/S/ Bruce C. Rhine Bruce C. Rhine	Chairman of the Board of Directors	February 25, 2019
/S/ J. Thomas Bentley J. Thomas Bentley	Director	February 25, 2019
/S/ Edward J. Brown Jr. Edward J. Brown Jr.	Director	February 25, 2019
/S/ Robert G. deuster Robert G. Deuster	Director	February 25, 2019
/S/ Christopher A. Seams Christopher A. Seams	Director	February 25, 2019
/S/ Timothy J. Stultz Timothy J. Stultz	Director	February 25, 2019
/S/ Christine A. Tsingos Christine A. Tsingos	Director	February 25, 2019

