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NANOMETRICS INC

FORM 10-K
(Annual Report)

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CIK	0000704532
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SIC Code	3829 - Measuring and Controlling Devices, Not Elsewhere Classified
Industry	Semiconductor Equipment & Testing
Sector	Technology
Fiscal Year	12/27

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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 31, 2016

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 **(State or other jurisdiction of incorporation or organization)**	**94-2276314** **(I.R.S. Employer Identification Number)**
1550 Buckeye Drive **Milpitas, California** **(Address of principal executive offices)**	**95035** **(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 and posted on its corporate Web site, if any, every Interactive Data File required to be submitted and posted pursuant to Rule 405 of Regulation S-T during the preceding 12 months (or for such shorter period that the registrant was required to submit and post such files). Yes ☒ 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 or a smaller reporting company. See the definitions of "large accelerated filer", "accelerated filer", and "smaller reporting company" in Rule 12b-2 of the Exchange Act. (Check one):

Large accelerated filer	☐	Accelerated filer	☒
Non-accelerated filer	☐	Smaller reporting company	☐

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

As of June 24, 2016, 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 $498.8 million. Shares of common stock held by each officer and director and by each person who owned 5% or more of the outstanding common stock 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 24, 2017 was 25,160,223.

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 2016 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 31, 2016.

NANOMETRICS INCORPORATED

FORM 10-K

FOR THE FISCAL YEAR ENDED DECEMBER 31, 2016

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CAUTIONARY INFORMATION REGARDING FORWARD-LOOKING STATEMENTS

This Annual Report on Form 10-K for the year ended December 31, 2016, 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 are not of historical facts 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, including sensors, optoelectronic devices, high-brightness LEDs, discretes, and data storages components. Our automated and integrated metrology systems measure critical dimensions, device structures, topography 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 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 applications. Our systems enable advanced process control for device manufacturers, providing improved device yield at reduced manufacturing cycle time, supporting the accelerated product life cycles in the semiconductor and other device 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. Our major customers include Samsung Electronics Co. Ltd., Intel Corporation, SK Hynix Semiconductor, Inc., Micron Technology, Inc., Taiwan Semiconductor Manufacturing Company Limited and Toshiba Corporation.

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) and at the SEC's Public Reference Room at 100 F Street, NE, Washington DC 20549. Interested parties may obtain information on the operation of the Public Reference Room by calling the SEC at 1-800-SEC-0330.

Industry Background

We participate in the sale, design, manufacture, marketing and support of process control systems for optical critical dimension metrology, thin film metrology, and wafer defect inspection used for semiconductor manufacturing. 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. Integrated circuits are made up of semiconductor material layers integrating millions or billions of transistors and other electronic components, connected through a complex wiring scheme of small copper wires, ultimately packaged into thin form factors to be mounted on circuit boards or other substrates. Our core focus is the measurement and control of the structure, composition, and geometry of the devices from the transistor layer through advanced wafer-level packaging 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, thin film head components for hard disk drives and alternative energy devices such as LEDs, power inverters and solar cells.

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 majority of our chip customers manufacture devices in production runs defined by the smallest printed feature and the associated circuit manufacturing methods, known as a technology node, which are measured in nanometers ("nm"), or one-billionth of a meter. Current volume production is running at the 1Xnm nodes across foundry, logic, and memory, with customers ramping 1Y or 10nm node and developing next generation 7 nm and below devices. In some cases, our customers are implementing new materials and methods in high volume manufacturing, including materials and device architectures to reduce power consumption including high dielectric constant (or high-k) materials, FinFET or tri-gate transistors, stacked memory devices including 3D-NAND, and additional system on chip solutions. To shrink features, new methods including multiple patterning lithography have been deployed. We believe the use of these new materials and methods has increased demand for our products. Next-generation devices with features smaller than 10nm are beginning to ramp production, which in turn likely will require new advancements in metrology and inspection capabilities. DRAM memory makers have shifted to 1X node production with development for subsequently smaller node devices currently underway (where X, Y and Z represent successively smaller geometries). Non-volatile memory makers of NAND and NOR devices have ramped 1X and 1Y node devices into high volume manufacturing with work extending into 1Z node development and production as well as simultaneously developing and ramping stacked or 3D non-volatile memory structures. Current 3D NAND devices are built around a stack of 24-48 layer pairs, and are expected to migrate to 64-96 layer pairs in the next generation of devices. Foundry and logic manufacturers are in volume production of both 16nm and 22nm node devi ces, ramping volume production of 10nm node devices and in advanced development of 7nm devices.

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 new 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 seven customers (as defined by capital expenditures for wafer fab equipment); 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 manufacturing industry. 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® III, Atlas II+, and Atlas XP/Atlas XP+ represent our line of high-performance metrology systems providing optical critical dimension (“OCD”®), thin film metrology and wafer stress for transistor and interconnect metrology applications. The OCD technology is supported by our NanoCD® suite of solutions including our NanoDiffract® software and NanoGen™ scalable computing engine that enables visualization, modeling, and analysis of complex structures. The UniFire™ system measures multiple parameters at any given process step in the advanced packaging process flow for critical dimension, overlay, and topography applications and has recently added inspection capabilities for both front-end of line patterned wafer and advanced packaging related applications.

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+ and IMPULSE® represent our latest metrology platform 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. Our Trajectory® system provides in-line measurement of layers in thin film thickness and composition in semiconductor applications and is qualified in production with major device makers.

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.

The RPMBlue™ is our photoluminescence mapping system designed specifically for the HB-LED market, and is complemented by the RPMBlue-FS, enabling a breadth of research and development configurability. We sell Fourier-Transform Infrared (“FTIR”) automated and manual systems in the QS2200/3300 and QS1200 respectively. The NanoSpec® line, including the NanoSpec II, supports thin film measurement across all applications in both low volume production and research applications.

Our process control systems can be categorized as follows:

System	Market	Applications
Automated Systems		
Atlas III, Atlas II+/Atlas XP/Atlas XP+	Semiconductor	Film Thickness, Film Stress, CD
UniFire	Semiconductor	Film Thickness, Overlay, CD, and Advanced Packaging Applications, Inspection
OCD Analysis		
NanoDiffract	Semiconductor	OCD
NanoGen	Semiconductor	OCD
Integrated Systems		
IMPULSE/IMPULSE+	Semiconductor	Film Thickness, CD
Trajectory	Semiconductor, Solar PV	Film Thickness, Composition
Materials Characterization Systems		
ECVPro	Compound Semiconductor, Solar PV, HB-LED	Electrical Properties
HL5500	Compound Semiconductor, Solar PV, HB-LED	Electrical Properties
QS1200	Substrate Semiconductor, Solar PV	Substrate Properties, Film Composition and Thickness
QS2200/3300	Substrate Semiconductor	Substrate Properties, Film Composition
NanoSpec ® II	Semiconductor	Film Thickness (Tabletop)
RPMBlue ™	HB-LED	Epitaxial Layer Properties
Stratus	Semiconductor	Substrate Properties, Film Composition and Thickness (Tabletop)

See Note 16 of our consolidated financial statements in Item 8, "Financial Statements and Supplementary Data," for revenues by product type, which information is incorporated by reference here.

Customers

We sell our metrology and inspection systems worldwide to semiconductor manufacturers, and producers of solid state devices. The majority of our systems are sold to customers located in Asia and the United States.

The following customers accounted for 10% or more of our total net revenues:

	2016	2015	2014
Micron Technology, Inc.	20.3%	15.8%	10.4%
Intel Corporation	18.0%	***	12.6%
SK Hynix	15.3%	10.7%	12.2%
Taiwan Semiconductor Manufacturing Company Limited	10.0%	19.4%	***
Samsung Electronics Co. Ltd.	***	13.2%	26.9%
Toshiba Corporation	***	10.2%	***

*** The customer accounted for less than 10% of total net revenues during the period.

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 comprised 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.

Net revenues from customers located in the United States and in foreign countries, as a percentage of total net revenues were as follows:

	2016	2015	2014
United States	14%	20%	22%
China	20%	9%	17%
South Korea	20%	16%	25%
Singapore	17%	9%	5%
Japan	12%	17%	9%
Taiwan	12%	25%	12%
All other countries	5%	4%	10%

See Note 16 of our consolidated financial statements in Item 8, "Financial Statements and Supplementary Data," for segment and geographical financial information, including revenues and long-lived assets by geographic region, and our consolidated financial statements for net revenue information, which is incorporated by reference here.

Customer Service and Support

We believe that customer service and technical support for our systems are important 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 parts and labor for most of our products. 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, France, Italy, and Germany.

Service revenues, including sales of replacement parts, represented 16%, 22%, and 20% of total net revenues in 2016, 2015 and 2014, respectively.

Backlog

As of December 31, 2016 and December 26, 2015, our backlog was $28.5 million and $32.1 million, respectively. Backlog includes orders received and booked, both shipped and not yet recognized in 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 different 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 competitors. 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.

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.

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

Manufacturing

Our manufacturing operations are in Milpitas, California 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. The majority of our automated and integrated products are currently manufactured at our Milpitas facility. We also use contract manufacturers in other locations in the United States, China, Israel and Japan. We currently do not expect our manufacturing operations to require additional major investments in capital equipment.

We produce key parts and components and make reasonable efforts to ensure that any 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 an established long-term supply agreement for supply of our spectroscopic ellipsometers and interferometers for use in our products. Although we seek to reduce our dependence on sole and limited source suppliers, partial or complete loss of these sources could disrupt production, delay scheduled deliveries to customers and have a material adverse effect on our revenues and results of operations.

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. The Atlas III product provides enhanced OCD capability with a significantly lower cost of ownership model. In our integrated markets, the IMPULSE system has been further developed for inline lithography track configuration to extend our tool of record position for lithography OCD. The IMPULSE+ system, which incorporates performance and productivity enhancements to the IMPULSE was introduced in 2015 and has been qualified across numerous OEM platforms.

Our research and development expenses for fiscal 2016, 2015 and 2014 were $31.4 million, $32.7 million and $33.8 million, respectively.

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 31, 2016, we had 212 patents, including foreign patents, with expiration dates ranging from 2016-2035. 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 31, 2016, we employed 532 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 as a result 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.

In the event that 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 24, 2017, are set forth below:

Name	Age	Position
Timothy J. Stultz, Ph.D.	69	President, Chief Executive Officer and Director
Jeffrey Andreson	55	Chief Financial Officer
S. Mark Borowicz, Ph.D.	44	Executive Vice President, Business Operations
Rollin Kocher	51	Sr. Vice President, Commercial Operations
Kevin Heidrich	46	Sr. Vice President, Strategic Marketing and Business Development
Janet Taylor	59	General Counsel

Dr. Timothy J. Stultz has served as President, Chief Executive Officer and director of Nanometrics Incorporated since August 2007. Dr. Stultz has more than 30 years of executive management experience. Prior to joining Nanometrics, Dr. Stultz was President and Chief Executive Officer of Imago Scientific Instruments Corporation, a supplier of proprietary 3-D atom probe microscopes to the research, materials and microelectronics industries; President and Chief Executive Officer for ThauMDx, a developer of diagnostic systems for the healthcare industry; and Vice President and General Manager of Veeco Instruments' Metrology and Instrumentation Business. Dr. Stultz received his B.S., M.S. and Ph.D. in Materials Science and Engineering from Stanford University.

Jeffrey Andreson joined Nanometrics as Chief Financial Officer in September 2014. Prior to Nanometrics, Mr. Andreson served at Intevac Corporation from August 2007 to September 2014 most recently as Executive Vice President, Finance and Administration, Chief Financial Officer, Treasurer and Secretary from August 2007 and in this role, was responsible for finance, information services and legal. From June to August 2007, Mr. Andreson served as Executive Vice President, Finance at Intevac. Prior to joining Intevac, Mr. Andreson served 12 years with Applied Materials in various controllership positions within the company most recently as Managing Director and Controller of the $2 billion Applied Materials' Global Services product group. Mr. Andreson joined Applied Materials in 1995 and held a number of senior financial positions, including: Managing Director, Global Financial Planning and Analysis; Controller, Metron Subsidiary; Controller, North American Sales and Service; and Controller, Volume Manufacturing. From 1989 through 1995, Mr. Andreson held various roles at Measurex Corporation. Mr. Andreson holds an MBA from Santa Clara University and a B.S. degree in finance from San Jose State University.

Dr. S. Mark Borowicz joined Nanometrics as Senior Vice President, Product & Field Operations Group in March 2013. In September 2016, Dr. Borowicz was promoted to Executive Vice President, Business Operations. Prior to Nanometrics, Dr. Borowicz held senior management positions in business development and product marketing at KLA-Tencor, Inc. from 2000 to 2013, where he was responsible for sales and product management for inspection and metrology businesses. Dr. Borowicz has seven patents in the field of electron beam technologies. Dr. Borowicz holds a B.S. in Mechanical Engineering from West Virginia University and a Ph.D. in Materials Engineering from Auburn University.

Rollin Kocher joined Nanometrics in March 2013 as Vice President of Worldwide Sales and Service. In September 2016, Mr. Kocher was promoted to Senior Vice President, Commercial Operations. Prior to joining Nanometrics, Mr. Kocher held several senior management positions over 17 years at KLA-Tencor, including Global Sales for Films and Scatterometry, Sales for Taiwan, North America and Europe, and Sr. Director of Sales for the Samsung Business Unit. His last position at KLA-Tencor 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, Sr. Vice President, Strategic Marketing and Business Development, joined Nanometrics in 2006. Mr. Heidrich has participated in many functions, expanding his scope to include new product development, corporate marketing, product marketing and business development. 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. Heidr ich 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.

ITEM 1A. RI SK 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 reduce demand for our products which in turn may cause us to operate unprofitably and may cause reductions in available cash, and may negatively impact our financial performance.

Global economic conditions, the gradual recovery of the global economy and the cyclical nature of the semiconductor industry have impacted and could impact future 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, 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 to timely and appropriately adapt to changes resulting from difficult 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 2016, four customers represented 20%, 18%, 15% and 10%, respectively, or collectively 63%, of our total net revenues. There are only a limited number of large companies operating in the semiconductor manufacturing industry and our market is characterized by continued consolidation in the customer base. 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 ellipso meter 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 in order to ensure overall quality and timeliness of delivery. Many of these components and subassemblies have significant production lead times. To date, we have been able to obtain adequate supplies of components and subassemblies for our systems in a timely manner. However, disruption or termination of certain of these sources could have a significant adverse impact on our ability to manufacture our systems. In addition, our failure to timely use components in our manufacturing processes due to delays or cancellation of orders may lead to write-downs of inventory. A disruption in supply or inventory window would, in turn, have a material adverse effect on our business, financial condition and results of operations. Our reliance on a sole supplier or a limited group of suppliers and our reliance on subcontractors involve several risks, including:

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

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

Some of our current and potential competitors have significantly greater resources than we do, and increased competition could impair sales of our products.

We operate in the highly competitive semiconductor industry and face competition from a number of companies, some of which 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.

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., 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 o rder and shipment uncertainties. Our profitability will decline if we fail to accurately forecast customer demand when managing inventory.

We generally sell our products on the basis of purchase orders rather than long-term purchase commitments from our customers. Our customers can typically cancel purchase orders or defer product shipments for some period without incurring liabilities to us. 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 are able to protect and improve profitability. 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. If we do identify suitable 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 could include, among other things:

- our inability to realize the benefits or cost savings that we expect to realize as a result of the acquisition;
- diversion of management's attention;
- our inability to successfully integrate our businesses with the business of the acquired company;
- motivating, recruiting and retaining executives and key employees; conforming standards, controls, procedures and policies, business cultures and compensation structures among our company and the acquired company;
- consolidating and streamlining sales, marketing and corporate operations;
- potential exposure to unknown liabilities of acquired companies;
- loss of key employees and customers of the acquired business; and
- managing tax costs or inefficiencies associated with integrating our operations following completion of the acquisitions.

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

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

- to obtain such financing we may be forced to obtain financing on terms that are not favorable to us and, in the case of equity or convertible debt financing, the financing may result in dilution to our stockholders; or
- such financing may not be available to us at all, which could prevent us from entering into 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 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 new 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 in the future have 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 frequent 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 cov ered 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-infringi ng 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 dam aged 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 2016, 2015, and 2014, 86%, 80% and 78%, 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 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. Our automated metrology systems can be priced from $900,000 to $2,100,000 per system, and our integrated metrology systems can be priced up to $500,000 per system. Accordingly, a small change in the number or mix of systems that we sell could cause significant changes in our operating results.

Lack of market acceptance for our products may affect our ability to generate revenue and may harm our business.

We have invested substantial time and resources into the development of new products, services and technologies. However, we cannot accurately predict the future level of acceptance of our products and services by our customers. As a result, we may not be able to generate anticipated revenue from sales of these products and services, or future new products, services and improvements.

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.

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 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 manufacture rs.

Some of our competitors have substantially greater financial resources and more extensive engineering, manufacturing, marketing and customer service and support resources than we do and therefore have the potential to increasingly dominate the semiconductor equipment industry. These competitors may deeply discount products similar to those that we sell, challenging or even exceeding our ability to make similar accommodations and threatening our ability to sell those products. As a result, we may fail to continue to compete successfully worldwide.

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. Accordingly, we may be unable to continue to compete in our markets and competition may intensify, or future competition, operating results, financial condition, and/or cash flows could suffer.

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 all 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 quality 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.

Our results of operations could vary as a result of the methods, estimates and judgments we use in applying our accounting policies.

The methods, estimates and judgments we use in applying our accounting policies have a significant impact on our results of operations. See “Note 1. Nature of Business, Basis of Presentation and Significant Accounting Policies” in Part II, Item 8, Note 1 of our consolidated financial statements. These methods, estimates and judgments are, by their nature, subject to substantial risks, uncertainties and assumptions, and factors may arise over time that leads us to change our methods, estimates and judgments. Changes in these methods, estimates and judgments could significantly affect our results of operations. In particular, our operating results have been affected by changes in our valuation allowance against our deferred tax assets, the calculation of share-based compensation expense and by the testing and potential impairment of long-lived assets such as goodwill and other intangible assets. For example, during the year ended December 31, 2016, we recorded a $27.4 million release of valuation allowance against our U.S, certain state and certain foreign deferred tax assets as we determined, based upon an evaluation of all available objectively verifiable evidence , including but not limited to our operations, current earnings and anticipated future earnings that a release is required. The valuation allowance release had a significant impact to our operating results. The process of evaluating the valuation allowance is highly subjective and requires significant judgment, and our results of operations could vary significantly from estimates. To the extent that we believe it is more likely that we will not realize our deferred tax assets, our financial statements will reflect another significant change to our tax provision and operating results.

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

Fluctuations in our effective tax rate may affect operating results. Our effective tax rate is subject to fluctuation based on a variety of factors, such as:

- the jurisdictions in which our profits are determined to be earned and taxed;
- changes to tax laws, regulations and interpretations;
- our ability to obtain approval and the timing of receipt of approval from the Internal Revenue Service of tax elections;
- changes in the valuation of our deferred tax assets and liabilities;
- increases in expenses not deductible for tax purposes, including write-offs of acquired in-process research and development and impairment of goodwill in connection with acquisitions and
- changes in available tax credits.

Any material increase in our effective tax rate would adversely affect our operating 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.

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 in our information technology system. While our system is designed with access security, if a third party gains unauthorized access to our data, including any data regarding our customers, the security breach could expose us to a risk of loss of this information, loss of business, litigation and possible liability. These security measures may be breached as a result of third-party action, including intentional misconduct by computer hackers, employee error, malfeasance or otherwise. Additionally, third parties may attempt to fraudulently induce employees or customers into disclosing sensitive information such as user names, passwords or other information to gain access to our customers' data or our data, including our intellectual property and other confidential business information, or our information technology systems. Because the techniques used to obtain unauthorized access, or to sabotage systems, change frequently and generally are not recognized until launched against a target, we may be unable to anticipate these techniques or to implement adequate preventative measures. Any security breach could result in a loss of confidence by our customers, damage our reputation, disrupt our business, lead to legal liability and negatively impact our future sales.

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 is primarily comprised of commercial paper, corporate debt securities, debt securities issued by U.S. governmental agencies and municipal debt securities. 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 operati ng results have varied in the past and probably will continue to vary significantly in the future, which will cause volatility in our stock price.

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

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

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.

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. 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 have identified a material weakness in internal control over financial reporting, which if not remedied, could adversely affect our business and results of operations.

Pursuant to Section 404 of the Sarbanes-Oxley Act of 2002, our management is required to perform evaluations of our internal control over financial reporting and our independent auditors are required to publicly attest to the effectiveness of our internal control over financial reporting. As described under “Item 9A - Controls and Procedures,” our management identified an internal control weakness surrounding our inventory accounts, and has concluded that the deficiency constitutes a material weakness in our internal control over financial reporting, and as result, internal control over financial reporting was not effective as of December 31, 2016. During our evaluation of internal controls over our cycle counting procedures, we determined that we did not design and maintain an effective control over the existence of inventories subject to the cycle count program. Specifically, the control was not effectively designed and maintained to verify all inventories that should be subject to the cycle count program were included and were counted at the frequency levels required under the Company’s policies. This control deficiency did not result in a material adjustment to the inventory and cost accounts and disclosures for the year ended December 31, 2016

To ensure existence of the Company’s inventory balances as recorded at December 31, 2016, we conducted a full physical inventory for the stocking locations subject to the cycle count program which resulted in an immaterial adjustment. The material weakness in the design and effectiveness of the control over the existence of inventories is in the process of being remediated. Our goal is t o remediate this material weakness by the end of 2017, subject to there being sufficient opportunities to conclude, through testing, that the enhanced control is designed and operating effectively.

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.

Compliance with federal securities laws, rules and regulations, as well as NASDAQ requirements, is becoming increasingly complex, and the significant attention and expense we must devote to those areas may have an adverse impact on our business.

Federal securities laws, rules and regulations, as well as NASDAQ rules and regulations, require companies to maintain extensive corporate governance measures, impose comprehensive reporting and disclosure requirements, set strict independence and financial expertise standards for audit and other committee members and impose civil and criminal penalties for companies and their chief executive officers, chief financial officers and directors for securities law violations. These laws, rules and regulations have increased, and in the future, are expected to continue to increase, the scope, complexity and cost of our corporate governance, reporting and disclosure practices, which could harm our results of operations and divert management's attention from business operations.

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 new 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 sufficien tly 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. UNRE SOLVED STAFF COMMENTS

None.

ITEM 2. PROPERTIES

At December 31, 2016, our owned or leased facilities included those described below:

Type	Location	Square Footage	Use
Owned	Milpitas, California	135,692	Corporate headquarters, manufacturing and corporate housing
Leased	Taiwan	22,167	Sales and service
Leased	South Korea	21,337	Sales, service and corporate housing
Leased	United States	19,551	Engineering, sales and service
Leased	Japan	16,628	Sales, service and corporate housing
Leased	China	9,046	Sales and service
Leased	Singapore	4,532	Sales and service
Leased	France	828	Sales and service

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

ITEM 3. LEGAL PROCEEDINGS

Not Applicable.

ITEM 4. MINE SAFETY DISCLOSURES

Not Applicable.

PART II

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

Market Information for Common Stock

Our common stock is quoted on the NASDAQ Global Select Market under the symbol "NANO." The following table sets forth, for the fiscal periods indicated, the high and low closing sales prices per share of our common stock on a quarterly basis as reported on the NASDAQ Global Select Market.

Fiscal Year 2016	High	Low
First quarter	$ 15.86	$ 12.63
Second quarter	$ 20.62	$ 13.82
Third quarter	$ 22.66	$ 19.65
Fourth quarter	$ 25.83	$ 19.65

Fiscal Year 2015	High	Low
First quarter	$ 18.60	$ 15.32
Second quarter	$ 17.09	$ 14.46
Third quarter	$ 16.30	$ 12.33
Fourth quarter	$ 15.91	$ 12.12

Stockholders

On February 24, 2017, there were approximately 149 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.

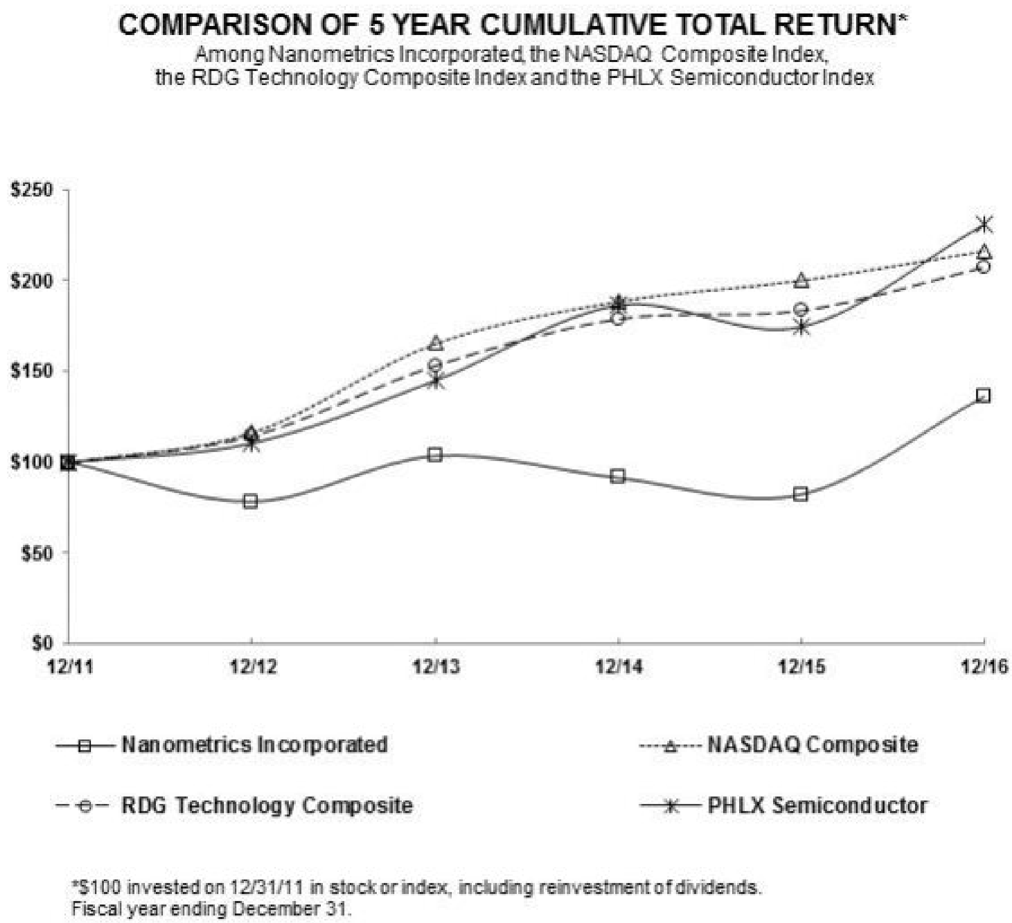
Dividend Policy

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.

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 (a) Nanometrics Incorporated, (b) a broad-based equity market index and (c) 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. The RDG Technology Composite Index was used in prior fiscal years' Form 10-K reports as the industry-specific index; however, the Company believes the PHLX Semiconductor index is a better indicator of how the Company compares to the overall Semiconductor industry.

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.



	12/11	12/12	12/13	12/14	12/15	12/16
Nanometrics Incorporated	100.00	78.28	103.42	91.31	82.19	136.05
NASDAQ Composite	100.00	116.41	165.47	188.69	200.32	216.54
RDG Technology Composite	100.00	114.61	152.95	178.50	183.08	206.81
PHLX Semiconductor	100.00	110.42	144.83	186.15	174.42	230.82

Recent Sales of Unregistered Securities

None.

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 2016, 2015, 2014, 2013 and 2012, as referred to below, refer to our fiscal years ended December 31, 2016, December 26, 2015, December 27, 2014, December 28, 2013 and December 29, 2012, respectively.

	Fiscal Year				
	2016 (2)	2015	2014 (1)	2013	2012
	(in thousands, except per share data)				
Consolidated Statement of Operations Data:					
Total net revenues	$ 221,129	$ 187,367	$ 166,443	$ 144,307	$ 182,881
Gross profit	$ 114,124	$ 89,667	$ 75,822	$ 62,676	$ 83,928
Income (loss) from operations	$ 29,095	$ 4,973	$ (11,653)	$ (21,709)	$ 5,478
Net income (loss)	$ 44,035	$ 2,905	$ (31,118)	$ (14,146)	$ 4,465
Basic net income (loss) per share	$ 1.79	$ 0.12	$ (1.30)	$ (0.61)	$ 0.19
Diluted net income (loss) per share	$ 1.75	$ 0.12	$ (1.30)	$ (0.61)	$ 0.19

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

(2) 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.

	Fiscal Year Ended				
	2016	2015	2014	2013	2012
	(in thousands)				
Consolidated Balance Sheet Data:					
Cash, cash equivalents and marketable securities	$ 129,961	$ 83,085	$ 83,962	$ 92,862	$ 109,908
Working capital	$ 174,353	$ 132,903	$ 119,797	$ 141,797	$ 158,587
Total assets	$ 287,830	$ 235,540	$ 223,236	$ 262,834	$ 259,454
Long-term liabilities including current portion of debt obligation	$ 2,030	$ 3,001	$ 5,497	$ 6,504	$ 13,884
Total stockholders' equity	$ 243,774	$ 187,328	$ 179,537	$ 207,373	$ 215,771

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 metrology and inspection systems for semiconductor manufacturing and other industries. Our systems are designed to precisely monitor optical critical dimensions and film thickness that are necessary to control the manufacturing process and to identify defects that can affect production yields and 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.

Our revenues are primarily derived from product sales but are also derived from customer service and system upgrades for the installed base of our products. In 2016, we derived 84% of our total net revenues from product sales and 16% 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 stops 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 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. These 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 manufacturers to rapidly achieve production efficiency. Device manufacturers are using our integrated and automated systems 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 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 persuasive evidence of an arrangement exists, delivery has occurred or services have been rendered, the seller's price is fixed or determinable, and collectability is reasonably assured. We derive revenue from the sale of process control metrology and inspection systems and related upgrades (“product revenue”) as well as spare part sales, billable services and service contracts (together “service revenue”). Upgrades are system software and hardware performance upgrades that extend the features and functionality of a product. Beginning in the first quarter of 2016, we include upgrades in product revenue, which consists of sales of complete, advance process control metrology and inspection systems (the “system(s)”). This change was due to the types of upgrades currently being sold, which are primarily system software and hardware performance upgrades to extend the features and functionality of a product. Previously, upgrades consisted of a group of parts and/or software that change the existing configuration of the products.

Nanometrics' systems consist of hardware and software components that function together to deliver the essential functionality of the system. Arrangements for sales of systems often include defined customer-specified acceptance criteria.

For repeat product sales to existing customers, revenue recognition occurs at the time title and risk of loss transfer to the customer, which usually occurs upon shipment from our manufacturing location, if it can be reliably demonstrated that the product has successfully met the defined customer specified acceptance criteria and all other recognition criteria have been met. For initial sales where we have not previously met the defined customer specified acceptance criteria, we recognize product revenues upon the earlier of receipt of written customer acceptance or expiration of the contractual acceptance period. In Japan, where contractual terms with the customer specify risk of loss and title transfers upon customer acceptance, we recognize revenue upon receipt of written customer acceptance, provided that all other recognition criteria have been met.

We warrant our products against defects in manufacturing. Upon recognition of product revenue, we record a liability for anticipated warranty costs. On occasion, customers request a warranty period longer than our standard warranty. In those instances, where extended warranty services are separately quoted to the customer, we defer and recognize the associated revenue as service revenue ratably over the term of the contract. We include the portion of service contracts and extended warranty services agreements that are uncompleted at the end of any reporting period in deferred revenue.

We also sell software that is considered to be an upgrade to a customer's existing systems. These standalone software sales are not essential to the tangible product's functionality and are accounted for under software revenue recognition rules which require vendor specific objective evidence ("VSOE") of fair value to allocate revenue in a multiple element arrangement. We recognize revenue from standalone software sales when the software is delivered to the customer, provided that all other recognition criteria have been met.

The majority of other upgrades are sold based on published specifications. For simple upgrades that do not require major configuration, revenue is recognized at the time title and risk of loss transfer to the customer, which is usually upon shipment. For complex and extensive upgrades, specific acceptance or prior acceptance for a similar upgrade is required in order to recognize revenue.

We recognize revenue related to spare parts upon shipment. We recognize revenue related to billable services when the services are completed. Service contracts may be purchased by the customer during or after the warranty period and we recognize revenue ratably over the service contract period.

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 may 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 portion of revenue associated with installation based on relative selling price and we recognize that revenue 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 p rovided as needed over the fixed arrangement term, and such terms can be up to twelve months. We do not generally grant customers a general right of return or refund and may impose a penalty on orders cancelled prior to the scheduled shipment date.

We evaluate our revenue arrangements to identify deliverables and to determine whether these deliverables are separable into multiple units of accounting. We allocate the arrangement consideration among the deliverables based on relative selling price. We have established VSOE for some of our products and services when a substantial majority of selling prices falls within a narrow range when sold separately. For deliverables with no established VSOE, we use best estimate of selling price to determine standalone selling price for such deliverable. We do not use third party evidence to determine standalone selling price since this information is not widely available in the market as our products contain a significant element of proprietary technology and the solutions offered differ substantially from our competitors. We have established a process for developing best estimated selling price ("BESP"), which incorporates historical selling prices, the effect of market conditions, gross margin objectives, pricing practices, as well as entity-specific factors. We monitor and evaluate BESP on a regular basis to ensure that changes in circumstances are accounted for in a timely manner.

When certain elements in multiple-element arrangements are not delivered or accepted at the end of a reporting period, the relative selling prices of undelivered elements are deferred until these elements are delivered and/or accepted. If deliverables cannot be accounted for as separate units of accounting, the entire arrangement is accounted for as a single unit of accounting and we defer revenue until all elements are delivered and all revenue recognition requirements are met.

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 stated at the lower of cost, which approximates actual cost on a first-in, first-out basis, or market. 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. Goodwill and indefinite lived assets are not amortized but tested annually for impairment. The goodwill impairment assessment involves three tests, Ste p 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 t he 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 goo dwill, 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, the 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 values 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 particular 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 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 we 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. Our income tax provision is primarily impacted by federal statutory rates, state and foreign income taxes and changes in our 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.

Upgrade Revenue and Related Cost

As discussed above, beginning the first quarter of 2016, we now include revenues associated with upgrade sales under Products Revenues, and the related costs in Cost of Products Revenue. This change was due to the types of upgrades currently being sold, which are primarily system software and hardware performance upgrades to extend the features and functionality of a product. Previously, upgrades consisted of a group of parts and/or software that change the existing configuration of a product. For the twelve months ended December 31, 2016, we included $11.0 million related to upgrade sales and $2.4 million of costs, in Products Revenues and Cost of Products Revenues, respectively. For the twelve months ended December 26, 2015, we included $7.9 million related to upgrade sales, and $3.0 million of costs, in Service Revenues and Costs of Service Revenues, respectively. In our discussion below comparing revenues and gross margin in 2016 to 2015 , we compare as if upgrade sales and related costs have been included in Product Revenue and Cost of Revenues in 2015 to give a more meaningful comparison

Results of Operations

Total net revenues

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

	Fiscal Year			
	2016	2015	Change	
Automated systems	$ 127,378	$ 102,386	$ 24,992	24.4%
Integrated systems	43,846	31,579	12,267	38.8%
Materials characterization systems	13,842	12,980	862	6.6%
Total product revenue	185,066	146,945	38,121	25.9%
Service	36,063	40,422	(4,359)	(10.8)%
Total net revenues	$ 221,129	$ 187,367	$ 33,762	18.0%

	Fiscal Year			
	2015	2014	Change	
Automated systems	$ 102,386	$ 108,768	$ (6,382)	(5.9)%
Integrated systems	31,579	15,334	16,245	105.9%
Materials characterization systems	12,980	9,487	3,493	36.8%
Total product revenue	146,945	133,589	13,356	10.0%
Service	40,422	32,854	7,568	23.0%
Total net revenues	$ 187,367	$ 166,443	$ 20,924	12.6%

In 2016, total net revenues increased by $33.8 million from 2015. During 2016, we included upgrade sales of $11.0 million, in Product Revenues. For the twelve months ended December 26, 2015, Product Revenues do not include $7.9 million related to upgrade sales, which we included in Service Revenues. For the twelve months ended December 31, 2016, had upgrade sales been included in Product Revenue in 2015, Product Revenues would have increased by $30.2 million. The increase was primarily attributable to an industry-wide improvement in 3D NAND-related semiconductor capital spending. Approximately $17.8 million of the increase related to Automated systems sales and $11.7 million of the increase related to our sales of Integrated Systems (principally *IMPULSE ®*), primarily with 3D-NAND-related customers. Materials Characterization also accounted for $0.7 million of the increased systems sales. Service revenue decreased by $4.4 million in 2016. For the twelve months ended December 31, 2016, had upgrade sales been excluded in Service Revenue in 2015, Service Revenue would have increased by $3.5 million principally due to an increase of $3.9 million in sales of spares and services revenue, offset by $0.4 million decline in extended warranty sales.

In 2015, total net revenues increased by $20.9 million from 2014, principally due to an industry-wide improvement in 3D NAND-related semiconductor capital spending and from an increase in foundry penetration. Approximately $16.2 million of the increase in product revenues was attributable to sales of our Integrated Systems (principally IMPULSE®), primarily with 3D-NAND-related customers. Materials Characterization accounted for $3.5 million of the increase and was partially offset by Automated systems sales which decreased by $6.4 million. Service revenue increased by $7.6 million in 2015 principally due to an increase in upgrade revenue as a result of higher demand for upgrades of installed tools. Upgrades tend to fluctuate based on availability of new functionality from upgrades and customer production cycles, which determine when customers purchase available upgrades.

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. Although sales to customers within individual countries of that region will vary from time to time, we expect that a substantial portion of our revenues will continue to be generated in Asia.

Gross margin

Our gross margin breakdown was as follows:

	Fiscal Year		
	2016	2015	2014
Products	53.1%	46.7%	46.5%
Service	44.1%	51.9%	41.9%

The calculation of product gross margin includes cost of products, amortization of intangibles and in 2016, related upgrades. The gross margin on product revenue increased to 53.1% in 2016 from 46.7% in 2015. Had upgrade sales and related cost been included in Product Revenue and Cost of Revenues in 2015, Product Gross Margin for 2015 would have been 47.5%. The increase in 2016 of 5.6 percentage points was due to a change in product mix, improved installation and warranty related costs and reduced amortization of intangibles as a result of full amortization of the intangible asset. The gross margin of our services business decreased to 44.1% from 51.9% in 2015, reflecting a decrease of 7.8 percentage points. Had upgrade sales and related cost been excluded from Service Revenues and Cost of Service Revenues, Service Gross Margin for 2015 would have been 49.5%, a decrease of 5.4 percentage points, due to the mix of services provided during the year in comparison to the prior year period, and lower labor utilization of service personnel.

The gross margin on product revenue increased to 46.7% in 2015 from 46.5% in 2014. The increase was due primarily to improved factory overhead absorption, lower amortization of intangibles and a 10% increase in product revenue during 2015, offset by higher installation and warranty costs. The gross margin of our services business increased to 51.9% from 41.9% in 2014, reflecting an increase of 10 percentage points, due principally to an increase in upgrade revenues, which typically have higher margins than core service revenue.

Operating expenses

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

	Fiscal Year		Change	
	2016	2015		
Research and development	$ 31,443	$ 32,701	$ (1,258)	(3.8)%
Selling	30,181	28,055	2,126	7.6%
General and administrative	23,381	22,444	937	4.2%
Amortization of intangible assets	24	114	(90)	(78.9)%
Restructuring charge	—	1,380	(1,380)	(100.0)%
Total operating expenses	$ 85,029	$ 84,694	$ 335	0.4%

	Fiscal Year		Change	
	2015	2014		
Research and development	$ 32,701	$ 33,776	$ (1,075)	(3.2)%
Selling	28,055	27,033	1,022	3.8%
General and administrative	22,444	23,980	(1,536)	(6.4)%
Amortization of intangible assets	114	420	(306)	(72.9)%
Restructuring charge	1,380	2,266	(886)	(39.1)%
Total operating expenses	$ 84,694	$ 87,475	$ (2,781)	(3.2)%

Research and development

Research and development costs decreased by $1.3 million or 3.8% in 2016 compared to 2015 related primarily due to lower spending for material expenses and related costs associated with research and development investments for our next generation systems.

Research and development costs decreased by $1.1 million or 3.2% in 2015 compared to 2014 related primarily to a decrease in spending for non-recurring engineering projects, including product design and prototype development, along with related material spending and expenses associated with R&D investments for our next generation Automated and Integrated systems, partially offset by increases in variable compensation costs.

Selling

Selling expenses increased by $2.1 million or 7.6% in fiscal year 2016 compared to fiscal year 2015. The increase is due to higher variable compensation, commission expense, and sales related costs, which is consistent with higher revenues in 2016 compared to 2015. In addition, during fiscal year 2016, there was a decrease in utilization of our sales application personnel for installation and warranty, which is included in cost of net revenues.

Selling expenses increased by $1.0 million or 3.8% in fiscal year 2015 compared to fiscal year 2014. The increase is primarily due to an increase in commissions and amortization of demonstration tools, offset in part by a decrease in travel and related expenses.

General and administrative

General and administrative expenses increased by $0.9 million or 4.2% in fiscal year 2016 compared to 2015. The increase was primarily due to higher variable compensation costs.

In fiscal year 2015 compared to 2014, general and administrative expenses decreased by $1.5 million primarily due to lower headcount and a decrease in consulting expenditures.

Amortization of intangible assets

Amortization of intangible assets included in operating expenses in fiscal year 2016 decreased slightly compared to 2015, as a result of the reduction in amortization due to intangible assets that became fully amortized in 2016.

In fiscal year 2015 compared to 2014, amortization of intangible assets included in operating expenses decreased compared to 2014 due to intangible assets that became fully amortized in 2014.

Restructuring charge

There were no restructuring charges recorded in 2016 fiscal year.

We recorded a restructuring charge of $1.4 million in 2015 as a result of our decision to maximize operating effectiveness. This amount includes charges primarily related to employee severance and related costs. As of December 26, 2015, we had completed and settled in full all cash payments related to employee severance.

Other income (expense), net

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

	Fiscal Year 2016	Fiscal Year 2015	Change	
Interest income	$ 35	$ 71	$ (36)	(50.7)%
Interest expense	(285)	(289)	4	(1.4)%
Interest income (expense), net	$ (250)	$ (218)	$ (32)	14.7 %
Net gains on investments	520	220	300	136.4 %
Other gains (losses), net	(230)	593	(823)	(138.8)%
Other income (loss), net	$ 290	$ 813	$ (523)	(64.3)%
Total other income (expense), net	$ 40	$ 595	$ (555)	(93.3)%

	Fiscal Year		Change	
	2015	2014		
Interest income	$ 71	$ 47	$ 24	51.1%
Interest expense	(289)	(389)	100	(25.7)%
Interest income (expense), net	$ (218)	$ (342)	$ 124	(36.3)%
Net gains on investments	220	179	41	22.9%
Other gains, net	593	195	398	204.1%
Other income, net	813	374	439	117.4%
Total other income, net	$ 595	$ 32	$ 563	1759.4%

Interest income received in fiscal year 2016 compared with fiscal year 2015 decreased minimally as the average balances of our cash and cash equivalents remained relatively flat. Interest expense in 2016 compared with fiscal year 2015 remained relatively flat.

Net gains on investments increased in 2016 as compared with fiscal year 2015, due to an increase in our investment portfolio balance and higher investment yields. The decrease in other income gains and losses in 2016 compared with fiscal 2015, was primarily driven by unfavorable impact of fluctuations of foreign exchange in 2016.

Interest income received in fiscal year 2015 compared with fiscal year 2014 increased minimally as the average balances of cash and cash equivalents balances remained relatively flat. Interest expense was lower in 2015 that in the prior year due primarily to payments made to Zygo to decrease the outstanding liability related to acquisition of certain assets from Zygo.

Net gains on investments increased minimally in 2015 from 2014, driven by slightly improved yields on our investment portfolio. The increase in other income gains and losses in 2015 compared with fiscal 2014 was primarily attributable to favorable impact of fluctuations of foreign exchange in 2015.

Provision for (benefit from) income taxes

We recorded an income tax benefit of $14.9 million in 2016, and income tax expense of $2.7 and $19.5 million in 2015 and 2014, respectively. The decrease in the tax provision for 2016 from 2015 was primarily related to the releasing of a valuation allowance against a significant portion of our U.S. deferred tax assets for the year ended 2016. The increase in the tax provision for 2015 from 2014 was primarily related to the recording of the same valuation allowance for the year ended 2014.

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 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. Our provision for income taxes for 2015 of $2.7 million reflects an effective tax rate of 47.8 %. This rate differs from the Federal statutory rate of 35.0% primarily due to losses incurred in foreign jurisdictions where no benefit is currently recorded, as well as equity compensation expenses for which no current tax deduction is available. Our provision for income taxes for 2014 of $19.5 million reflects an effective tax rate of negative 167.8%. This rate differs from the Federal statutory rate of 35.0% primarily due to the recording of a valuation allowance against our U.S. deferred tax assets which represented a $23.9 million provision, as well as equity compensation expenses for which no current tax deduction is available, offset by foreign income being taxed at lower rates.

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. As such, in 2016, we released a valuation allowance against a significant portion of our U.S. deferred tax asset of $23.9 million. We also released $3.5 million of valuation allowance against our deferred tax assets in Israel and United Kingdom, both of which have no impact to our effective tax rate. We currently maintain a valuation allowance against our deferred tax assets in California, Germany, Switzerland, and Singapore.

Liquidity and Capital Resources

Our principal sources of liquidity are cash and cash equivalents, and 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 31, 2016, December 26, 2015 and December 27, 2014 (in millions):

	December 31, 2016	December 26, 2015	December 27, 2014
Cash, cash equivalents and marketable securities	$ 130.0	$ 83.1	$ 84.0
Working capital	$ 174.4	$ 132.9	$ 119.6
Cash provided by (used in) operating activities	$ 45.7	$ 1.6	$ (0.6)
Cash provided by (used in) investing activities	$ (42.1)	$ 2.0	$ (8.1)
Cash provided by (used in) financing activities	$ 5.3	$ 0.2	$ (0.7)

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 of $1.7 million. 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 property, plant and equipment of $4.0 million, 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.

During 2015, cash provided by operating activities was a result of $2.9 million of net income, non-cash adjustments to net income of $19.4 million and a decrease in net change in operating assets and liabilities of $20.7 million. Increase in cash from operating activities in fiscal 2015 compared to fiscal 2014 was primarily due to improved working capital and increase in sales. Cash provided by investing activities of $2.0 million during 2015, consisted primarily of cash provided by maturities of marketable securities, net of purchases of $0.4 million, and cash received from sales of marketable securities of $3.4 million, partially offset by cash used to acquire property, plant and equipment of $1.8 million. Cash provided by financing activities of $0.2 million during 2015 consisted primarily of $4.0 million in proceeds from issuance of common stock from the employee stock purchase program and the exercise of stock options, partially offset by cash used to repurchase common stock of $1.7 million, royalty and other payments to Zygo of $0.9 million, and cash paid for taxes on net issuance of stock awards of $1.2 million.

During 2014, cash used in operating activities of $0.6 million was a result of $31.1 million of net losses, non-cash adjustments to net income of $37.8 million and a decrease in net change in operating assets and liabilities of $7.3 million. Cash used in investing activities of $8.1 million during 2014 consisted primarily of cash used for purchases of marketable securities, net of maturities, of $2.3 million; and cash used to acquire property, plant and equipment of $5.8 million. Cash used in financing activities of $0.7 million during 2014 consisted primarily of cash used to repurchase common stock of $5.3 million, royalty and other payments to Zygo of $0.6 million, and cash paid for taxes on net issuance of stock awards of $0.7 million, partially offset by $6.0 million in proceeds from issuance of common stock from the employee stock purchase program and the exercise of stock options.

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, $9.2 million of our cash is held by foreign subsidiaries, a portion of which, would have to be repatriated to the United States. We currently do not intend nor foresee a need to repatriate these funds. 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.

If we s hould 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 fo reign 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.

Debt and Repurchases of Common Stock

Line of Credit – Our revolving line of credit facility with Comerica expired on May 30, 2016 and was not renewed. The revolving line of credit agreement included a provision for the issuance of commercial or standby letters of credit by the bank on our behalf. The value of all letters of credit outstanding reduced the total line of credit available. The revolving line of credit was collateralized by a blanket lien on all of our domestic assets excluding intellectual property and real estate. The minimum borrowing interest rate was 3.00% per annum. Borrowing was limited to the lesser of (a) $12.0 million plus the borrowing base, or (b) $20.0 million.

Repurchases of Common Stock - In May 29, 2012, our Board of Directors approved a stock repurchase program to repurchase up to $20.0 million of our common stock. Stock repurchases under the programs may be made through open market and privately negotiated transactions, at times and in such amounts as management deems appropriate. The timing and actual number of shares repurchased is dependent on a variety of factors including price, corporate and regulatory requirements and other market conditions.

There were no shares repurchased during fiscal year 2016.

Shares repurchased and retired for fiscal year 2015 and 2014 of the applicable repurchase programs, 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):

	Fiscal Year 2015	Fiscal Year 2014
Number of shares of common stock repurchased	111,050	362,633
Weighted average price per share	$ 15.49	$ 14.74
Total cost of repurchase	$ 1,721	$ 5,344
Amount available for repurchase at end of period	$ 4,397	$ 6,118

$4.4 million remained available for the future repurchase of our common stock under the 2012 program.

Business Partnership –On June 17, 2009, we announced a strategic business partnership with Zygo whereby we purchased inventory and certain other assets from Zygo, and the two companies entered into a supply agreement. We made payments to Zygo over a period of time, as acquired inventory was sold and other aspects of the supply agreement were executed. We made royalty and sustaining engineering payments of $0.3 million and $0.9 million to Zygo in fiscal years 2016 and 2015, respectively.

On December 8, 2016, we amended our supplier agreement with Zygo, of which, we are released from any existing and future contingent liability related to the supply agreement.

Off-Balance Sheet Arrangements

We had no off-balance sheet arrangements or obligations as of December 31, 2016 and December 26, 2015, respectively.

Contractual Obligations

The following table summarizes our contractual cash obligations as of December 31, 2016, and the effect of such obligations.

		Payments due by period			
	Total	Less than 1 year	1-3 years	4-5 years	More than 5 years
Purchase commitments - inventory (1)	$ 30,592	$ 30,592	$ —	$ —	$ —
Other long-term liabilities	353	1	—	—	352
Operating lease obligations	3,886	1,562	1,944	380	—
Total	$ 34,831	$ 32,155	$ 1,944	$ 380	$ 352

(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 31, 2016 was approximately $30.6 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.

Excluded from the contractual obligation table above are $3.7 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 QUALITA TIVE DISCLOSURES ABOUT MARKET RISK

We are exposed to financial market risks related to foreign currency exchange rates and interest rates.

Foreign Currency Risk

A substantial part of our business consists of sales made to customers outside the United States: 86%, 80%, and 78% of sales in 2016, 2015, and 2014, respectively; and 18%, 22%, and 16% of net revenues in 2016, 2015, and 2014, 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 31, 2016 was approximately $11.5 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 $1.2 million in transaction gains or losses which would be included in our statement of operations.

For 2016, 2015 and 2014, foreign currency transactions resulted in a loss of $0.4 million, a gain of $0.5 million and a gain of $0.1 million, respectively.

In order 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 following table provides information about our foreign currency forward exchange contracts as of December 31, 2016 and December 26, 2015. The information is provided in United States dollar equivalent amounts. The table presents the notional amounts, at contract exchange rates, and the weighted average contractual foreign currency exchange rates expressed as units of the foreign currency per United States dollar, which in some cases may not be the market convention for quoting a particular currency. All of the 2016 and 2015 forward contracts mature during January 2017 and January 2016, respectively.

	As of December 31, 2016		As of December 26, 2015	
	Notional Principal (in millions)	Contract Price	Notional Principal (in millions)	Contract Price
Forward Contracts				
Korean won	$ 2.6	1,202.79	$ 7.0	1,174.00
European Union euro	2.8	0.96	4.1	1.10
Israeli shekel	1.4	3.84	2.1	3.88
Singapore dollar	1.3	1.45	2.7	1.41
Chinese yuan	2.1	6.99	1.4	6.52
Japanese yen	1.0	116.31	13.2	121.27
Taiwanese dollar	1.8	32.21	—	—
British pound	0.9	0.81	—	—
Total	$ 13.9		$ 30.5	
Estimated Fair Value	$ 13.9		$ 30.4	

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.

Interest Rate Risk

Our exposure to market risk resulting from changes in interest rates relates primarily to our investment portfolio. At December 31, 2016, and December 26, 2015, we held $82.9 million and $44.9 million, respectively, in marketable securities. The fair value of our marketable securities could be adversely impacted due to a rise in interest rates, but we do not believe such impact would be material. Securities with longer maturities are subject to a greater interest rate risk than those with shorter maturities and as of December 31, 2016 and December 26, 2015, the average duration of our portfolio was less than six and nine months, respectively. We do not hold securities for trading purposes.

ITEM 8. FINANCIAL STATEME NTS AND SUPPLEMENTARY DATA

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

INDEX TO CONSOLIDATED FINANCIAL STATEMENTS

Report of Independent Regis tered Public Accounting Firm

To the Board of Directors and Stockholders of
Nanometrics Incorporated

In our opinion, the accompanying consolidated balance sheets and the related consolidated statements of operations, of comprehensive income (loss), of stockholders' equity, and of cash flows present fairly, in all material respects, the financial position of Nanometrics Incorporated and its subsidiaries at December 31, 2016 and December 26, 2015, and the results of their operations and their cash flows for each of the three years in the period ended December 31, 2016, in conformity with accounting principles generally accepted in the United States of America. In addition, in our opinion, the financial statement schedule listed in the index appearing under Item 15(a)(2) presents fairly, in all material respects, the information set forth therein when read in conjunction with the related consolidated financial statements. Also in our opinion, the Company did not maintain, in all material respects, effective internal control over financial reporting as of December 31, 2016, based on criteria established in Internal Control - Integrated Framework (2013) issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO) because a material weakness in internal control over financial reporting related to the existence of inventories subject to the cycle count program existed as of that date. A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the annual or interim financial statements will not be prevented or detected on a timely basis. The material weakness referred to above is described in the Report of Management on Internal Control over Financial Reporting appearing under Item 9A. We considered this material weakness in determining the nature, timing, and extent of audit tests applied in our audit of the 2016 consolidated financial statements, and our opinion regarding the effectiveness of the Company's internal control over financial reporting does not affect our opinion on those consolidated financial statements. The Company's management is responsible for these financial statements and financial statement schedule, for maintaining effective internal control over financial reporting and for its assessment of the effectiveness of internal control over financial reporting, included in management's report referred to above. Our responsibility is to express opinions on these financial statements, on the financial statement schedule, and on the Company's internal control over financial reporting based on our integrated audits. We conducted our audits in accordance with the standards of the Public Company Accounting Oversight Board (United States). Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the financial statements are free of material misstatement and whether effective internal control over financial reporting was maintained in all material respects. Our audits of the financial statements included examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements, assessing the accounting principles used and significant estimates made by management, and evaluating the overall financial statement presentation. 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.

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
March 2, 2017

NANOMETRICS INCORPORATED

CONSOLIDATED BALANCE SHEETS
(In thousands except share and per share amounts)

	December 31, 2016	December 26, 2015
ASSETS		
Current assets:		
Cash and cash equivalents	$ 47,062	$ 38,154
Marketable securities	82,899	44,931
Accounts receivable, net of allowances of $73 and $150, respectively	39,457	37,832
Inventories	38,837	47,749
Inventories-delivered systems	2,457	2,856
Prepaid expenses and other	5,667	6,592
Total current assets	216,379	178,114
Property, plant and equipment, net	44,226	44,493
Goodwill	8,940	9,415
Intangible assets, net	412	1,867
Deferred income tax assets	17,399	1,118
Other assets	474	533
Total assets	$ 287,830	$ 235,540
LIABILITIES AND STOCKHOLDERS' EQUITY		
Current liabilities:		
Accounts payable	$ 11,342	$ 11,675
Accrued payroll and related expenses	12,656	10,097
Deferred revenue	9,168	12,790
Other current liabilities	8,047	8,878
Income taxes payable	813	1,771
Total current liabilities	42,026	45,211
Deferred revenue	816	827
Income taxes payable	841	775
Deferred tax liability	20	521
Other long-term liabilities	353	878
Total liabilities	44,056	48,212
Commitments and contingencies (Note 11)		
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: 25,070,889 and 24,224,286, respectively, issued and outstanding	25	24
Additional paid-in capital	271,969	258,715
Accumulated deficit	(22,174)	(66,209)
Accumulated other comprehensive income	(6,046)	(5,202)
Total stockholders' equity	243,774	187,328
Total liabilities and stockholders' equity	$ 287,830	$ 235,540

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF OPERATIONS
(In thousands except per share amounts)

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Net revenues:			
Products	$ 185,066	$ 146,945	$ 133,589
Service	36,063	40,422	32,854
Total net revenues	221,129	187,367	166,443
Costs of net revenues:			
Cost of products	85,391	76,224	68,812
Cost of service	20,160	19,450	19,086
Amortization of intangible assets	1,454	2,026	2,723
Total costs of net revenues	107,005	97,700	90,621
Gross profit	114,124	89,667	75,822
Operating expenses:			
Research and development	31,443	32,701	33,776
Selling	30,181	28,055	27,033
General and administrative	23,381	22,444	23,980
Amortization of intangible assets	24	114	420
Restructuring charge	—	1,380	2,266
Total operating expenses	85,029	84,694	87,475
Income (loss) from operations	29,095	4,973	(11,653)
Other (income) expense:			
Interest income	35	71	47
Interest expense	(285)	(289)	(389)
Other income (expense), net	290	813	374
Total other income (expense), net	40	595	32
Income (loss) before income taxes	29,135	5,568	(11,621)
Provision for (benefit from) income taxes	(14,900)	2,663	19,497
Net income (loss)	$ 44,035	$ 2,905	$ (31,118)
Net income (loss) per share:			
Basic	$ 1.79	$ 0.12	$ (1.30)
Diluted	$ 1.75	$ 0.12	$ (1.30)
Weighted average shares used in per share calculation:			
Basic	24,655	24,059	23,958
Diluted	25,153	24,375	23,958

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF COMPREHENSIVE INCOME (LOSS)
(In thousands)

	Year Ended		
	December 31, 2016	**December 26, 2015**	**December 27, 2014**
Net income (loss)	$ 44,035	$ 2,905	$ (31,118)
Other comprehensive income (loss):			
Change in foreign currency translation adjustment	(869)	(2,344)	(3,239)
Employee benefit plan adjustment	(17)	(76)	(106)
Net change on unrealized gains (losses) on available-for-sale investments	42	(13)	(36)
Other comprehensive loss	(844)	(2,433)	(3,381)
Comprehensive income (loss)	$ 43,191	$ 472	$ (34,499)

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY
(In thousands, except share amounts)

	Common Stock Shares	Common Stock Amount	Additional Paid-In Capital	Accumulated Deficit	Accumulated Other Comprehensive Income	Total Stockholders' Equity
Balance as of December 28, 2013	23,537,275	$ 24	$ 244,733	$ (37,996)	$ 612	$ 207,373
Net loss				(31,118)	—	(31,118)
Employee benefit plan adjustment	—	—	—	—	(106)	(106)
Foreign currency translation adjustments	—	—	—	—	(3,239)	(3,239)
Unrealized gain on investments, net of tax	—	—	—	—	(36)	(36)
Issuance of common stock under stock-based compensation plans	639,087	—	5,255	—	—	5,255
Stock-based compensation expense	—	—	6,752	—	—	6,752
Repurchases and retirement of common stock under share repurchase plans	(362,633)	—	(5,344)	—	—	(5,344)
Balance as of December 27, 2014	23,813,729	24	251,396	(69,114)	(2,769)	179,537
Net income	—	—	—	2,905		2,905
Employee benefit plan adjustment	—	—	—	—	(76)	(76)
Foreign currency translation adjustments	—	—	—	—	(2,344)	(2,344)
Unrealized gain on investments, net of tax	—	—	—	—	(13)	(13)
Issuance of common stock under stock-based compensation plans	521,607	—	2,792	—	—	2,792
Stock-based compensation expense	—	—	6,248	—	—	6,248
Repurchases and retirement of common stock under share repurchase plans	(111,050)	—	(1,721)	—	—	(1,721)
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

See Notes to Consolidated Financial Statements

NANOMETRICS INCORPORATED

CONSOLIDATED STATEMENTS OF CASH FLOWS
(In thousands)

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Cash flows from operating activities:			
Net income (loss)	$ 44,035	$ 2,905	$ (31,118)
Reconciliation of net income (loss) to net cash provided by (used in) operating activities:			
Depreciation and amortization	8,295	9,075	9,767
Stock-based compensation	7,666	6,248	6,752
Excess tax benefit from equity awards	1,036	—	—
Disposal of fixed assets	478	1,121	249
Inventory write-down	2,110	2,645	2,897
Deferred income taxes	(16,783)	345	17,915
Changes in fair value of contingent payments to Zygo Corporation	(1,175)	(56)	201
Changes in assets and liabilities:			
Accounts receivable	(2,707)	(12,610)	3,861
Inventories	4,526	(16,431)	(7,173)
Inventories-delivered systems	399	(943)	4,988
Prepaid expenses and other	905	3,271	2,303
Accounts payable, accrued and other liabilities	2,462	4,167	1,790
Deferred revenue	(3,634)	1,006	(12,855)
Income taxes payable	(1,928)	828	(212)
Net cash provided by (used in) operating activities	45,685	1,571	(635)
Cash flows from investing activities:			
Sales of marketable securities	5,955	3,383	—
Maturities of marketable securities	38,775	41,863	38,839
Purchases of marketable securities	(82,864)	(41,449)	(41,100)
Purchases of property, plant and equipment	(3,999)	(1,846)	(5,792)
Net cash provided by (used in) investing activities	(42,133)	1,951	(8,053)
Cash flows from financing activities:			
Payments to Zygo Corporation related to acquisition	(315)	(851)	(587)
Proceeds from sale of shares under employee stock option plans and purchase plan	8,447	3,974	5,958
Excess tax benefit from equity awards	(1,036)	—	—
Taxes paid on net issuance of stock awards	(1,822)	(1,182)	(702)
Repurchases of common stock under share repurchase plans	—	(1,721)	(5,344)
Net cash provided by (used in) financing activities	5,274	220	(675)
Effect of exchange rate changes on cash and cash equivalents	82	(264)	(726)
Net increase (decrease) in cash and cash equivalents	8,908	3,478	(10,089)
Cash and cash equivalents, beginning of period	38,154	34,676	44,765
Cash and cash equivalents, end of period	$ 47,062	$ 38,154	$ 34,676
Supplemental disclosure of cash flow information:			
Cash paid (refund) for income taxes, net	$ 3,767	$ (826)	$ 861
Supplemental disclosure of non-cash investing activities:			
Transfer of inventory to property, plant and equipment, net	$ 2,345	$ 1,469	$ 3,275

See 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 design, manufacture, market, sell and support optical critical dimension ("OCD"), thin film and overlay dimension metrology and inspection systems used primarily in the manufacturing of semiconductors, solar photovoltaics (“solar PV”) and high-brightness LEDs (“HB-LED”), as well as by customers in the silicon wafer and data storage industries. 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 located 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 – On October 17, 2014, the Board of Directors of the Company approved a change in the Company's fiscal year from a fiscal year ending on the Saturday closest to December 31 to a 52/53 week fiscal year ending on the last Saturday of the calendar year. For fiscal year ended December 31, 2016, the period presented consisted of a 53-week year. For fiscal years ended December 26, 2015 and December 27, 2014 the periods presented consisted of a 52-week year.

Upgrade Revenue and Related Cost - Beginning the first quarter of 2016, revenues associated with upgrade sales are now included under Products Revenues, and the related costs in Cost of Products Revenue. This change was due to the types of upgrades currently being sold, which are primarily system software and hardware performance upgrades to extend the features and functionality of a product. Previously upgrades consisted of a group of parts and/or software that change the existing configuration of a product. For the twelve months ended December 31, 2016, $11.0 million related to upgrade sales and $2.4 million of costs, are included in Products Revenues and Cost of Products Revenues. For the year ended December 26, 2015, $7.9 million related to upgrade sales, and $3.0 million of costs, are included in Service Revenues and Costs of Service Revenues, respectively, in the accompanying Condensed Consolidated Statement of Operations.

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 consists of a $0.4 million loss, a $0.5 million gain and a $0.1 million gain for the years ended December 31, 2016, December 26, 2015, and December 27, 2014, 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. As discussed above, commencing in the first quarter of 2016, 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.

In summary, the Company recognizes revenue when persuasive evidence of an arrangement exists, delivery has occurred or services have been rendered, the seller's price is fixed or determinable, and co llectability is reasonably assured.

For repeat product sales to existing customers, revenue recognition occurs at the time title and risk of loss transfer to the customer, which usually occurs upon shipment from the Company's manufacturing location, if it can be reliably demonstrated that the product has successfully met the defined customer specified acceptance criteria and all other recognition criteria have been met. For initial sales where the product has not previously met the defined customer specified acceptance criteria, product revenues are recognized upon the earlier of receipt of written customer acceptance or expiration of the contractual acceptance period. In Japan, where contractual terms with the customer specify risk of loss and title transfers upon customer acceptance, revenue is recognized upon receipt of written customer acceptance, provided that all other recognition criteria have been met.

The Company warrants its products against defects in manufacturing. Upon recognition of product revenue, a liability is recorded for anticipated warranty costs. On occasion, customers request a warranty period longer than the Company's standard warranty. In those instances, where extended warranty services are separately quoted to the customer, 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.

As part of its customer services, the Company sells software that is considered to be an upgrade to a customer's existing systems. These standalone software sales are not essential to the tangible product's functionality and are accounted for under software revenue recognition rules which require vendor specific objective evidence (“VSOE”) of fair value to allocate revenue in a multiple element arrangement. Revenue from software sales is recognized when the software is delivered to the customer, provided that all other recognition criteria have been met.

The majority of other upgrades are sold based on published specifications. For simple upgrades that do not require major configuration, revenue is recognized at the time title and risk of loss transfer to the customer, which is usually upon shipment. For complex and extensive upgrades, specific acceptance or prior acceptance for a similar upgrade is required in order to recognize revenue.

Revenue related to spare parts is recognized upon shipment. Revenue related to billable services is recognized as the services are performed. Service contracts may be purchased by the customer during or after the warranty period and revenue is recognized ratably over the service contract period.

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, which terms can be up to twelve months. The Company does not grant its customers a general right of return or any refund terms and imposes a penalty on orders cancelled prior to the scheduled shipment date.

The Company regularly evaluates its revenue arrangements to identify deliverables and to determine whether these deliverables are separable into multiple units of accounting. The Company allocates the arrangement consideration among the deliverables based on relative selling prices. The Company has established VSOE for some of its products and services when a substantial majority of selling prices falls within a narrow range when sold separately. For deliverables with no established VSOE, the Company uses best estimate of selling price to determine standalone selling price for such deliverable. The Company does not use third party evidence to determine standalone selling price since this information is not widely available in the market as the Company's products contain a significant element of proprietary technology and the solutions offered differ substantially from competitors. The Company has established a process for developing estimated selling prices, which incorporates historical selling prices, the effect of market conditions, gross margin objectives, pricing practices, as well as entity-specific factors. The Company monitors and evaluates estimated selling price on a regular basis to ensure that changes in circumstances are accounted for in a timely manner.

When certain elements in multiple-element arrangements are not delivered or accepted at the end of a reporting period, the relative selling prices of undelivered elements are deferred until these elements are delivered and/or accepted. If deliverables 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.

Business Combinations - The Company allocates the purchase price of acquired companies to the tangible and intangible assets acquired and liabilities assumed based upon their estimated fair values at the acquisition date. The purchase price allocation process requires management to make significant estimates and assumptions, especially at the acquisition date with respect to intangible assets and inventory acquired. While best estimates and assumptions as a part of the purchase price allocation process are used to accurately value assets acquired and liabilities assumed at the acquisition date, 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, the Company may 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 recorded in the consolidated statements of operations.

The Company estimates the fair value of inventory acquired by utilizing the net realizable value method which is based on the estimated sales price of the product less appropriate costs to complete and selling costs. Examples of critical estimates in valuing certain intangible assets that were acquired or may be acquired in the future include but are not limited to:

- future expected cash flows from sales of products, services and acquired developed technologies and patents;
- expected costs to develop the in-process research and development into commercially viable products and estimated cash flows from the projects when completed;
- the acquired company's customer relationships, as well as assumptions about the estimated useful lives of the relationships; and
- discount rates.

Unanticipated events and circumstances may occur that may affect the accuracy or validity of assumptions, estimates or actual results associated with business combinations.

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 stated at the lower of cost, which approximates actual cost on a first-in, first-out basis, or market. 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."

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

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	5-10 years
Customer relationships	2-10 years
Brand name	5-10 years
Patented technology	7-10 years
Trademark	5 years

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 excee ds its fair value, an impairment loss equal to the difference is recognized. See Note 7, "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 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 the majority 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.

Shipping and Handling Costs – Shipping and handling costs are included as a component of cost of net revenues.

Advertising Costs – The Company expenses advertising costs as incurred. Advertising costs were $0.2 million in 2016, $0.3 million in 2015, and $0.2 million in 2014.

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 (Loss) Per Share - Basic net income (loss) per share excludes dilution and is computed by dividing net income (loss) 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 and 0.3 million stock option shares for fiscal year 2016 and 2015, respectively, were included in the calculation of diluted shares. During fiscal 2014, the Company incurred a net loss, therefore, diluted net loss per share excludes 0.4 million shares that were anti-dilutive.

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, 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 2016, 2015 and 2014 consisted of 73%, 69% and 72%, 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 ca sh 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 thir d-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 fo reign 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.

Certain components and sub-assemblies used in the Company's products are purchased from a sole supplier or a limited group of suppliers. In particular, 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 Issued Accounting Pronouncements

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 Company is currently evaluating the effect of this update on its consolidated financial condition and results of operations.

In October 2016, the 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. This standard will be effective for annual reporting periods beginning after December 15, 2017, including interim reporting period within those annual periods. Early adoption is permitted. This standard update is required to be adopted using the modified retrospective approach, with a cumulative catch-up adjustment to retained earnings in the period of adoption. The Company is currently evaluating the impact of adopting this standard on its consolidated financial condition and results of operations.

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. If early adopted in an interim period, any adjustments should be reflected as of the beginning of the fiscal year that includes that interim period, and all the amendments must be adopted in the same 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 Company is currently evaluating the impact of adopting this update on its consolidated statements of cash flows.

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 March 2016, the FASB issued an accounting standards update that simplifies several aspects of the accounting for share-based payment award transactions, including income tax consequences, classification of awards as equity or liability, and classification on the statement of cash flows. The standard is effective for public companies for annual reporting periods beginning after December 16, 2016, and interim periods within those annual periods. Early adoption is permitted. Upon adoption, the Company will continue to estimate forfeitures expected to occur to determine the amount of compensation cost to be recognized in each period. The standard requires excess tax benefits and tax deficiencies to be recorded in the income statement when the awards vest or are settled rather than paid-in capital increasing volatility in results of operations. The Company will apply the presentation requirements for the cash flows related to excess tax benefits. The cash flows related to employee taxe s paid for withheld shares will be presented as a financing activity as required under the new guidance. Finally, the standard eliminates the requirement to delay the recognition of excess tax benefits until it reduces current taxes payable. The Company is unable to estimate the impact of adoption as it is dependent upon future stock option exercises which cannot be predicted. However, the Company is expecting the adoption of the standard to have an impact on net income, basic and diluted earnings per share , deferred tax assets, net cash from operations, and the effective tax rate.

In February 2016, the FASB issued an accounting standards 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. This standard is required to be applied with a modified retrospective transition approach. The Company generally does not finance purchases of equipment or other capital, but does lease some equipment and facilities. The Company is currently evaluating the impact of this standard on its consolidated financial statements and related disclosures but anticipates the majority of its existing operating lease commitments will be recognized as operating lease liabilities and right-of-use assets.

In November 2015, the Financial Accounting Standards Board (“FASB”) issued an accounting standards update that amends existing guidance to require that deferred income tax liabilities and assets be classified as noncurrent in a classified balance sheet, and eliminates the prior guidance which required an entity to separate deferred tax liabilities and assets into a current amount and a noncurrent amount in a classified balance sheet. As permitted, the Company early-adopted this standard in fiscal year 2015 on a prospective basis. No prior periods were retrospectively adjusted.

In July 2015, the FASB issued an accounting standards update which simplifies the measurement of inventory by requiring inventory to be measured at the lower of cost and net realizable value. The new standard applies only to inventories for which cost is determined by methods other than last-in-first-out and the retail inventory method. It is effective for public companies for annual reporting periods beginning after December 15, 2016, and interim periods within those fiscal years. The Company does not expect the application of this standard to have a material impact on our consolidated financial statements.

In May 2014, the FASB issued an accounting standards update which requires an entity to recognize the amount of revenue to which it expects to be entitled for the transfer of promised goods or services to customers. The updated standard will replace most existing revenue recognition guidance in U.S. GAAP when it becomes effective and permits the use of either the retrospective or cumulative effect transition method. In August 2015, the FASB deferred for one year the effective date of the new revenue standard, with early adoption permitted but not earlier than the original effective date. Consequently, the new standard will be effective for the Company on December 31, 2017 and the Company does not plan to adopt early. The Company has not yet selected a transition method and is currently evaluating the effect that the updated standard will have on its consolidated financial statements and related disclosures.

While the Company continues to assess the impact of the new standard, the Company believes the most likely impact will be to the accounting for arrangements that include incentives or services bundled with volume purchases. Under current U.S. GAAP, the revenue attributable to these incentives is recognized when the incentives performance conditions are met. While the Company currently expects revenue related to these arrangements to remain unchanged, the nature of the performance obligations may change the timing of the revenue recognition. The Company is currently evaluating the impact of the new standard on these arrangements and will continue to monitor industry activities and other guidance provided by the accounting profession and regulators and adjust our approach and implementation plans as required.

Note 3. 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.

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 fol lowing 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 31, 2016				December 26, 2015			
	Fair Value Measurements Using Input Types				Fair Value Measurements Using Input Types			
	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Assets:								
Cash equivalents:								
Money market funds	$ 959	$ —	$ —	$ 959	$ 590	$ —	$ —	$ 590
Commercial paper and corporate debt securities	—	2,499	—	2,499	—	4,568	—	4,568
Total cash equivalents	$ 959	$ 2,499	$ —	$ 3,458	$ 590	$ 4,568	$ —	$ 5,158
Marketable securities:								
U.S. Treasury, U.S. Government and U.S. Government agency debt securities	—	17,072	—	17,072	4,401	20,164	—	24,565
Certificate of deposits	—	23,019	—	23,019	—	—	—	—
Commercial paper	—	22,402	—	22,402	—	1,884	—	1,884
Municipal securities and corporate debt securities	—	14,943	—	14,943	—	18,482	—	18,482
Asset backed securities	—	5,463	—	5,463	—	—	—	—
Total marketable securities	$ —	$ 82,899	$ —	$ 82,899	$ 4,401	$ 40,530	$ —	$ 44,931
Total (1)	$ 959	$ 85,398	$ —	$ 86,357	$ 4,991	$ 45,098	$ —	$ 50,089
Liabilities:								
Contingent consideration payable	$ —	$ —	$ —	$ —	$ —	$ —	$ 1,490	$ 1,490

(1) Excludes $43.6 million and $33.0 million held in operating accounts as of December 31, 2016 and December 26, 2015, 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 has the ability to 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.

Changes in Level 3 liabilities	(in thousands)
Fair value at December 27, 2014	$ 2,397
Payments made to Zygo Corporation	(851)
Change in fair value included in earnings	(56)
Fair value at December 26, 2015	1,490
Payments made to Zygo Corporation	(315)
Change in fair value included in earnings	(1,175)
Fair value at December 31, 2016	$ —

As of December 31, 2016, the Company settled its liabilities of $1.2 million from Zygo Corporation, a wholly-owned subsidiary of AMETEK, Inc. ("Zygo"). Under the settlement agreement with Zygo, the company is released from any existing and future contingent liability related to the supply agreement.

As of December 26, 2015, the Company had liabilities of $1.5 million resulting from the acquisition of certain assets from Zygo which are measured at fair value on a recurring basis. Of the $1.5 million of Zygo liability at December 26, 2015, $0.9 million was a current liability and $0.6 million was a long-term liability. The fair values of these liabilities were determined using Level 3 inputs using a discounted cash flow model incorporating assumptions that market participants would use in their estimates of fair value. Some of these assumptions included estimates for discount rate, and timing and the amount of cash flows.

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 (expense), 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 loss on settlement of forward foreign currency contracts included in the fiscal year ended December 31, 2016 and December 26, 2015, were $1.7 million and $0.3 million, respectively, and these balances are included in other income (expense), net, in the consolidated statements of operations.

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

	As of December 31, 2016 Notional Principal (in millions)	As of December 26, 2015 Notional Principal (in millions)
Undesignated Hedges:		
Forward Foreign Currency Contracts	$ 13.9	$ 30.5

Note 4. Cash and Investments

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

	December 31, 2016			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Market Value
Cash	$ 43,604	$ —	$ —	$ 43,604
Cash equivalents:				
Money market funds	959	—	—	959
Commercial paper and corporate debt securities	2,499	—	—	2,499
Marketable securities:				
U.S. Treasury securities	5,667	—	—	5,667
U.S. Government agency securities	11,412	—	(7)	11,405
Certificates of deposits	23,000	19	—	23,019
Commercial paper	22,402	—	—	22,402
Corporate debt securities	14,194	—	(6)	14,188
Municipal securities	756	—	(1)	755
Asset-backed securities	5,466	—	(3)	5,463
Total cash, cash equivalents, and marketable securities	$ 129,959	$ 19	$ (17)	$ 129,961

	December 26, 2015			
	Amortized Cost	Gross Unrealized Gains	Gross Unrealized Losses	Estimated Fair Market Value
Cash	$ 32,996	$ —	$ —	$ 32,996
Cash equivalents:				
Money market funds	590	—	—	590
Commercial paper and corporate debt securities	4,568	—	—	4,568
Marketable securities:				
U.S. Treasury securities	4,411	—	(10)	4,401
U.S. Government agency securities	20,193	1	(29)	20,165
Commercial paper	1,884	—	—	1,884
Corporate debt securities	14,759	—	(23)	14,736
Municipal securities	3,747	1	(3)	3,745
Total cash, cash equivalents, and marketable securities	$ 83,148	$ 2	$ (65)	$ 83,085

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 31, 2016 and December 26, 2015, 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 gain and losses on sale of securities are recorded in other income, net, in our statement of operations. Net realized gains and losses for fiscal 2016, 2015, and 2014 was $0.5 million, $0.2 million and $0.2 million, respectively.

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 31, 2016, and December 26, 2015 were insignificant and no marketable securities had other than temporary impairment. All marketable securities as of December 31, 2016 and December 26, 2015, had maturity dates of less than two years.

Note 5. 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 0.77% to 1.68% based on the anticipated length of time between the date the sale is consummated and t he expected collection date of the receivables sold. The Company sold $31.5 million and $15.7 million of receivables during fiscal years ended December 31, 2016 and December 26, 2015, 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 31, 2016 and December 26, 2015.

Note 6. Financial Statement Components

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

	At	
	December 31, 2016	December 26, 2015
Inventories:		
Raw materials and sub-assemblies	$ 23,506	$ 26,784
Work in process	10,347	12,862
Finished goods	4,984	8,103
Inventories	38,837	47,749
Inventories-delivered systems	2,457	2,856
Total inventories	$ 41,294	$ 50,605
Property, plant and equipment, net: (1)		
Land	$ 15,568	$ 15,569
Building and improvements	20,532	20,158
Machinery and equipment	35,659	32,995
Furniture and fixtures	2,282	2,266
Software	9,756	8,245
Capital in progress	2,748	1,328
Total property, plant and equipment, gross	86,545	80,561
Accumulated depreciation and amortization	(42,319)	(36,068)
Total property, plant and equipment, net	$ 44,226	$ 44,493
(1) Total depreciation and amortization expense for the years ended December 31, 2016, December 26, 2015 and December 27, 2014 was $6.8 million, $6.9 million, and $6.6 million, respectively.		
Other Current Liabilities:		
Accrued warranty	$ 3,838	$ 4,504
Accrued taxes	290	646
Customer deposits	581	290
Retrofit liability	432	—
Fair value of current portion of contingent payments to Zygo Corporation related to acquisition	—	945
Accrued professional services	424	481
Accrued royalties	1,233	437
Other	1,249	1,575
Total other current liabilities	$ 8,047	$ 8,878

Components of Accumulated Other Comprehensive Income (Loss)

	Years Ended			
	Foreign Currency Translations	Defined Benefit Pension Plans	Unrealized Income (Loss) on Investment	Accumulated Other Comprehensive Income
Balance as of December 27, 2014	$ (2,604)	$ (134)	$ (31)	$ (2,769)
Current period change	(2,344)	(76)	(13)	(2,433)
Balance as of December 26, 2015	(4,948)	(210)	(44)	(5,202)
Current period change	(869)	(17)	42	(844)
Balance as of December 31, 2016	$ (5,817)	$ (227)	$ (2)	$ (6,046)

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 7. Goodwill and Intangible Assets

The following table summarizes the activity in the Company's goodwill during the years ended December 31, 2016 and December 26, 2015, respectively (in thousands):

	Amounts
Balance as of December 28, 2014	$ 10,494
Foreign currency movements	(1,079)
Balance as of December 26, 2015	9,415
Foreign currency movements	(475)
Balance as of December 31, 2016	$ 8,940

There were no business acquisitions made by the Company during fiscal years 2016, 2015 and 2014.

Goodwill Impairment and Long-lived Asset Impairment

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 2016 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 31, 2016. The Company did not record any impairment charges related to goodwill in fiscal year 2016.

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 2016.

Finite-lived intangible assets a re recorded at cost, less accumulated amortization. Finite-lived intangible assets as of December 31, 2016 and December 26, 2015 consisted of the following (in thousands):

	December 31, 2016		
	Adjusted cost	Accumulated amortization	Net carrying amount
Developed technology	$ 15,726	$ (15,380)	$ 346
Customer relationships	9,322	(9,322)	—
Brand names	1,927	(1,927)	—
Patented technology	2,252	(2,186)	66
Trademark	80	(80)	—
Total	$ 29,307	$ (28,895)	$ 412

	December 26, 2015		
	Adjusted cost	Accumulated amortization	Net carrying amount
Developed technology	$ 16,098	$ (14,387)	$ 1,711
Customer relationships	9,364	(9,364)	—
Brand names	1,927	(1,903)	24
Patented technology	2,252	(2,120)	132
Trademark	80	(80)	—
Total	$ 29,721	$ (27,854)	$ 1,867

The amortization of finite-lived intangibles is computed using the straight-line method. Estimated lives of finite-lived intangibles range from two to ten years. Total amortization expense for the fiscal years ended December 31, 2016, December 26, 2015 and December 27, 2014, was $1.5 million, $2.1 million and $3.1 million, respectively.

There were no impairment charges related to intangible assets recorded during the year ended December 31, 2016.

The estimated future amortization expense of finite intangible assets as of December 31, 2016, is as follows (in thousands):

Fiscal Years	Amounts
2017	206
2018	140
2019	66
Thereafter	—
Total future amortization expense	$ 412

Note 8. 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 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 31, 2016	December 26, 2015
Balance as of beginning of period	$ 4,504	$ 2,953
Accruals for warranties issued during period	4,509	8,332
Settlements during the period	(5,175)	(6,781)
Balance as of end of period	$ 3,838	$ 4,504

Note. 9. Restructuring

The Company recorded a restructuring charge of approximately $2.3 million in 2014 as a result of its decision to consolidate and reorganize certain aspects of its operations, primarily in the U.K. This amount included charges primarily related to employee severance, other expenses (primarily vendor contract termination costs) and early termination costs of a facility lease.

The Company recorded a restructuring charge of approximately $1.4 million in 2015 as a result of its decision to maximize operating effectiveness. This amount includes charges primarily related to employee severance and related costs.

As of December 31, 2016, the Company had completed and settled in full all cash payments related to these charges.

The table below summarizes the components of the Company's restructuring reserves for the years ended December 31, 2016 and December 26, 2015, and December 27, 2014 (in thousands):

	Employee severance and benefits	Facility termination costs	Other	Total
Balance as of December 28, 2013	$ —	$ —	$ —	$ —
Charges	1,163	784	319	2,266
Cash Payments	(780)	(201)	(288)	(1,269)
Balance as of December 27, 2014	$ 383	$ 583	$ 31	$ 997
Charges	1,369	—	11	1,380
Cash Payments	(1,752)	(334)	(35)	(2,121)
Balance as of December 26, 2015	$ —	$ 249	$ 7	$ 256
Charges	—	—	—	—
Cash Payments	—	(249)	(7)	(256)
Balance as of December 31, 2016	$ —	$ —	$ —	$ —

Note 10. Line of Credit and Debt Obligations

Line of Credit – The Company's revolving line of credit facility of up to $12.0 million expired on May 30, 2016 and was not renewed.

Note 11. 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 31, 2016 and December 26, 2015.

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 31, 2016 was approximately $30.6 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 2016, 2015 and 2014 was approximately $1.8 million, $1.7 million and $2.0 million, respectively. Future minimum lease payments under its operating leases are as follows (in thousands):

	Operating Leases
2017	$ 1,562
2018	1,189
2019	755
2020	301
2021	79
Thereafter	—
Total	$ 3,886

On June 17, 2009, the Company announced a strategic business partnership with Zygo Corporation ("Zygo") whereby it has purchased inventory and certain other assets from Zygo, and the two companies entered into a supply agreement. The Company made payments to Zygo over a period of time as acquired inventory was sold and other aspects of the supply agreement were executed. The Company made royalty and sustaining engineering payments of $0.3 million and $0.9 million to Zygo in fiscal years 2016 and 2015, respectively.

On December 8, 2016, the Company amended its agreement with Zygo, of which, the Company is released from any existing and future contingent liabilities to Zygo.

Note 12. Net Income (Loss) Per Share

The Company presents both basic and diluted net income (loss) per share on the face of its consolidated statements of operations. Basic net income (loss) per share excludes the effect of potentially dilutive shares and is computed by dividing net income (loss) 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 (loss) per share computations is as follows (in thousands):

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Weighted average common shares outstanding used in basic net income (loss) per share calculation	24,655	24,059	23,958
Potential dilutive common stock equivalents, using treasury stock method	498	316	—
Weighted average shares used in diluted net income (loss) per share calculation	25,153	24,375	23,958

For the year ended December 31, 2016, December 26, 2015, and December 27, 2014, the Company had securities outstanding which could potentially dilute basic earnings per share in the future. For the years ended December 31, 2016 and December 26, 2015, 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 and 0.3 million shares, respectively. For the year ended December 27, 2014 potential dilutive common stock equivalents of 0.4 million shares were anti-dilutive and therefore were excluded from the calculation due to the net loss position.

Note 13. 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.

Stock Repurchase

On May 29, 2012, the Company's Board of Directors approved a program to repurchase up to $20.0 million of its common stock, referred to as the 2012 program. Stock repurchases under this program may be made through open market and privately negotiated transactions, at times and in such amounts as management deems appropriate. The timing and actual number of shares repurchased is dependent on a variety of factors including price, corporate and regulatory requirements and other market conditions.

There were no shares repurchased and retired during fiscal year 2016.

Shares repurchased and retired for fiscal year 2015 and 2014 of the applicable repurchase programs, with the associated cost of repurchase and amount available for repurchase at the end of the respective periods are as follows (in thousands, except number of shares and weighted average price per share):

	Fiscal Year 2015	Fiscal Year 2014
Number of shares of common stock repurchased	111,050	362,633
Weighted average price per share	$ 15.49	$ 14.74
Total cost of repurchase	$ 1,721	$ 5,344
Amount available for repurchase at end of period	$ 4,397	$ 6,118

$4.4 million remained available for the future repurchase of our common stock under the 2012 program.

Stock Option Plans

The Nanometrics option plans are as follows:

Plan Name	Participants	Shares Authorized
2005 Equity Incentive Plan	Employees, consultants and directors	7,292,594
2002 Non-statutory Stock Option Plan	Employees and consultants	1,200,000
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 are allowed 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. At the end of the fiscal year ended December 31, 2016, the Company had 0.1 million shares remaining for issuance under the ESPP. Shares purchased under the ESPP were 212,619 shares, 125,504 shares and 122,112 shares in 2016, 2015 and 2014 at a weighted average price of $14.29, $13.98 and $13.76, 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 of options granted were 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 of grant. The expected volatility was based on the historical volatility of the Company's stock price. These factors could change in the future, which would affect the stock-based compensation expense in future periods.

The weighted-average fair value of stock-based compensation to employees is based on the single option valuation approach. Forfeitures are estimated and it is assumed no dividends will be declared. The estimated fair value of stock-based compensation awards to employees is amortized over the vesting period of the options. The weighted-average fair value calculations are based on the following average assumptions:

	Fiscal Year 2016	Fiscal Year 2015	Fiscal Year 2014
Stock Options:			
Expected life	—	—	4.6 years
Volatility	—	—	54.9%
Risk free interest rate	—	—	1.54%
Dividends	—	—	—
Employee Stock Purchase Plan:			
Expected life	0.5 years	0.5 years	0.5 years
Volatility	38.7%	36.9%	31.2%
Risk free interest rate	0.44%	0.12%	0.54%
Dividends	—	—	—

Stock Options and Restricted Stock Units ("RSUs")

On May 24, 2013, the Company approved further amendments to the 2005 Equity Incentive Plan including: increasing the number of shares of common stock authorized by 2.6 million shares, changing the multiplier ratio from 2:1 to 1.7:1 against the plan for each award, other than a stock option or stock appreciation right, and providing the maximum term of stock options to be seven years. All other terms remained the same.

Stock Options

The weighted average fair value per share of the stock options awarded in fiscal year 2014 was $8.13. No stock options were granted in fiscal years 2015 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 27, 2014	1,382,993	$ 13.92	3.41	$ 4,108
Exercised	(229,510)	9.65		
Cancelled/Forfeited	(94,012)	16.67		
Outstanding at December 26, 2015	1,059,471	14.61	2.47	$ 1,920
Exercised	(442,339)	13.66		
Cancelled/Forfeited	(176,587)	15.83		
Outstanding at December 31, 2016	440,545	15.06	2.12	$ 4,405
Exercisable at December 31, 2016	407,920	$ 14.94	2.00	$ 4,129

The aggregate intrinsic value in the above table represents the total pretax intrinsic value, based on the Company's closing stock price of $25.06 as of December 31, 2016, 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 2016, 2015 and 2014 was $2.7 million, $1.6 million and $3.0 million, respectively. The fair value of options vested during 2016, 2015 and 2014 was $0.7 million, $1.5 million and $3.2 million, respectively.

The following table summarizes ranges of outstanding and exercisable options as of December 31, 2016.

	Options Outstanding			Options Exercisable	
Exercise Prices	Number Outstanding	Weighted Average Remaining Contractual Life (Years)	Weighted Average Exercise Price	Number Exercisable	Weighted Average Exercise Price
$9.5-$10.46	17,400	0.32	$ 10.05	17,400	$ 10.05
$11.37-$11.37	114,166	0.88	11.37	114,166	11.37
$12.98-$15.33	45,691	3.01	14.36	38,954	14.34
$15.35-$15.74	44,437	2.58	15.65	40,586	15.65
$15.85-$15.85	60,000	3.19	15.85	56,250	15.85
$15.97-$17.33	57,166	2.30	16.89	48,527	16.85
$17.7-$18.27	36,935	2.34	18.12	33,267	18.15
$18.51-$18.51	13,750	4.13	18.51	8,333	18.51
$18.79-$18.79	1,000	4.23	18.79	437	18.79
$19.03-$19.03	50,000	2.13	$ 19.03	50,000	$ 19.03
$9.5-$19.03	440,545			407,920	

As of December 31, 2016, the total unrecognized compensation costs related to unvested stock options was $0.2 million and is expected to be recognized as an expense over a weighted average remaining amortization period of 0.65 years.

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 476,667 and 506,459 RSUs during the years ended December 31, 2016 and December 26, 2015, 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 Value
Outstanding RSUs as of December 27, 2014	563,337	$ 17.90
Granted	506,459	15.62
Released	(237,520)	16.59
Cancelled	(119,033)	16.59
Outstanding RSUs as of December 26, 2015	713,243	15.99
Granted	476,667	17.45
Released	(315,872)	16.05
Cancelled	(54,253)	16.29
Outstanding RSUs as of December 31, 2016	819,785	$ 16.79

As of December 31, 2016, the total unrecognized compensation costs related to RSU's was $8.0 million and is expected to be recognized as an expense over a weighted average remaining amortization period of 1.77 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 an executive. The PSUs will vest in three equal tranches over one, two, three years based on the relative performance of the Company’s stock during those periods, compared to 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.

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 27, 2014	—	—
Granted	60,000	$ 12.23
Outstanding PSUs as of December 26, 2015	60,000	12.23
Granted	67,500	8.52
Released	(13,333)	12.03
Cancelled	(6,667)	12.03
Outstanding PSUs as of December 31, 2016	107,500	$ 9.94

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:

	2016 Award	2015 Award
Grant Date Fair Value Per Share	$ 8.52	$ 12.23
Weighted-average assumptions/inputs:		
Expected Dividend	—	—
Range of risk-free interest rates	0.92%	0.25%-1.1%
Range of expected volatilities for peer group	22%-93%	23%-65%

The number of RSUs granted during fiscal year 2016 was 476,667, which counted as 810,334 shares, and PSUs granted during fiscal year 2016 was 67,500, which counted as 114,750 against the 2005 Equity Incentive Plan. The number of RSUs cancelled during fiscal year 2016 was 54,253, which counted as 92,230 shares and PSUs cancelled during fiscal year 2016 was 6,667, which counted as

11,334, 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 2016, 2015 and 2014 and shares available for grant as of the respective period end dates, is as follows:

	Fiscal Year 2016	Fiscal Year 2015	Fiscal Year 2014
Shares available for grant at beginning of fiscal year	1,916,589	2,464,082	2,937,001
Options - granted	—	—	(74,300)
Options - cancelled	176,587	94,012	191,061
Options - expired plan shares	(116,192)	(1,800)	(17,491)
RSUs - granted	(810,334)	(860,980)	(805,120)
RSUs - cancelled	92,230	202,356	167,404
RSUs - shares issued to satisfy tax withholding obligations	179,117	120,919	65,527
PSUs - granted	(114,750)	(102,000)	
PSUs - cancelled	11,334	—	—
Shares available for grant at end of fiscal year	1,334,581	1,916,589	2,464,082

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. As stock-based compensation expense recognized in the consolidated statement of operations for the years ended December 31, 2016, December 26, 2015 and December 27, 2014 is based on awards expected to vest, it has been reduced for estimated forfeitures. ASC 740 requires forfeitures to be estimated at the time of grant and revised, if necessary, in subsequent periods if actual forfeitures differ from those estimates. The Company's estimated forfeiture rates are based on historical forfeiture experience, which the Company believes is the best available information to estimate the future forfeiture rate. 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 benefit in fiscal year 2016, and none in both fiscal years 2015 and 2014, 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 2016	Fiscal Year 2015	Fiscal Year 2014
Cost of products	$ 403	$ 274	$ 268
Cost of service	509	309	287
Research and development	1,408	1,036	1,245
Selling	2,046	1,881	1,642
General and administrative	3,300	2,748	3,243
Restructuring	—	—	67
Total stock-based compensation expense related to employee stock options and employee stock purchases	$ 7,666	$ 6,248	$ 6,752

Note 14. 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 $0.2 million for each of the fiscal years ended 2016, 2015 and 2014, respectively; and the net funding deficiency of the Benefit Plan was $0.4 million, $0.3 million, and $0.3 million for the fiscal years ended December 31, 2016, December 26, 2015, and December 27, 2014, respectively. Based on the nature and limited extent of the pension plan, we determined this pension plan was not material for separate disclosure.

Note 15. 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 31, 2016	December 26, 2015	December 27, 2014
Domestic	$ 25,372	$ 178	$ (15,691)
Foreign	3,763	5,390	4,070
Income (loss) before income taxes	$ 29,135	$ 5,568	$ (11,621)

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

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Current:			
Federal	$ 697	$ 148	$ 358
State	85	3	(151)
Foreign	2,111	2,266	1,327
	2,893	2,417	1,534
Deferred:			
Federal	(16,641)	190	17,368
State	(320)	3	550
Foreign	(832)	53	45
	(17,793)	246	17,963
Provision (benefit) for income taxes	$ (14,900)	$ 2,663	$ 19,497

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

	At	
	December 31, 2016	December 26, 2015
Deferred tax assets:		
Reserves and accruals	$ 11,043	$ 13,712
Deferred revenue	349	1,154
Shared based compensation	2,590	3,856
Tax credit carry-forwards	10,112	8,658
Net operating losses	8,434	13,218
Depreciation & amortization	(2,898)	366
Other	(1,252)	94
Total deferred tax assets	28,378	41,058
Less: Valuation allowance	(10,980)	(36,786)
Total deferred tax assets net of valuation allowance	17,398	4,272
Deferred tax liabilities:		
Depreciation & amortization	(6)	(2,537)
Other	(14)	(1,137)
Total deferred tax liabilities	(20)	(3,674)
Net deferred tax assets	$ 17,378	$ 598

As of December 31, 2016, the Company had net operating loss carryforwards of $26.7 million in California and $31.8 million in foreign countries, which begin to expire in 2018. A total of $3.1 million of the California net operating loss carryforward and $1.3 million of the foreign net operating loss carryforward are related to excess tax benefits as a result of stock option exercises, and therefore will be recorded in additional paid-in capital in the period that they become realized. During the year ended December 31, 2016, the Company realized $0.2 million of excess tax benefits as a result of stock option exercises, therefore, $0.1 million was recorded to additional paid-in capital.

As of December 31, 2016, the Company had available carryforward Federal and California R&D tax credits of $8.6 million and $7.8 million, respectively. Federal R&D tax credit carryforwards begin to expire in 2026. State R&D tax credits carryforward indefinitely. A total of $0.2 million of the state R&D tax credits are related to excess tax benefits as a result of stock option exercises, and therefore will be recorded to additional paid-in-capital in the period that they become realized.

During the years ended December 31, 2016 and December 26, 2015, the change in valuation allowances was $(25.8) million and $1.6 million, respectively. The valuation allowance decrease in 2016 was primarily related to the release of a valuation allowance against a significant portion of the Company’s U.S. deferred tax assets, as well as valuation allowance release against a portion of our foreign deferred tax assets. 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 of the deferred tax assets will not be realized. For the year ended December 31, 2016, the Company possessed enough positive evidence to determine that is was more-likely-than-not that the Company would utilize a significant portion of its deferred tax assets. Therefore, the Company released $27.4 million of valuation allowance. The Company continues to maintain valuation allowances against its California and certain foreign deferred tax assets as a result of uncertainties regarding the realization of the asset 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.

Changes in tax laws and tax rates could affect the Company's recorded deferred tax assets and liabilities in the future. The Company's tax liabilities involve dealing with uncertainties in the application of complex tax laws and regulations in a multitude of jurisdictions across its global operations. Management will account for any such changes or factors in the period in which such law changes are enacted.

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 31, 2016	December 26, 2015	December 27, 2014
Income taxes computed at U.S. statutory rate	$ 10,197	$ 1,949	$ (4,067)
State income taxes	223	28	(109)
Foreign tax rate differential	3,502	342	777
Change in valuation allowance	(25,738)	1,648	23,894
Non-deductible Equity Compensation	380	311	242
Tax credits	(3,191)	(1,834)	(2,187)
Domestic production activities deduction	(354)	—	—
Liabilities for uncertain tax positions	67	74	118
Other, net	14	145	829
Provision (benefit) for income taxes	$ (14,900)	$ 2,663	$ 19,497

Certain amounts of the income tax rate reconciliation for the years ended December 27, 2014, were reclassified to other components within the reconciliation to be consistent with classification used for the year ended December 26, 2015 and the year ended December 31, 2016. There was no impact to the total provision (benefit) for income taxes based on these reclassifications.

As of December 31, 2016, approximately $3.7 million of undistributed earnings from non-U.S. operations held by the Company's foreign subsidiaries are designated as indefinitely reinvested outside the U.S. Accordingly, no additional U.S. income taxes or additional foreign withholding taxes have been provided thereon. The amount of unrecognized deferred tax liability related to these earnings would be immaterial.

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.

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

	Rollforward Table (at Gross): As of		
	December 31, 2016	December 26, 2015	December 27, 2014
Unrecognized tax benefits - beginning of the period	$ 6,961	$ 6,442	$ 4,436
Gross increases-tax positions in prior period	23	127	655
Gross decreases-tax positions in prior period	(1,193)	(306)	(123)
Gross increases-current-period tax positions	686	698	1,541
Lapse of statute of limitations	—	—	(67)
Unrecognized tax benefits - end of the period	$ 6,477	$ 6,961	$ 6,442

The unrecognized tax benefit at December 31, 2016 was $6.5 million, of which $3.7 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 31, 2016, December 26, 2015 and December 27, 2014. 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 foreign jurisdictions including Korea, Japan, Taiwan, and China. 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 2007 forward for various foreign jurisdictions.

Note 16. Segment, Geographic, Product 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 31, 2016, December 26, 2015, and December 27, 2014, 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):

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Total net revenues (1)**:**			
South Korea	$ 44,735	$ 30,572	$ 41,381
China	43,460	17,373	28,702
Singapore	37,096	17,395	7,905
United States	29,887	36,720	36,123
Taiwan	27,189	46,715	19,790
Japan	26,604	31,140	15,185
Other	12,158	7,452	17,357
Total net revenues	$ 221,129	$ 187,367	$ 166,443

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

	December 31, 2016	December 26, 2015
Long-lived tangible assets:		
United States	$ 42,688	$ 42,581
Taiwan	818	1,056
South Korea	554	697
Japan	57	59
All Other	109	100
Total long-lived tangible assets	$ 44,226	$ 44,493

The Company's product lines differ primarily based on the environment in which the systems will be used. Automated systems are used primarily in high-volume production environments. Materials characterization products are primarily used to measure the composition, band gap, structure, and other physical and electrical properties of semiconducting materials for discrete electronic industry, high brightness LED and solar/photovoltaic structures in both development and high volume environments. Integrated systems are installed inside wafer processing equipment to provide near real-time measurements for improving process control and increasing throughput. Revenues by product type were as follows (in thousands):

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Automated Systems	$ 127,378	$ 102,386	$ 108,768
Integrated Systems	43,846	31,579	15,334
Materials Characterization Systems	13,842	12,980	9,487
Total product revenues	$ 185,066	$ 146,945	$ 133,589

The following customers accounted for 10% or more of total accounts receivable, net:

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Taiwan Semiconductor Manufacturing Company Limited	20.1%	25.6%	20.2%
Samsung Electronics Co. Ltd.	14.3%	***	10.0%
Micron Technology, Inc.	11.8%	***	23.7%
Intel Corporation	11.1%	***	***
Toshiba Corporation	10.2%	27.1%	***
GLOBALFOUNDRIES	***	***	10.2%

*** The customer accounted for less than 10% of total accounts receivable, net, as of that period end.

The following customers accounted for 10% or more of total net revenue:

	Years Ended		
	December 31, 2016	December 26, 2015	December 27, 2014
Micron Technology, Inc.	20.3%	15.8%	10.4%
Intel Corporation	18.0%	***	12.6%
SK Hynix	15.3%	10.7%	12.2%
Taiwan Semiconductor Manufacturing Company Limited	10.0%	19.4%	***
Samsung Electronics Co. Ltd.	***	13.2%	26.9%
Toshiba Corporation	***	10.2%	***

*** The customer accounted for less than 10% of total net revenue during the period.

SUPPLEMENTAL FINANCIAL INFORMATION

Selected Quarterly Financial Results (Unaudited)

The following table sets forth selected consolidated quarterly results of operations for the years ended December 31, 2016 and December 26, 2015 (in thousands, except per share amounts):

	Quarters Ended			
	December 31, 2016	**September 24, 2016**	**June 25, 2016**	**March 26, 2016**
Total net revenues	$ 59,159	$ 58,714	$ 55,767	$ 47,489
Gross profit	$ 30,804	$ 30,404	$ 28,425	$ 24,491
Income from operations	$ 8,963	$ 9,066	$ 7,336	$ 3,730
Net income (1)	$ 26,654	$ 7,883	$ 6,031	$ 3,467
Net income per share:				
Basic	$ 1.07	$ 0.32	$ 0.25	$ 0.14
Diluted	$ 1.04	$ 0.31	$ 0.24	$ 0.14
Shares used in per share computations:				
Basic	24,949	24,826	24,524	24,308
Diluted	25,514	25,282	24,927	24,597

	Quarters Ended			
	December 26, 2015	**September 26, 2015**	**June 27, 2015**	**March 28, 2015**
Total net revenues	$ 42,684	$ 45,678	$ 48,629	$ 50,376
Gross profit	$ 20,805	$ 22,219	$ 23,264	$ 23,379
Income (loss) from operations	$ (1,041)	$ 1,264	$ 2,509	$ 2,241
Net income (loss)	$ (1,813)	$ 818	$ 1,344	$ 2,556
Net income (loss) per share:				
Basic	$ (0.07)	$ 0.03	$ 0.06	$ 0.11
Diluted	$ (0.07)	$ 0.03	$ 0.06	$ 0.11
Shares used in per share computations:				
Basic	24,203	24,145	24,020	23,866
Diluted	24,203	24,352	24,285	24,257

(1) Net Income included a release of non-cash valuation allowance of $27.4 million against a significant portion of the Company’s U.S. and foreign

ITEM 9. CHANGES IN AND DISAGREEMENTS WITH ACCO UNTANTS 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, 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 Chief Financial Officer ("CFO"), as appropriate, to allow timely decisions regarding required disclosure. Our management, with participation of our CEO and CFO, has evaluated the effectiveness of our disclosure controls and procedures as of December 31, 2016, 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 CFO have concluded that as of the end of the period covered by this report, our disclosure controls and procedures were not effective as a result of the material weakness in our internal control over financial reporting discussed below.

Notwithstanding the identified material weakness, management, including our CEO and CFO, believes the consolidated financial statements included in this Annual Report on Form 10-K fairly represent in all material respects our financial condition, results of operations and cash flows at and for the periods presented in accordance with U.S. GAAP.

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 Securities Exchange Act of 1934, 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.

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.

Under the supervision and with the participation of our management, including our CEO and CFO, we assessed the effectiveness of our internal control over financial reporting as of December 31, 2016. 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 according to the COSO criteria, we have concluded that there was a material weakness related to the existence of inventories subject to our cycle counting program, as described in more detail below, as of

December 31, 2016. Due to this material weakness, management concluded that the Company’s inte rnal control over financial reporting was not effective as of December 31, 2016.

A material weakness is a deficiency, or a combination of deficiencies, in internal control over financial reporting, such that there is a reasonable possibility that a material misstatement of the company's annual or interim financial statements will not be prevented or detected on a timely basis.

Management identified the following material weakness in the Company’s internal control over financial reporting as of December 31, 2016:

The Company did not design and maintain an effective control over the existence of inventories subject to the cycle count program. Specifically, the control was not effectively designed and maintained to verify all inventories that should be subject to the cycle count program were included and were counted at the frequency levels required under the Company’s policies. This control deficiency did not result in a material adjustment to the inventory and cost accounts and disclosures for the year ended December 31, 2016. However, this control deficiency could result in misstatements of the aforementioned accounts and disclosures that would result in a material misstatement to the annual or interim consolidated financial statements that would not be prevented or detected. Accordingly, our management has determined that this control deficiency constitutes a material weakness.

The effectiveness of our internal control over financial reporting as of December 31, 2016 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

No change in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Securities Exchange Act of 1934, as amended) occurred during the fourth quarter ended December 31, 2016, that has materially affected, or is reasonably likely to materially affect, our internal control over financial reporting.

Remediation Plan

Although the Company has begun implementing a number of remediation initiatives to improve the Company’s internal control over financial reporting in fiscal 2017, there can be no assurance that the Company will eliminate the aforementioned material weakness in fiscal 2017. A summary of the remediation plans is provided below.

The Company is evaluating the material weakness and developing a plan of remediation to strengthen our overall controls over accounting for the existence of inventories subject to our cycle count program. To ensure existence of the Company’s inventory balances as recorded at December 31, 2016, the Company conducted a full physical inventory for the stocking locations subject to the cycle count program which resulted in an immaterial adjustment. Additionally, we have updated the Company’s part master with the correct cycle-count frequency requirements.

To address the material weakness, the following remedial actions have been or will be taken:

- Implementation of additional quarterly reporting and monitoring controls over additions to or changes to the Company’s item master records
- Design of an automated methodology for determining and assigning the frequency levels each item should be counted

Our goal is to remediate this material weakness by the end of 2017, subject to there being sufficient opportunities to conclude, through testing, that the enhanced control is designed and operating effectively.

ITEM 9B. OTHER INFORMATION

None.

PART III

ITEM 10. DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE

The information required by this Item is incorporated by reference to our Proxy Statement for our 2017 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 31, 2016, 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 1, 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 of our existing equity compensation plans as of December 31, 2016.

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	431,135	$	15.15	1,334,581
Equity compensation plans not approved by security holders (1)	9,410	$	10.45	—
Total	440,545	$	15.06	1,334,581

(1) Represents the 2002 Non-Statutory Stock Plan, which was adopted without the approval of security holders. This Plan provides for the grant of non-statutory stock options to employees and service providers at grant prices equal to the fair market value on the date of grant, with an expiration date not to exceed 10 years from the grant date.

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.

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:

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 following the signature page of this Annual Report on Form 10-K, which is incorporated by reference here.

ITEM 16. FORM 10-K SUMMARY

None.

SIGNA TURES

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: March 2, 2017

NANOMETRICS INCORPORATED

By: /S/ TIMOTHY J. STULTZ

Timothy J. Stultz
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/ TIMOTHY J. STULTZ Timothy J. Stultz	President, Chief Executive Officer and Director (Principal Executive Officer)	March 2, 2017
/S/ JEFFREY ANDRESON Jeffrey Andreson	Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	March 2, 2017
/S/ BRUCE C. RHINE Bruce C. Rhine	Chairman of the Board of Directors	March 2, 2017
/S/ J. THOMAS BENTLEY J. Thomas Bentley	Director	March 2, 2017
/S/ EDWARD J. BROWN JR. Edward J. Brown Jr.	Director	March 2, 2017
/S/ CHRISTOPHER A. SEAMS Christopher A. Seams	Director	March 2, 2017
/S/ CHRISTINE TSINGOS Christine Tsingos	Director	March 2, 2017

EXHIBIT INDEX

Exhibit No.	Description
3.(i)	**Certificate of Incorporation**
3.1(1)	Certificate of Incorporation of the Registrant
3.(ii)	**Bylaws**
3.2 (2)	Bylaws of the Registrant
4	**Instruments Defining the Rights of Security Holders, Including Indentures**
4.1 (3)	Form of Common Stock Certificate
10	**Material Contracts**
	Management Contracts, Compensatory Plans, Contracts or Arrangements
10.1 (4)	Form of Indemnification Agreement between the Registrant and each of its directors and executive officers
10.2 (5)	Registrant’s 2000 Employee Stock Option Plan and form of Stock Option Agreement
10.3 (6)	Registrant’s 2000 Director Stock Option Plan and form of Stock Option Agreement
10.4 (7)	Registrant’s 2002 Non-statutory Stock Option Plan and form of Stock Option Agreement
10.5 (8)	Registrant’s Amended and Restated 2003 Employee Stock Purchase Plan
10.6 (9)	Form of Subscription Agreement Under the Registrant’s Amended and Restated 2003 Employee Stock Purchase Plan
10.7 (17)	Registrant’s Amended and Restated 2005 Equity Incentive Plan
10.8 (6)	Registrant’s Amended and Restated 2005 Equity Incentive Plan forms of Stock Option and Restricted Stock Unit Agreements
10.9 (10)	Executive Performance Bonus Plan
10.10 (11)	Form of Offer Letter to Timothy J. Stultz
10.11 (12)	Amended and Restated Executive Severance Agreement between the Registrant and Timothy J. Stultz, dated February 23, 2010
10.12 (18)	Employment Agreement between Registrant and Jeffrey Andreson, dated September 22, 2014
10.13 (22)	Compensation Arrangements with Named Executive Officers
10.14 (23)	Form of Performance-Based Restricted Stock Unit Agreement
10.15 (24)	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Timothy J. Stultz, Ph.D., dated May 19, 2015
10.16 (24)	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Jeffrey Andreson, dated May 19, 2015
10.17 (24)	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and S. Mark Borowicz, dated May 19, 2015
10.18 (24)	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Kevin Heidrich, dated May 19, 2015
10.19 (25)	Form of Indemnification Agreement between the Registrant and each of its directors and executive officers

10.20 (26)	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Janet Taylor, date August 27, 2015
10.21 (26)	Compensation Arrangement With Non-Employee Directors
10.22	General Severance Benefits and Change in Control Severance Benefits Agreement between Registrant and Rollin Kocher, dated November 10, 2016
	All Other Material Contracts
10.23 (7)	Loan and Security Agreement effective as of February 14, 2007 by and between Comerica Bank, the Registrant, Accent Optical Technologies, Nanometrics, Inc. and Nanometrics IVS Division, Inc.
10.24 (13)	First Amendment to the Loan and Security Agreement dated September 14, 2007
10.25 (13)	Second Amendment to the Loan and Security Agreement dated May 11, 2009, with an effective date of April 29, 2009
10.26 (14)	Third Amendment to the Loan and Security Agreement dated June 15, 2009
10.27 (15)	Fourth Amendment to the Loan and Security Agreement dated April 13, 2010
10.28 (14)	Asset Transfer Agreement by and between Zygo Corporation and the Registrant, dated June 17, 2009
10.29 (14)	Supply Agreement by and between Zygo Corporation and the Registrant dated June 17, 2009
10.30 (16)	Fifth Amendment to the Loan and Security Agreement dated April 23, 2012
10.31 (19)	Compensation of Non-Employee Directors
10.32 (20)	Extension to the Loan and Security Agreement dated April 30, 2014
10.33 (21)	Sixth Amendment to the Loan and Security Agreement by and between the Registrant and Comerica Bank dated May 30, 2014
21	**Subsidiaries**
21.1	Subsidiaries of the Registrant
23	**Consents of Experts and Counsel**
23.1	Consent of PricewaterhouseCoopers LLP Independent Registered Public Accounting Firm
31	**Rule 13a-14(a)/15d-14(a) Certifications**
31.1	Certification of Timothy J. Stultz, principal executive officer of the Registrant, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
31.2	Certification of Jeffrey Andreson, principal financial officer and principal accounting officer of the Registrant, pursuant to Section 302 of the Sarbanes-Oxley Act of 2002
32	**Section 1350 Certifications**
32.1*	Certification of Timothy J. Stultz, principal executive officer of the Registrant, and Jeffrey Andreson, principal financial officer and principal accounting officer of the Registrant pursuant to Section 906 of the Sarbanes-Oxley Act of 2002
101.INS	XBRL Instance Document
101.SCH	XBRL Taxonomy Extension Schema Document
101.CAL	XBRL Taxonomy Extension Calculation Linkbase Document

101.DEF	XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	XBRL Taxonomy Extension Label Linkbase Document
101.PRE	XBRL Taxonomy Extension Presentation Linkbase Document

(1) Incorporated by reference to Exhibit 3.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on October 5, 2006.
(2) Incorporated by reference to Exhibit 3.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on April 12, 2012.
(3) Incorporated by reference to Exhibit 4.1 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on November 9, 2006.
(4) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on February 20, 2013.
(5) Incorporated by reference to Exhibit 4.2 filed with the Registrant's Registration Statement on Form S-8 (File No. 333-40866) filed on July 6, 2000.
(6) Incorporated by reference to the like-described exhibit filed with the Registrant's Annual Report on Form 10-K (File No. 000-13470) filed on March 13, 2008.
(7) Incorporated by reference to the like-described exhibit filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on May 10, 2007.
(8) Incorporated by reference to Appendix 1 filed with the Registrant's definitive proxy statement on Schedule 14A (File No. 000-13470) filed on April 4, 2016.
(9) Incorporated by reference to Exhibit 4.1 filed with the Registrant's Registration Statement on Form S-8 (File No.333-108474) filed on September 3, 2003.
(10) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on May 11, 2011.
(11) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on August 8, 2007.
(12) Incorporated by reference to Exhibit 10.25 filed with the Registrant's Annual Report on Form 10-K (File No. 000-13470) filed on March 26, 2010.
(13) Incorporated by reference to the like-described exhibit filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on May 12, 2009.
(14) Incorporated by reference to the like-described exhibit filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on August 11, 2009.
(15) Incorporated by reference to Exhibit 99.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on April 19, 2010.
(16) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on May 9, 2012.
(17) Incorporated by reference to Appendix A filed with the Registrant's definitive proxy statement on Schedule 14A (File No. 000-13470) filed on April 10, 2013.
(18) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on October 31, 2014.
(19) Incorporated by reference to Exhibit 10.3 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on July 28, 2016.
(20) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on August 1, 2014.
(21) Incorporated by reference to Exhibit 99.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on June 4, 2014.
(22) Incorporated by reference to the disclosure in Item 5.02 of the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on February 26, 2016.
(23) Incorporated by reference to Exhibit 99.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on March 24, 2015.
(24) Incorporated by reference to the like-described exhibit filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on May 22, 2015.
(25) Incorporated by reference to Exhibit 10.1 filed with the Registrant's Current Report on Form 8-K (File No. 000-13470) filed on February 20, 2013.
(26) Incorporated by reference to the like-described exhibit filed with the Registrant's Quarterly Report on Form 10-Q (File No. 000-13470) filed on October 30, 2015.
* Furnished herewith.

SCHEDU LE II

NANOMETRICS INCORPORATED

VALUATION AND QUALIFYING ACCOUNTS

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

Year Ended	Balance at beginning of period	Additions to Allowance	Charges Utilized/Write-offs	Balance at end of period
December 31, 2016	$ 150	$ —	$ (77)	$ 73
December 26, 2015	$ 253	$ 10	$ (113)	$ 150
December 27, 2014	$ 293	$ —	$ (40)	$ 253

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

Year Ended	Balance at beginning of period	Additions to Allowance	Charges Utilized/Write-offs	Balance at end of period
December 31, 2016	$ 36,786	$ 1,643	$ (27,449)	$ 10,980
December 26, 2015	$ 35,835	$ 951	$ —	$ 36,786
December 27, 2014	$ 11,665	$ 24,170	$ —	$ 35,835

Exhibit 10.22

GENERAL SEVERANCE BENEFITS AND

CHANGE IN CONTROL SEVERANCE BENEFITS AGREEMENT

This **GENERAL SEVERANCE BENEFITS AND CHANGE IN CONTROL SEVERANCE BENEFITS AGREEMENT** (this " ***Agreement*** ") is entered into as of the **_10th_** day of November, 2016 (the " ***Effective Date*** "), by and between **ROLLIN KOCHER** (" ***Executive*** ") and **NANOMETRICS INCORPORATED** (the " ***Company*** ") (together, the " ***Parties*** "). This Agreement is intended to provide Executive with certain compensation and benefits in the event of certain qualifying terminations of Executive's employment. Certain capitalized terms used in this Agreement are defined in Article 6.

The Company and Executive hereby agree as follows:

ARTICLE 1

SCOPE OF AND CONSIDERATION FOR THIS AGREEMENT

1.1 Upon termination of Executive's employment for any reason, Executive shall be entitled to the Accrued Obligations. The Company and Executive wish to set forth in this Agreement the compensation and benefits that Executive shall be entitled to receive upon a Covered Termination or Change in Control Termination.

1.2 The duties and obligations of the Company to Executive under this Agreement in the event of a Covered Termination or Change in Control Termination shall be in consideration for Executive's compliance with the limitations and conditions on benefits as described in Article 4, including the timely provision of an effective Release, in substantially the form of **Exhibit A attached hereto (the "Release")** return of Company property and continued compliance with certain obligations described in Article 4. Provision of the Accrued Obligations to Executive is not conditioned upon Executive's compliance with the conditions on benefits described in Article 4.

1.3 This Agreement shall supersede any other policy, plan, program or arrangement, including, without limitation, any contract between Executive and the Company (or any subsidiary or affiliate of the Company), relating to severance benefits payable by the Company to Executive in connection with a termination of employment.

ARTICLE 2

COVERED TERMINATION SEVERANCE BENEFITS (NOT IN CONNECTION WITH CHANGE IN CONTROL)

2.1 Covered Termination Severance Benefits. Upon a Covered Termination, and subject to the limitations and conditions set forth in this Agreement, including Executive's timely provision of an effective Release and satisfaction of all other conditions set forth in Article 4, Executive shall be eligible to receive the benefits set forth in this Article 2 (in addition to the Accrued Obligations).

2.2 Salary Continuance. Executive shall receive, as severance, an amount equal to Executive's Base Salary for six (6) months, payable in equal installments over the six (6) month period following the Termination Date in accordance with the Company's payro ll schedule then in effect, provided that (i) the payments shall commence on the first regularly scheduled payroll pay date following the effective date of the Release, (ii) the first payment shall be a "catch up" payment to include the total amount that E xecutive would have received as of such date if these payments had commenced with the first payroll pay date following the Termination Date, and (iii) such payment schedule is subject to any delay in payment required by Section 5.5.

2.3 Health Continuation Coverage .

(a) Provided that Executive is eligible and has made the necessary elections for continuation coverage pursuant to COBRA under a health, dental, or vision plan sponsored by the Company, the Company shall pay the applicable premiums (inclusive of premiums for Executive's dependents for such health, dental, or vision plan coverage as in effect immediately prior to the date of the Covered Termination) for such continued health, dental, or vision plan coverage following the date of the Covered Termination for up to six (6) months (such period, the " ***COBRA Payment Period*** ") but in no event after such time as Executive and Executive's dependents are no longer eligible for COBRA coverage. Such coverage shall be counted as coverage pursuant to COBRA. If Executive and Executive's dependents continue coverage pursuant to COBRA following the conclusion of the period that the Company makes premium payments hereunder, Executive will be responsible for the entire payment of such premiums required under COBRA for the remainder of the applicable COBRA period.

(b) For purposes of this Section 2.4 (i) references to COBRA shall be deemed to refer also to analogous provisions of state law, and (ii) any applicable insurance premiums that are paid by the Company shall not include any amounts payable by Executive under a Code Section 125 health care reimbursement plan, which amounts, if any, are the sole responsibility of Executive.

(c) Notwithstanding the foregoing, if the Company determines, in its sole discretion, that the Company cannot provide the COBRA premium benefits without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), the Company shall in lieu thereof pay Executive a taxable cash amount, which payment shall be made regardless of whether the Executive or his qualifying family members elect or are eligible for COBRA continuation coverage (the " ***Health Care Benefit Payment*** "). The Health Care Benefit Payment shall be paid in monthly or bi-weekly installments on the same schedule that the COBRA premiums would otherwise have been paid to the insurer. The Health Care Benefit Payment shall be equal to the amount that the Company otherwise would have paid for COBRA insurance premiums (which amount shall be calculated based on the premium for the first month of coverage), and shall be paid until the expiration of the COBRA Payment Period.

ARTICLE 3

Change in Control Severance Benefits

3.1 Change in Control Severance Benefits. Upon a Change in Control Termination, and subject to the limitations and conditions set forth in this Agreement, including Executive's timely provision of an effective Release and satisfaction of all conditions set forth in Article 4, Executive shall be eligible to receive the benefits set forth in this Article 3 (in addition to the Accrued Obligations).

3.2 Salary Severance Payment. Executive shall receive, as severance, an amount equal to Executive's Base Salary for twelve (12) months, payable in a single lump sum on the first regularly scheduled payroll pay date following the effective date of the Release, subject to any delay in payment required by Section 5.5.

3.3 Bonus Severance Payment. Executive shall receive an additional severance payment in an amount equal to 100% of Executive's target annual bonus in effect for the fiscal year in which the Termination Date occurs (the " ***Bonus Severance Payment*** "). The Bonus Severance Payment shall be paid on the first regular payroll date following the effective date of the Release, subject to any delay in payment required by Section 5.5.

3.4 Health Continuation Coverage .

(a) Provided that Executive is eligible and has made the necessary elections for continuation coverage pursuant to COBRA under a health, dental, or vision plan sponsored by the Company, the Company shall pay the applicable premiums (inclusive of premiums for Executive's dependents for such health, dental, or vision plan coverage as in effect immediately prior to the Termination Date) for such continued health, dental, or vision plan coverage following the Termination Date for up to twelve (12) months (such period, the " ***CIC COBRA Payment Period*** ") but in no event after such time as Executive and Executive's dependents are no longer eligible for COBRA coverage. Such coverage shall be counted as coverage pursuant to COBRA. If Executive and Executive's dependents continue coverage pursuant to COBRA following the conclusion of the period that the Company makes premium payments hereunder, Executive will be responsible for the entire payment of such premiums required under COBRA for the remainder of the applicable COBRA period.

(b) For purposes of this Section 3.4, (i) references to COBRA shall be deemed to refer also to analogous provisions of state law, and (ii) any applicable insurance premiums that are paid by the Company shall not include any amounts payable by Executive under a Code Section 125 health care reimbursement plan, which amounts, if any, are the sole responsibility of Executive.

(c) Notwithstanding the foregoing, if the Company determines, in its sole discretion, that the Company cannot provide the COBRA premium benefits without potentially incurring financial costs or penalties under applicable law (including, without limitation, Section 2716 of the Public Health Service Act), the Company shall in lieu thereof pay Executive a taxable cash amount, which payment shall be made regardless of whether the Executive or his qualifying family members elect or are eligible for COBRA continuation coverage (the " ***CIC Health Care Benefit Payment*** "). The CIC Health Care Benefit Payment shall be paid in monthly or bi-weekly installments on the same schedule that the COBRA premiums would otherwise have been paid to the insurer. The CIC Health Care Benefit Payment shall be equal to the amount that the Company otherwise would have paid for COBRA insurance premiums (which amount shall be calculated based on the premium for the first month of coverage), and shall be paid until the expiration of the CIC COBRA Payment Period.).

3.5 Equity Awards. Executive shall receive the following benefits with respect to the Executive's equity awards.

(a) The vesting and exercisability of all outstanding options to purchase the Company's common stock, stock appreciation rights, stock units or other equity rights with respect to the Company granted to Executive pursuant to any equity incentive plan of the Company which would otherwise have vested conditioned solely upon Executive's continued services with the Company shall accelerate vesting in full.

(b) Any reacquisition or repurchase rights held by the Company with respect to common stock issued or issuable pursuant to any equity award granted to Executive pursuant to any equity incentive plan of the Company which would otherwise have lapsed conditioned solely upon Executive's continued services with the Company shall lapse in full.

(c) Any equity awards granted to Executive pursuant to any equity incentive plan of the Company which would otherwise vest based on attainment of performance criteria (" ***Performance Award*** s") will either: (i) not be subject to acceleration of vesting pursuant to this Agreement if the terms of such Performance Awards supersede this Agreement, or (ii) if the terms of such Performance Awards do not supersede this Agreement, such Performance Awards will accelerate vesting in full; provided however, that if such Performance Awards have multiple vesting levels depending on the level of performance, such Performance Awards will accelerate vesting at the "target level."

(d) If Executive is unable to exercise all or a portion of any exercisable equity awards granted to Executive pursuant to any equity incentive plan of the Company during the applicable post Termination Date exercise period due to a contractual, legal or regulatory restriction that prohibits the exercise of such Company's equity awards, the exercise period of such equity awards shall be automatically extended for an additional ninety (90) days following the termination of such contractual, legal or regulatory restriction; provided, however that in no event will such exercise period be extended beyond the maximum permitted contractual term for such equity awards and nothing herein is intended to prohibit earlier cancellation or termination of such equity awards in connection with a Change in Control in which such exercisable awards are not assumed, substituted or continued.

ARTICLE 4

Limitations and Conditions on Benefits

4.1 Rights Conditioned on Compliance. Executive's rights to receive all severance benefits described in Article 2 and Article 3 (other than the Accrued Obligations) shall be conditioned upon and subject to Executive's compliance with all the limitations and conditions on benefits as described in this Article 4. Executive acknowledges and agrees that Executive's obligations under this Article 4 are an essential part of the consideration Executive is providing hereunder in exchange for which and in reliance upon which the Company has agreed to provide the payments and benefits under this Agreement. Accordingly, Executive agrees that Executive will forfeit, effective as of the date of any breach or failure to comply with any of Executive's continuing obligations under this Article 4, any right, entitlement, claim or interest in or to any then unpaid portion of the severance payments or benefits provided in Article 2 or Article 3.

4.2 Resignation of all Company Positions on Termination Date . No later than the Termination Date, and prior to the provision or payment of any benefits under this Agreement on account of such Covered Termination or Change in Control Termination, as applicable, Executive must resign from all positions that Executive holds with the Company unless otherwise requested by the Company.

4.3 Release Prior to Payment of Benefits. Prior to the provision or payment of any benefits under this Agreement on account of a Covered Termination or Change in Control Termination, as applicable, Executive must execute a general waiver and release of all known and unknown claims in substantially the form attached hereto as **Exhibit A** (or in such other form as may later be specified by the Company) (the " ***Release*** "), and such release must become effective in accordance with its terms, but in no event later than sixty (60) days following the Termination Date (the " ***Release Deadline*** "). No am ount shall be paid under this Agreement prior to the effective date of the Release . The Company may modify the Release in its discretion to comply with changes in applicable law at any time prior to Executive's execution of such Release. Such Release sha ll specifically relate to all of Executive's rights and claims in existence at the time of such execution and shall confirm Executive's obligations under Executive's written confidentiality or proprietary information agreement (or any successor agreement t hereto) and any similar obligations under applicable law. It is understood that, as specified in the applicable Release, Executive has a certain number of calendar days to consider whether to execute such Release. If Executive does not execute such Relea se within the applicable period, Executive shall have no further rights, title or interests in or to any severance benefits or payments pursuant to, this Agreement. It is further understood that if Executive is aged 40 years old or older at the time of a Change in Control Termination or a Covered Termination, as applicable, Executive may revoke the applicable Release in writing within seven (7) calendar days after its execution by Executive. If Executive revokes such Release within such subsequent seven (7) day period, no benefits shall be provided or payable under this Agreement pursuant to such Covered Termination or Change in Control Termination, as applicable.

4.4 Return of Company Property. Not later than the Termination Date (unless otherwise agreed by the Company in writing), Executive shall return to the Company all documents (and all copies thereof) and other property and information belonging to the Company that Executive has in his or her possession or control. The documents and property to be returned include, but are not limited to, all files, correspondence, email, memoranda, notes, notebooks, records, plans, forecasts, reports, studies, analyses, compilations of data, proposals, agreements, financial information, research and development information, marketing information, operational and personnel information, databases, computer-recorded information, tangible property and equipment (including, but not limited to, computers, facsimile machines, mobile telephones, and servers), credit cards, entry cards, identification badges and keys; and any materials of any kind which contain or embody any proprietary or confidential information of the Company (and all reproductions thereof in whole or in part). Executive agrees to make a diligent search to locate any such documents, property and information. If Executive has used any personally owned computer, server, or e-mail system to receive, store, review, prepare or transmit any Company confidential or proprietary data, materials or information, then within ten (10) business days after the Termination Date (or within such other timing as provided in writing by the Company), Executive shall provide the Company with a computer-useable copy of all such information and then permanently delete and expunge such confidential or proprietary information from those systems without retention of any reproductions. Executive agrees to provide the Company access to Executive's personally owned computer, server or e-mail systems as requested to verify that the necessary copying and/or deletion is done.

4.5 Cooperation and Continued Compliance with Proprietary Information Obligations.

(a) From and after the Termination Date, Executive shall cooperate fully with the Company in connection with its actual or contemplated defense, prosecution, or investigation of any existing or future litigation, arbitrations, mediations, claims, demands, audits, government or regulatory inquiries, or other matters arising from events, acts, or failures to act that occurred during the time period in which Executive was employed by the Company (including any period of employment with an entity acquired by the Company). Such cooperation includes, without limitation, being available upon reasonable notice, without subpoena, to provide accurate and complete advice, assistance and information to the Company, i ncluding offering and explaining evidence, providing truthful and accurate sworn statements, and participating in discovery and t rial preparation and testimony . Executive also agrees to promptly send the Company copies of all correspondence (for example, but not limited to, subpoenas) received by Executive in connection with any such legal proceedings, unless Executive is expressly prohibited by law from so doing. T he Company will reimburse Executive for reasonable out-of-pocket expenses incurred in connection with any such cooperation (excluding foregone wages, salary, or other compensation) within thirty (30) days of Executive's timely presentation of appropriate documentation thereof, in accordance with the Company's standard reimbursement policies and procedures , and will make reasonable efforts to accommodate Executive's scheduling needs.

(b) From and after the Termination Date, Executive shall continue to abide by all of the terms and provisions of Executive's written confidentiality or proprietary information agreement (and any other comparable agreement signed by Executive), in accordance with its terms.

4.6 Continued Compliance with Nondisparagement, Noncompetion and Nonsolicitation Requirements.

(a) During the period of Executive's employment with the Company and during the Continuation Period, Executive will not knowingly and materially disparage, criticize, or otherwise make any derogatory statements regarding the Company or any officer, director or agent of the Company nor will the Company knowingly and materially disparage, criticize, or otherwise make any derogatory statements regarding Executive. Notwithstanding the foregoing, nothing contained in this Agreement will be deemed to restrict Executive, the Company or any of the Company's current or former officers and/or directors from providing information to any governmental or regulatory agency (or in any way limit the content of any such information) to the extent they are requested or required to provide such information pursuant to applicable law or regulation.

(b) Executive acknowledges that the nature of the Company's business is such that if Executive were to become employed by, or substantially involved in, the business of a competitor of the Company during the Continuation Period, it would be very difficult for Executive not to rely on or use the Company's trade secrets and confidential information. Thus, to avoid the inevitable disclosure of the Company's trade secrets and confidential information, Executive agrees and acknowledges that Executive's right to receive any then unpaid portion of the severance payments or benefits provided in Article 2 or Article 3 shall be conditioned upon Executive not directly or indirectly engaging in (whether as an employee, consultant, agent, proprietor, principal, partner, stockholder, corporate officer, director or otherwise), nor having any ownership interested in or participating in the financing, operation, management or control of, any person, firm, corporation or business that competes with Company or is a customer of the Company; provided , however, that nothing contained in this Section 4.6(b) shall be construed to prohibit Executive from purchasing and owning (directly or indirectly) up to two percent (2%) of the capital stock or other securities of any competitor corporation or other or other entity whose stock or securities are traded on any national or regional securities exchange or the national over-the-counter market and such ownership shall be excluded from the prohibition set forth in this Section 4.6(b).

(c) During the Continuation Period Executive shall not either directly or indirectly solicit, induce, attempt to hire, recruit, encourage, take away, hire any employee of the Company or cause any employee of the Company to leave his or her employment either for Exec utive or for any other entity or person.

4.7 Survival. The provisions of this Article 4 shall survive the termination of this Agreement.

ARTICLE 5

TAX TREATMENT, REDUCTIONS AND OFFSETS

5.1 Parachute Payments.

(a) If any payment or benefit (including payments and benefits pursuant to this Agreement) Executive would receive in connection with a Change in Control from the Company or otherwise (“ ***Payment*** ”) would (i) constitute a “parachute payment” within the meaning of Section 280G of the Code, and (ii) but for this sentence, be subject to the excise tax imposed by Section 4999 of the Code (the “ ***Excise Tax*** ”), then such Payment will be equal to the Reduced Amount. The “ ***Reduced Amount*** ” will be either (x) the largest portion of the Payment that would result in no portion of the Payment being subject to the Excise Tax, or (y) the largest portion, up to and including the total, of the Payment, whichever amount set forth in clause (x) or (y), after taking into account all applicable federal, state, provincial, foreign, and local employment taxes, income taxes, and the Excise Tax (all computed at the highest applicable marginal rate), results in such Participant's receipt, on an after-tax basis, of the greater economic benefit notwithstanding that all or some portion of the Payment may be subject to the Excise Tax. If a reduction in a Payment is required pursuant to the preceding sentence and the Reduced Amount is determined pursuant to clause (x) of the preceding sentence, the reduction shall occur in the manner (the " ***Reduction Method*** ") that results in the greatest economic benefit for Participant. If more than one method of reduction will result in the same economic benefit, the items so reduced will be reduced pro rata (the " ***Pro Rata Reduction Method*** ").

(b) Notwithstanding any provision of this Section 5.1 to the contrary, if the Reduction Method or the Pro Rata Reduction Method would result in any portion of the Payment being subject to taxes pursuant to Section 409A of the Code that would not otherwise be subject to taxes pursuant to Section 409A of the Code, then the Reduction Method and/or the Pro Rata Reduction Method, as the case may be, shall be modified so as to avoid the imposition of taxes pursuant to Section 409A of the Code as follows: (i) as a first priority, the modification shall preserve to the greatest extent possible, the greatest economic benefit for the Executive as determined on an after-tax basis; (ii) as a second priority, Payments that are contingent on future events (e.g., being terminated without Cause), shall be eliminated before Payments that are not contingent on future events; and (iii) as a third priority, Payments that are "deferred compensation" within the meaning of Section 409A of the Code shall be reduced before Payments that are not "deferred compensation" within the meaning of Section 409A of the Code.

(c) The professional firm engaged by the Company for general tax purposes as of the day prior to the effective date of the Change in Control shall make all determinations required to be made under this Section 5.1. If the professional firm so engaged by the Company is serving as an accountant or auditor for the individual, entity or group effecting the Change in Control, the Company shall appoint a nationally recognized independent registered public accounting firm to make the determinations required hereunder. The Company shall bear all expenses with respect to the determinations by such professional firm required to be made hereunder. Any good faith determinations of the professional firm made hereunder sh all be final, binding and conclusive upon the Company and Executive.

(d) If Executive receives a Payment for which the Reduced Amount was determined pursuant to clause (x) of Section 5.1(a) and the Internal Revenue Service determines thereafter that some portion of the Payment (after reduction pursuant to clause (x) of Section 5.1(a)) is subject to the Excise Tax, Executive shall promptly return to the Company a sufficient amount of the Payment so that no portion of the remaining Payment is subject to the Excise Tax. For the avoidance of doubt, if the Reduced Amount was determined pursuant to clause (y) of Section 5.1(a), Executive shall have no obligation to return any portion of the Payment pursuant to the preceding sentence.

5.2 Certain Reductions and Offsets. To the extent that any federal, state or local laws, including, without limitation, the federal Worker Adjustment and Retraining Notification Act (the " ***WARN Act*** ") or any other so-called "plant closing" laws (including but not limited to California Labor Code Section 1400 *et seq.*), require the Company to give advance notice or make a payment of any kind to Executive because of Executive's involuntary termination due to a layoff, reduction in force, plant or facility closing, sale of business, change in control, or any other similar event or reason, the benefits payable under this Agreement shall be correspondingly reduced. The benefits provided under this Agreement are intended to satisfy any and all statutory obligations that may arise out of Executive's involuntary termination of employment for the foregoing reasons, and the parties shall construe and enforce the terms of this Agreement accordingly.

5.3 Mitigation. Executive shall not be required to mitigate damages or the amount of any payment provided under this Agreement by seeking other employment or otherwise, nor shall the amount of any payment provided for under this Agreement be reduced by any compensation earned by Executive as a result of employment by another employer or by any retirement benefits received by Executive after the date of a Covered Termination or Change in Control Termination.

5.4 Indebtedness of Executive . If Executive is indebted to the Company on the effective date of a Covered Termination or Change in Control Termination, the Company reserves the right to offset any severance payments and benefits under this Agreement by the amount of such indebtedness; *provided, however,* that any such offse t does not violate or result in the imposition of tax under Section 409A of the Code.

5.5 Section 409A .

(a) Notwithstanding anything to the contrary herein, the following provisions apply to the extent severance and other benefits provided herein are subject to Section 409A of the Code and the regulations and other guidance thereunder and any state law of similar effect (collectively " ***Section 409A*** "). Severance benefits shall not commence until Executive has a "separation from service" for purposes of Section 409A. Each installment of severance benefits is a separate "payment" for purposes of Treas. Reg. Section 1.409A-2(b)(2)(i), and the severance benefits are intended to satisfy the exemptions from application of Section 409A provided under Treasury Regulations Sections 1.409A-1(b)(4), 1.409A-1(b)(5) and 1.409A-1(b)(9). However, if such exemptions are not available and Executive is, upon separation from service, a "specified employee" for purposes of Section 409A, then, solely to the extent necessary to avoid adverse personal tax consequences under Section 409A, the timing of the severance benefits payments shall be delayed until the earlier of (i) six (6) months and one day after Executive's separation from service, or (ii) Executive's death.

(b) If the severance benefits are not covered by one or more exemptions from the application of Section 409A and the Release could become effective in the calendar year following the calendar year in which Executive separates from service, the separation agreement will not be deemed effective any earlier than the Release Deadline. None of the severance benefits will be paid or otherwise delivered prior to the effective date of the Release.

(c) All expenses or other reimbursements as provided herein shall be payable in accordance with the Company's policies in effect from time to time, provided that such reimbursements (i) shall be made on or prior to the last day of the taxable year following the taxable year in which such expenses were incurred by Executive; (ii) no such reimbursement or expenses eligible for reimbursement in any taxable year shall in any way affect the expenses eligible for reimbursement in any other taxable year; and (iii) the right to reimbursement or in-kind benefits shall not be subject to liquidation or exchanged for another benefit.

(d) The severance and other benefits provided herein are intended to qualify for an exemption from application of Section 409A or comply with its requirements to the extent necessary to avoid adverse personal tax consequences under Section 409A, and any ambiguities herein shall be interpreted accordingly.

5.6 Tax Withholding . All payments made and benefits provided under this Agreement shall be subject to applicable withholding for federal, state and local income and employment taxes.

ARTICLE 6

DEFINITIONS

erwise provided, for purposes of this Agreement, the following definitions shall apply:

6.1 ***"Accrued Obligations"*** means (i) any portion of Executive's annual base salary or incentive compensation earned through Executive's termination date not theretofore paid, (ii) any unreimbursed business expenses which are eligible for reimbursement in accordance with the Company's policies, (iii) any accrued but unused vacation pay or paid time off owed to Executive, and (iv) any amount arising from Executive's participation in, or benefits under, any employee benefit plans, programs or arrangements, which amounts shall be payable in accordance with the terms and conditions of such employee benefit plans, programs or arrangements. Accrued Obligations also includes any rights to indemnification Executive many have under the Company's Certificate of Incorporation, Bylaws, or separate indemnification agreement, as applicable, and as each may be amended from time to time.

6.2 " ***Base Salary*** " means 1/12 th of Executive's annual base salary (excluding incentive pay, premium pay, commissions, overtime, bonuses, and other forms of variable compensation) as in effect on the date of a Change in Control Termination or a Covered Termination, as applicable, but determined without giving effect to any reduction in Base Salary that would give rise to the Executive's right to resign for Good Reason.

6.3 " ***Board*** " means the Board of Directors of the Company.

6.4 " ***Cause*** " means (i) Executive's willful gross misconduct; (ii) Executive's unjustifiable neglect of his duties (as determined in the good faith judgment of the Board); (iii) Executive's acting in any manner that has a direct, substantial and adverse effect on the Company or its reputation; (iv) Executive's repeated material failure or repeated refusal to comply with reasonable written policies, standards and regulations established by the Company from time to time which failure, if curable, is not cured to the reas onable satisfaction of the Board during the thirty (30) day period following written notice of such failure from the Company; (v) any tortuous act, unlawful act or malfeasance which causes or reasonably could cause (for example, if it became publicly known) material harm to the Company's standing, condition or reputation; (vi) any material breach by Executive of the provisions of any confidential information agreement with the Company or other material improper disclosure of the Company's confidential or pr oprietary information; (vii) Executive's theft, dishonesty, or falsification of any Company records; (viii) Executive's being found liable in any Securities and Exchange Commission or other civil or criminal securities law action or entering any cease and desist order with respect to such action (regardless of whether or not Executive admits or denies liability); or (ix) Executive (A) obstructing or impeding; (B) endeavoring to influence, obstruct or impede, or (C) failing to materially cooperate with, any investigation authorized by the Board or any governmental or self-regulatory entity (an "Investigation"). However, Executive's failure to waive attorney-client privilege relating to communications with Executive's own attorney in connection with an Invest igation will not constitute "Cause."

6.5 " ***Change in Control*** " means the occurrence of any of the following: (i) any "person" (as such term is used in Sections 13(d) and 14(d) of the Securities Exchange Act of 1934, as amended) becomes the "beneficial owner" (as defined in Rule 13d-3 under said Act), directly or indirectly, of securities of the Company representing 50% or more of the total voting power represented by, or 50% or more of the fair value of, the Company's then outstanding voting power represented by, or 50% or more of the fair value of, the Company's then outstanding voting securities; (ii) any action or event occurring within a two-year period, as a result of which less than a majority of the directors are Incumbent Directors. "Incumbent Directors" will mean directors who either (A) are directors of the Company as of the date hereof, or (B) are elected, or nominated for election, to the Board with the affirmative votes of a majority of the Incumbent Directors at the time of such election or nomination (but will not include an individual whose election or nomination is in connection with an actual or threatened proxy contest relating to the election of directors to the Company); (iii) the consummation of a merger or consolidation of the Company with any other corporation, other than a merger or consolidation which would result in the voting securities of the Company outstanding immediately prior thereto continuing to represent (either by remaining outstanding or by being converted in to voting securities of the surviving or resulting entity, including any parent holding company) at least fifty percent (50%) of the total voting power represented by the voting securities of the Company or such surviving or resulting entity outstanding immediately after such merger or consolidation; or (iv) the consummation of the sale, lease or other disposition by the Company of all or substantially all the Company's assets. In addition, to the extent required for compliance with Section 409A of the Code, in no event will a Change in Control be deemed to have occurred if such transaction is not also a "change in the ownership or effective control of" the Company or a "change in the ownership of a substantial portion of the assets of" the Company, as determined under Treasury Regulations Section 1.409A-3(i)(5).

6.6 " ***Change in Control Termination*** " means an " ***Involuntary Termination Without Cause*** " or " ***Resignation for Good Reason ,*** " either of which occurs on or within twelve (12) months following, the effective date of a Change in Control, provided that any such termination is a "separation from service" within the meaning of Treasury Regulation Section 1.409A-1(h). For the sake of clarity, a termination of employment due to Executive's death or disability will not constitute a Change in Control Termination for purposes of this Agreement.

6.7 " ***COBRA*** " means the Consolidated Omnibus Budget Reconciliation Act of 1985, as amended.

6.8 " ***Code*** " means the Internal Revenue Code of 1986, as amended.

6.9 " ***Company*** " means Nanometrics Incorporated or, following a Change in Control, the surviving entity resulting from such transaction, or any subsequent surviving entity resulting from any subsequent Change in Control.

6.10 ***"Continuation Period"*** means the 6 month period following the Termination Date in the event of a Covered Termination and the 12 month period following the Termination Date in the event of a Change in Control Termination, as applicable.

6.11 " ***Covered Termination*** " means an " ***Involuntary Termination Without Cause*** " or " ***Resignation for Good Reason*** " either of which occurs other than on or within twelve (12) months following, the effective date of a Change in Control, provided that any such termination is a "separation from service" within the meaning of Treasury Regulation Section 1.409A-1(h). For the sake of clarity, a termination of employment due to Executive's death or disability will not constitute a Covered Termination for purposes of this Agreement.

6.12 " ***Involuntary Termination Without Cause*** " means Executive's dismissal or discharge by the Company for reasons other than Cause and other than as a result of death or disability.

6.13 " ***Resignation for Good Reason*** " means Executive's resignation from all positions Executive holds with the Company at such time, which resignation occurs within ninety (90) days following any of the following events taken without Executive's written consent, provided that Executive has given the Company written notice of such event within thirty (30) days after the first occurrence of such event and the Company has not cured such event, to the extent curable, within thirty (30) days thereafter:

(a) A material decrease in Executive's base compensation (which includes Executive's base salary and target bonus);

(b) A material diminution in Executive's authority, duties or responsibilities (including any change in Executive's position such that Executive is no longer employed in substantially the same position and with substantially the same level of authority, responsibilities or duties at the ultimate parent corporation in an affiliated group of companies);

(c) A relocation of Executive's assigned office location to a facility which is more than fifty (50) miles from its current location and which materially increases Executive's one-way driving distance from Executive's principal personal residence to such office location at which Executive is required to perform services (except for required business travel to the extent consistent with Executive's prior business travel obligations); or

(d) The material breach by the Company of this Agreement, the Prior Agreement or any other then current agreement under which Executive performs services for the Company.

6.14 " ***Termination Date*** " means the effective date of the Change in Control Termination or Covered Termination, as applicable.

ARTICLE 7

General Provisions

7.1 Employment Status. This Agreement does not constitute a contract of employment or impose upon Executive any obligation to remain as an employee, or impose on the Company any obligation (i) to retain Executive as an employee, (ii) to change the status of Executive as an at-will employee or (iii) to change the Company's policies regarding termination of employment.

7.2 Notices. Any notices provided hereunder must be in writing, and such notices or any other written communication shall be deemed effective upon the earlier of personal delivery (including personal delivery by facsimile) or the third day after mailing by first class mail, to the Company at its primary office location and to Executive at Executive's address as listed in the Company's payroll records. Any payments made by the Company to Executive under the terms of this Agreement shall be delivered to Executive either in person or at the address as listed in the Company's payroll records. Either Party can change his or its address for receipt of notice by providing writing notice to the other Party of such change.

7.3 Severability. Whenever possible, each provision of this Agreement will be interpreted in such manner as to be effective and valid under applicable law, but if any provision of this Agreement is held to be invalid, illegal or unenforceable in any respect under any applicable law or rule in any jurisdiction, such invalidity, illegality or unenforceability will not affect any other provision or any other jurisdiction, but this Agreement will be reformed, construed and enforced in such jurisdiction as if such invalid, illegal or unenforceable provisions had never been contained herein.

7.4 Waiver. If either party should waive any breach of any provisions of this Agreement, such Party shall not thereby be deemed to have waived any preceding or succeeding breach of the same or any other provision of this Agreement.

7.5 Complete Agreement. This Agreement, including **Exhibit A** hereto constitutes the entire agreement between Executive and the Company and is the complete, final, and exclusive embodiment of their agreement with regard to this subject matter, wholly superseding all written and oral agreements with respect to payments and benefits to Executive in the event of employment termination, including but not limited to the Prior Agreement. It is entered into without reliance on any promise or representation other than those expressly contained herein.

7.6 Amendment or Termination of Agreement; Continuation of Agreement. This Agreement may be changed or terminated only upon the mutual written consent of the Company and Executive. The written consent of the Company to a change or termination of this Agreement must be signed by an executive officer of the Company (other than Executive) after such change or termination has been approved by the Board. Unless so terminated, this Agreement shall continue in effect for as long as Executive continues to be employed by the Company or by any surviving entity following any Change in Control. In other words, if, following a Change in Control, Executive continues to be employed by the surviving entity without a Change in Control Termination and the surviving entity then undergoes a Change in Control, following which Executive is terminated by the subsequent surviving entity in a Change in Control Termination, then Executive shall receive the benefits described in Article 3 hereof.

7.7 Count erparts. This Agreement may be executed in separate counterparts, any one of which need not contain signatures of more than one party, but all of which taken together will constitute one and the same Agreement.

7.8 Headings. The headings of the Articles and Sections hereof are inserted for convenience only and shall not be deemed to constitute a part hereof nor to affect the meaning thereof.

7.9 Successors and Assigns. This Agreement is intended to bind and inure to the benefit of and be enforceable by Executive, and the Company, and any surviving entity resulting from a Change in Control and upon any other person who is a successor by merger, acquisition, consolidation or otherwise to the business formerly carried on by the Company, and their respective successors, assigns, heirs, executors and administrators, without regard to whether or not such person actively assumes any rights or duties hereunder; *provided, however,* that Executive may not assign any duties hereunder and may not assign any rights hereunder without the written consent of the Company.

7.10 Choice of Law. All questions concerning the construction, validity and interpretation of this Agreement will be governed by the law of the State of California, without regard to such state's conflict of laws rules.

7.11 Dispute Resolution . To ensure the rapid and economical resolution of disputes that may arise in connection with Executive's employment and services for the Company, Executive and the Company agree that any and all disputes, claims, or causes of action, in law or equity, including but not limited to statutory claims, arising from or relating to the enforcement, breach, performance, or interpretation of this Agreement, Executive's employment with and services for the Company, or the termination of Executive's employment with and services for the Company, will be resolved pursuant to the Federal Arbitration Act, 9 U.S.C. §§1-16, and to the fullest extent permitted by law, by final, binding and confidential arbitration conducted in San Jose, California (or such other location as mutually agreed by the parties) by JAMS, Inc. (*"* ***JAMS*** *"*) or its successors by a single arbitrator. *Both Executive and the Company acknowledge that by agreeing to this arbitration procedure, they each waive the right to resolve any such dispute through a trial by jury or judge or administrative proceeding* . Any such arbitration proceeding will be governed by JAMS' then applicable rules and procedures for employment disputes, which can be found at http://www.jamsadr.com/rules-clauses/ and which will be provided to Executive upon request. In any such proceeding, the arbitrator shall (a) have the authority to compel adequate discovery for the resolution of the dispute and to award such relief as would otherwise be permitted by law; and (b) issue a written arbitration decision including the arbitrator's essential findings and conclusions and a statement of the award. Executive and the Company each shall be entitled to all rights and remedies that either would be entitled to pursue in a court of law. Nothing in this Agreement is intended to prevent either the Company or Executive from obtaining injunctive relief in court to prevent irreparable harm pending the conclusion of any such arbitration pursuant to applicable law. The Company shall pay all filing fees in excess of those that would be required if the dispute were decided in a court of law, and shall pay the arbitrator's fees and any other fees or costs unique to arbitration. Any awards or orders in such arbitrations may be entered and enforced as judgments in the federal and state courts of any competent jurisdiction.

7.12 Construction of Agreement. In the event of a conflict between the text of the Agreement and any summary, description or other information regarding the Agreement, the text of the Agreement shall control.

In Witness Whereof, the parties have executed this Agreement on the Effective Date written above.

Nanometrics Incorporated Rollin Kocher

By: /S/ Timothy Stultz /S/ Rollin Kocher

Name: Timothy Stultz

Title: President/CEO

<u>Exhibit A</u>

Release of Claims

In consideration of the payments and other benefits set forth in the General Severance Benefits and Change in Control Severance Benefits Agreement dated September 14th, 2016 to which this form is attached, I, Rollin Kocher, hereby furnish Nanometrics Incorporated (the " ***Company*** ") with the following release and waiver (" ***Release and Waiver*** ").

In exchange for the consideration provided to me by the Employment Agreement that I am not otherwise entitled to receive, I hereby generally and completely release the Company and its current and former directors, officers, employees, stockholders, partners, agents, attorneys, predecessors, successors, parent and subsidiary entities, insurers, affiliates, and assigns (collectively, the " ***Released Parties*** ") from any and all claims, liabilities and obligations, both known and unknown, that arise out of or are in any way related to events, acts, conduct, or omissions occurring prior to or on the date that I sign this Release and Waiver (collectively, the " ***Released Claims*** "). The Released Claims include, but are not limited to: (a) all claims arising out of or in any way related to my employment with the Company, or the termination of that employment; (b) all claims related to my compensation or benefits from the Company including salary, bonuses, commissions, vacation pay, expense reimbursements, severance pay, fringe benefits, stock, stock options, or any other ownership interests in the Company; (c) all claims for breach of contract, wrongful termination, and breach of the implied covenant of good faith and fair dealing; (d) all tort claims, including claims for fraud, defamation, emotional distress, and discharge in violation of public policy; and (e) all federal, state, and local statutory claims, including claims for discrimination, harassment, retaliation, misclassification, attorneys' fees, or other claims arising under the federal Civil Rights Act of 1964 (as amended), the federal Americans with Disabilities Act of 1990 (as amended), the federal Age Discrimination in Employment Act of 1967 (as amended) (the " ***ADEA*** "), the California Labor Code, and the California Fair Employment and Housing Act (as amended). Notwithstanding the foregoing, the following are not included in the Released Claims (the " ***Excluded Claims*** "): (a) any rights or claims for indemnification I may have pursuant to any written indemnification agreement with the Company to which I am a party, the charter, bylaws, or operating agreements of the Company, or under applicable law; (b) any rights or claims to unemployment compensation, funds accrued in my 401k account, or any vested equity incentives; (c) any rights that are not waivable as a matter of law; or (d) any claims arising from the breach of this Release and Waiver. I hereby represent and warrant that, other than the Excluded Claims, I am not aware of any claims I have or might have against any of the Released Parties that are not included in the Released Claims.

I also acknowledge that I have read and understand Section 1542 of the California Civil Code which reads as follows: " **A general release does not extend to claims which the creditor does not know or suspect to exist in his or her favor at the time of executing the release, which if known by him or her must have materially affected his or her settlement with the debtor.** " I hereby expressly waive and relinquish all rights and benefits under that Section and any law of any jurisdiction of similar effect with respect to any claims I may have against the Company.

I acknowledge that, among other rights, I am waiving and releasing any rights I may have under ADEA, that this Release and Waiver is knowing and voluntary, and that the consideration given for this

Release and Waiver is in addition to anything of value to which I was already entitled as an executive of the Company. If I am 40 years of age or older upon execution of this Releas e and Waiver, I further acknowledge that I have been advised, as required by the Older Workers Benefit Protection Act, that: (a) the release and waiver granted herein does not relate to claims under the ADEA which may arise after this Release and Waiver i s executed; (b) I should consult with an attorney prior to executing this Release and Waiver; and (c) I have twenty-one (21) days from the date of termination of my employment with the Company in which to consider this Release and Waiver (although I may ch oose voluntarily to execute this Release and Waiver earlier); (d) I have seven (7) days following the execution of this Release and Waiver to revoke my consent to this Release and Waiver; and (e) this Release and Waiver shall not be effective until the sev en (7) day revocation period has expired without my having previously revoked this Release and Waiver.

I acknowledge my continuing obligations under my Proprietary Information and Inventions Agreement. Pursuant to the Proprietary Information and Inventions Agreement I understand that among other things, I must not use or disclose any confidential or proprietary information of the Company and I must immediately return all Company property and documents (including all embodiments of proprietary information) and all copies thereof in my possession or control. I understand and agree that my right to the severance pay I am receiving in exchange for my agreement to the terms of this Release and Waiver is contingent upon my continued compliance with my Proprietary Information and Inventions Agreement.

This Release and Waiver constitutes the complete, final and exclusive embodiment of the entire agreement between the Company and me with regard to the subject matter hereof. I am not relying on any promise or representation by the Company that is not expressly stated herein. This Release and Waiver may only be modified by a writing signed by both me and a duly authorized officer of the Company.

KOCHER

/S/ Rollin Kocher

Date: 12/21/2016

Exhibit 21.1

List of Subsidiaries

Name	Jurisdiction
Nanometrics France S.A.S	France
Accent Optical Technologies (Germany) GmbH	Germany
Nanometrics (Switzerland) GmbH	Switzerland
Nanometrics U.K. Ltd.	United Kingdom
Nanometrics China Company Ltd.	China
Nanometrics Israel, Ltd.	Israel
Nanometrics Japan K.K.	Japan
Nanometrics Korea Limited	South Korea
Nanometrics Southeast Asia Pte. Limited	Singapore
Nanda Technologies GmbH	Germany

Exhibit 23.1

CONSENT OF INDEPENDENT REGISTERED PUBLIC ACCOUNTING FIRM

We hereby consent to the incorporation by reference in the Registration Statements on Form S-8 (Nos. 333-33583, 333-40866, 333-91714, 333-101137, 333-108474, 333-136557, 333-149339, 333-164088, 333-176502, 333-192183 and 333-213277) and on Form S-3 (No. 333-163168) of Nanometrics, Inc. of our report dated March 2, 2017 relating to the financial statements, financial statement schedule and the effectiveness of internal control over financial reporting, which appears in this Form 10-K.

/s/ PricewaterhouseCoopers LLP

San Jose, CA

March 2, 2017

Exhibit 31.1

Certification of the Principal Executive Officer Pursuant to

Act of Rules 13a-14(a) or 15d-14(a) of the Securities Exchange 1934,

As Adopted Pursuant to

Section 302 of the Sarbanes-Oxley Act of 2002

I, Timothy J. Stultz, the Chief Executive Officer of Nanometrics Incorporated, certify that:

1. I have reviewed this annual report on Form 10-K of Nanometrics Incorporated;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this annual report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this annual report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 2, 2017

By: /s/ Timothy J. Stultz
Timothy J. Stultz
Chief Executive Officer

Exhibit 31.2

Certification of the Principal Financial Officer Pursuant to

Rules 13a-14(a) or 15d-14(a) of the Securities Exchange Act of 1934,

As Adopted Pursuant to

Section 302 of the Sarbanes-Oxley Act of 2002

I, Jeffrey Andreson, the Chief Financial Officer of Nanometrics Incorporated, certify that:

1. I have reviewed this annual report on Form 10-K of Nanometrics Incorporated;

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this annual report;

4. The registrant's other certifying officer and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   (a) Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this annual report is being prepared;

   (b) Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, 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;

   (c) Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   (d) Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth quarter in the case of an annual report) that has materially affected or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   (a) All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   (b) Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: March 2, 2017

By: /s/ Jeffrey Andreson
Jeffrey Andreson
Chief Financial Officer

Exhibit 32.1

CERTIFICATION OF CHIEF EXECUTIVE OFFICER AND CHIEF FINANCIAL OFFICER

PURSUANT TO 18 U.S.C. SECTION 1350, AS ADOPTED

PURSUANT TO SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

Each of the undersigned hereby certifies, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, in his capacity as an officer of Nanometrics Incorporated (the "Company") that based on his knowledge:

1. The Annual Report on Form 10-K of the Company for the fiscal year ended December 31, 2016 (the "Report") fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended, and

2. The information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company.

Date:	March 2, 2017	By:	/S/ TIMOTHY J. STULTZ
		Name:	Timothy J. Stultz
		Title:	Chief Financial Officer

Date:	March 2, 2017	By:	/S/ JEFFREY ANDRESON
		Name:	Jeffrey Andreson
		Title:	Chief Financial Officer