UNITED STATES
SECURITIES AND EXCHANGE COMMISSION
Washington, D.C. 20549

Form 10-K

ANNUAL REPORT PURSUANT TO SECTION 13 OR 15(d) OF THE SECURITIES EXCHANGE ACT OF 1934
For the fiscal year ended December 31, 2018
Commission file number 0-31285

TTM TECHNOLOGIES, INC.
(Exact Name of Registrant as Specified in Its Charter)

Delaware	**91-1033443**
(State or Other Jurisdiction of Incorporation or Organization)	*(I.R.S. Employer Identification No.)*
1665 Scenic Avenue Suite 250, Costa Mesa, California	**92626**
(Address of Principal Executive Offices)	*(Zip Code)*

(714) 327-3000
(Registrant's telephone number, including area code)

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

Title of Each Class	Name of Each Exchange on Which Registered
Common Stock, $0.001 par value	Nasdaq Global Select Market

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 15(d) of the Act. Yes ☐ No ☑

Indicate by check mark whether the registrant: (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes ☑ No ☐

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

Indicate by check mark if disclosure of delinquent filers pursuant to Item 405 of Regulation S-K (§229.405 of this chapter) is not contained herein, and will not be contained, to the best of registrant's knowledge, in definitive proxy or information statements incorporated by reference in Part III of this Form 10-K or any amendment to this Form 10-K. ☑

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer", "smaller reporting company" and "emerging growth company" in Rule 12b-2 of the Exchange Act:

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

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

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

The aggregate market value of Common Stock held by non-affiliates of the registrant (based on the closing price of the registrant's Common Stock as reported on the Nasdaq Global Select Market on July 2, 2018, the last business day of the most recently completed second fiscal quarter), was $1,667,802,925. For purposes of this computation, all officers, directors, and 10% beneficial owners of the registrant are deemed to be affiliates of the registrant. Such determination should not be deemed to be an admission that such officers, directors, or 10% beneficial owners are, in fact, affiliates of the registrant.

As of February 21, 2019, there were outstanding 104,383,376 shares of the registrant's Common Stock, $0.001 par value.

DOCUMENTS INCORPORATED BY REFERENCE

Portions of the registrant's definitive Proxy Statement for its 2019 Annual Meeting of Stockholders are incorporated by reference into Part III of this report. Such Proxy Statement will be filed with the Securities and Exchange Commission within 120 days after the end of the fiscal year to which this report relates.

TTM TECHNOLOGIES, INC.

ANNUAL REPORT ON FORM 10-K

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PART I

Statement Regarding Forward-Looking Statements

This report on Form 10-K contains forward-looking statements regarding future events or our future financial and operational performance. Forward-looking statements include statements regarding markets for our products; trends in net sales, gross profits and estimated expense levels; liquidity and anticipated cash needs and availability; and any statement that contains the words "anticipate," "believe," "plan," "forecast," "foresee," "estimate," "project," "expect," "seek," "target," "intend," "goal" and other similar expressions. The forward-looking statements included in this report reflect our current expectations and beliefs, and we do not undertake publicly to update or revise these statements, even if experience or future changes make it clear that any projected results expressed in this annual report or future quarterly reports to stockholders, press releases or company statements will not be realized. In addition, the inclusion of any statement in this report does not constitute an admission by us that the events or circumstances described in such statement are material. Furthermore, we wish to caution and advise readers that these statements are based on assumptions that may not materialize and may involve risks and uncertainties, many of which are beyond our control, that could cause actual events or performance to differ materially from those contained or implied in these forward-looking statements. These risks and uncertainties include the business and economic risks described in "Item 1A — Risk Factors".

Unless otherwise indicated or unless the context requires otherwise, all references to time periods refer to our fiscal year, and all reference to "TTM," "our company," "we," "us," "our," and similar names refer to TTM Technologies, Inc. and its subsidiaries.

ITEM 1. *BUSINESS*

General

We are a leading global printed circuit board (PCB) manufacturer, focusing on quick-turn and volume production of technologically complex PCBs, backplane assemblies and electro-mechanical solutions (E-M Solutions), as well as a global designer and manufacturer of radio-frequency (RF) and microwave components and assemblies. We are the largest PCB manufacturer in North America and one of the largest PCB manufacturers in the world, in each case based on revenue, according to the 2017 rankings from N.T. Information LTD (NTI). In 2018, we generated $2.8 billion in net sales and ended the year with approximately 27,000 employees worldwide. We operate a total of 29 specialized facilities in North America and China. We focus on providing time-to-market and volume production of advanced technology products and offer a one-stop design, engineering and manufacturing solution to our customers providing engineering support and prototype product development as well as mass production of products for the customers we serve. This one-stop design and manufacturing solution allows us to align technology development with the diverse needs of our customers and to enable them to reduce the time required to develop new products and bring them to market. We serve a diversified customer base consisting of approximately 2,200 customers in various markets throughout the world, including aerospace and defense, automotive components, smartphones and touchscreen tablets, high-end computing, medical, industrial and instrumentation related products as well as networking/communications infrastructure products. Our customers include both original equipment manufacturers (OEMs) and electronic manufacturing services (EMS) providers.

We manage our worldwide operations based on two reportable segments: (1) *PCB*, which consists of sixteen domestic PCB, RF sub-system, and RF component fabrication plants, including two facilities that provide follow-on value-added services; nine PCB fabrication and RF component plants in China; and one in Canada; and (2) *E-M Solutions*, which consists of three custom electronic assembly plants in China. Each segment operates predominantly in the same industries with production facilities that produce customized products for our customers and use similar means of product distribution.

Additional information on our reportable segments and product information is contained in Note 18 of the Notes to Consolidated Financial Statements.

Acquisition of Anaren, Inc.

On April 18, 2018, we acquired all of the equity interests of Anaren, Inc. (Anaren) for a total consideration of $787.9 million. Anaren is a leading designer and provider of mission-critical RF solutions, microelectronics, and microwave components and assemblies for the wireless infrastructure and aerospace and defense electronics markets. Anaren's microwave products are used in wireless communication systems including wireless infrastructure, wireless consumer and medical applications, as well as advanced radar, beam-forming, jamming, motion control and receiver applications for the space and defense markets, covering a broad range of frequencies and power levels. Its Integrated Radio module product lines provide proprietary low power RF monitoring solutions deployable in a wide variety of end market applications.

Industry Overview

PCBs are manufactured in panels from sheets of laminated material. Each panel is typically subdivided into multiple PCBs, each consisting of a pattern of electrical circuitry etched from copper to provide an electrical connection between the components mounted to it. PCBs serve as the foundation for virtually all electronic products, including the electronic components integrated into automobiles, consumer electronics products (smartphones and touchscreen tablets), high-end commercial electronic equipment (such as medical equipment, data communications routers, switches and servers) and aerospace and defense electronic systems.

In recent years, the demand for smaller sized electronic devices with more features and functionality has been increasing. Products designed to offer faster data transmission, thinner and more lightweight packaging, and reduced power consumption generally require increasingly complex PCBs to meet these criteria. By using advanced processes such as High Density Interconnect (HDI) and modified semi-additive process (mSAP) technologies, circuit densities can be increased, thereby providing for smaller products with higher packaging densities. Furthermore, rigid-flex circuits can be found in small and lightweight end products, such as smartphones and touchscreen tablets and increasingly in other end markets such as automotive, industrial and aerospace and defense. PCB manufacturers also manufacture substrates that serve as the interconnect between integrated circuits (ICs) and the PCB. With the Anaren acquisition, we now also manufacture advanced RF components and sub-systems. We collectively refer to all of these technologies as "advanced technologies," and they generally have growth rates which are higher than conventional technologies. In addition, most of our markets have low volume requirements during the prototype stage that demand a highly flexible manufacturing environment which later transitions to a higher volume requirement during product ramp.

According to estimates in a November 2018 report by Prismark Partners, worldwide demand for PCBs was approximately $58.8 billion in 2017. Of this worldwide demand for production in 2017, Prismark Partners reports that PCB production in the Americas accounted for approximately 5% (approximately $2.7 billion), PCB production in China accounted for approximately 50% (approximately $29.7 billion), and PCB production in the rest of the world accounted for approximately 45% (approximately $26.4 billion). According to the same report by Prismark Partners, worldwide demand for PCBs is forecast to grow at a 4% compound annual growth rate (CAGR) from 2017 to 2022 driven mostly by multilayer boards and package substrates. Prismark Partners expects 5G wireless infrastructure to be a growth driver for the PCB market in 2019. In addition, Prismark Partners expects the PCB markets to have a moderate annual growth from 2019 onwards until it picks up again slightly in 2022.

Industry Trends

We believe that several trends impacting the PCB manufacturing industry which will benefit us in the future. These trends include:

Shorter electronic product life cycles, which create opportunities for PCB manufacturers that can offer engineering support in the prototype stage and manufacturing scalability throughout the production life cycle.

Increasing complexity of electronic products, which requires technologically complex PCBs that can accommodate higher speeds and component densities, including HDI, flexible, and substrate PCBs as well as intricately engineered RF components and subsystems.

Higher demand for reliable product manufactured in the U.S., encompassing better oversight on sub-tier supply chain materials and controls.

Growing utilization of PCB technology in automobiles. An increasing trend toward sophisticated safety systems, automated driving, electric/hybrid vehicles and miniaturization of electronic devices in the automotive industry is driving increasing electronic content and higher PCB usage in automobiles, particularly with regard to the increased demand for advanced technologies like HDI, rigid-flex and RF PCBs for radar.

Increasing concentration of global PCB production in Asia. China has emerged as a global production center for electronics manufacturers. We believe that the expected continued concentration of consumer electronic production in China should result in additional commercial market share potential for PCB manufacturers with a strong presence and reputation in China.

Supply chain consolidation by commercial OEMs. We believe that PCB manufacturers which can offer one-stop manufacturing capabilities — from prototype to volume production — have a competitive advantage in the market.

Our Strategy

Our goal is to be the leading global provider of time-critical, one-stop manufacturing services for highly complex PCBs and RF components. Our core strategy includes the following elements:

Provide differentiated capabilities beyond the base PCB by incorporating advanced design-to-specification engineering support, testing, components and specialized assembly into the value-added package provided to customers. With the acquisition of Anaren, TTM has moved beyond build to print manufacturing and assembly capabilities to engage with customers in designing a more complete RF solution to meet their technology needs. With the additional design capabilities, TTM now provides cost effective, ready for manufacture, enabling technologies to the customer. We intend to build on the Anaren acquisition to deepen our RF engagement with key aerospace and defense customers as well as to carry this same capability to our commercial automotive, telecom and networking customers.

Maintain our customer-driven culture and provide superior service to our customers in our core markets of aerospace and defense, automotive, cellular phones, computing and storage, medical/industrial/instrumentation, and networking/communications. Our customer-oriented culture is designed to achieve extraordinary service, competitive differentiation, and superior execution. Our customer-oriented strategies include engaging in co-development of new products, capturing new technology products for next generation equipment, and continuing investments to enhance our broad offering of PCB and RF/microwave technologies. We believe our ability to anticipate and meet customers' needs is critical to retaining existing customers and attracting leading companies as new customers.

Drive operational efficiency and productivity. We are highly focused on improving our operational execution to increase efficiency, productivity and yields. We strongly believe in the benefits of sharing best practices across our extensive manufacturing footprint and rely on stringent goals for throughput, quality and customer satisfaction to measure our effectiveness. The fast paced nature of our business requires a disciplined approach to manufacturing that is rooted in continuous improvement.

Accelerate customer and end-market diversification through strategic mergers and acquisitions. We have a history of executing successful acquisitions that have been key to our growth and profitability. We continuously look for strategic opportunities that could facilitate our efforts to further diversify into other growing end markets including automotive and aerospace and defense. Our acquisition of Anaren increased our service and product offering for our broad customer base. Additionally, our acquisition of Anaren deepened our engagement with existing leading customers in the telecom and aerospace and defense end markets, demonstrating the benefits of this strategy.

Accelerate our expansion into the automotive and other growing markets using our advanced technology as a key point of differentiation. With rising requirements for faster data transmission, shrinking features (i.e., lightweight and thin), and lower power consumption, many PCB designs have migrated to more complex HDI PCBs from conventional multi-layer PCB technologies. This trend began with PCBs used in portable devices such as smartphones and touchscreen tablets but has become an increasing trend in other end markets, such as automotive, networking/communications, medical, and aerospace and defense. We are focused in particular on the automotive opportunity where the combination of our strength in highly reliable conventional and RF PCBs and our advanced technology PCB product capabilities allows us to meet our automotive customers' growing demand in such areas as infotainment, radar systems, cameras for advanced driver assistance systems and electric vehicles. As our customers consolidate their supply chain, our objective is to differentiate ourselves as a strategic supplier with the technology breadth to meet most, if not all, of our automotive customers' PCB requirements.

Address customer needs in all stages of the product life cycle. By providing a one-stop solution, we work to service our customers' needs from the earliest stages of product design and development through volume production. We believe that by servicing our customers early in the development process, we are able to demonstrate our capabilities and establish an incumbent position early in the product development cycle, which translates into additional opportunities as our customers move into volume production. We believe our expertise is enhanced by our ability to deliver highly complex PCBs to customers in significantly compressed lead times. This rapid delivery service enables OEMs to develop sophisticated electronic products more quickly and reduce their time to market. We believe we will be able to increase customer engagement with our acquisition of Anaren's proprietary and customizable RF solutions from the concept stage through to volume, which typically results in higher customer engagement.

Deliver strong financial performance with improved asset turnover. We aspire to deliver industry-leading financial performance. We expect to achieve this by servicing our customers' needs in higher-growth end markets in a cost-efficient and effective manner. We believe that this strategy will allow us to generate strong cash flows, which will enable us to reduce financial leverage over time while at the same time providing us with the financial flexibility to continue to invest in our business, including through opportunistic acquisitions.

Products and Services

We offer a wide range of PCB products, RF components, and electro-mechanical solutions, including conventional PCBs, RF and microwave circuits, HDI PCBs, substrate-like PCBs, flexible PCBs, rigid-flex PCBs, custom assemblies and system integration, IC substrates, passive RF components, advanced ceramic RF components, hi-reliability multi-chip modules, and beamforming and switching networks. We also offer certain value-added services to support our customers' needs. These include design-for-manufacturability (DFM), PCB layout design, simulation and testing services, and quick turnaround (QTA) production. By offering this wide range of PCB products and complementary value-added services, we are able to provide our customers with a "one-stop" manufacturing solution for their PCB requirements. This differentiates us from our competition and enhances our relationships with our customers.

Conventional PCBs

A conventional PCB is made from a composite laminate that is metalized with a conductive material such as copper. The PCB is the basic platform used to interconnect components in most electronic products including computers, communications equipment, cellular phones, high-end consumer electronics, automotive controls, commercial aerospace and defense systems and medical and industrial equipment. Conventional PCBs can be classified as single-sided, double-sided and multi-layer boards.

We focus on higher layer count conventional PCBs. A multi-layer PCB can accommodate more complex circuitry than a single-sided or double-sided PCB and as such requires more sophisticated production techniques. The number of layers comprising a PCB often increases with the complexity of the end product. For example, a simple consumer device such as a garage door controller may use a single-sided or double-sided PCB, while a high-end network router or computer server may use a PCB with 30 or more layers.

RF and microwave circuits

We produce and test specialized circuits used in radio-frequency or microwave emission and collection applications. These products are typically used for radar, transmit/receive antennas and similar wireless applications. Markets for these products include defense, avionics, satellite, and commercial applications including telecom, networking and automotive. The manufacture of these products requires advanced materials, equipment, and methods that are highly specialized and distinct from conventional printed circuit manufacturing techniques. We also offer specialized radio-frequency assembly and test services. We have developed integrated solutions across our facilities and capabilities to provide sophisticated integrated electronics for numerous platforms, ranging from digital RF memory (DRFM) to frequency up/down converters (UDC) and channelized amplifiers for military and space applications.

High density interconnect or HDI PCBs

Our facilities in North America and China also produce high density interconnect (HDI) PCBs, which are PCBs with higher interconnect density per unit area requiring more sophisticated technology and manufacturing processes for their production than conventional PCB products. HDI PCBs are boards with high-density characteristics including micro-sized holes, or microvias (diameter at or less than 0.15 mm), and fine line circuitry (circuit line width and spacing at or less than 0.075 mm) and are fabricated with thin high performance materials, thereby enabling more interconnection functions per unit area. HDI PCBs generally are manufactured using a sequential build-up process in which circuitry is formed in the PCB one layer at a time through successive drilling, plating and lamination cycles. In general, a board's complexity is a function of interconnect and circuit density, layer count, laminate material type and surface finishes. As electronic devices have become smaller and more portable with higher functionality, demand for advanced HDI PCB products has increased dramatically. We define advanced HDI PCBs as those having more than one layer of microvia interconnection structure.

Substrate-like PCBs or SLPs

Substrate-like PCBs (SLPs) represent the next evolution of high end HDI PCBs. SLPs are PCBs with even higher interconnect density per unit area than the traditional Advanced HDI PCBs described above and require an even more sophisticated manufacturing technology called modified semi-additive process or mSAP. The mSAP process is adapted from IC substrate fabrication and uses enhancements to the subtractive and additive techniques of traditional PCBs. This enables fine line circuitry (circuit line width and spacing at or less than 0.03 mm). We manufacture SLPs with the mSAP process in our China facilities and the products are generally used in the cellular market which requires high performance in a small footprint. Demand for this type of high-density circuit is beginning to penetrate the markets of more traditional PCBs.

Flexible PCBs

Flexible PCBs are printed circuits produced on flexible films, allowing them to be folded or bent to fit the available space or allowing for application movement. We manufacture circuits on flexible substrates that can be installed in three-dimensional applications for electronic packaging systems. Use of flexible circuitry can enable improved reliability and electrical performance, reduced weight and reduced assembly costs when compared with traditional wire harness or ribbon cable packaging. Flexible PCBs can provide for flexible electronic connectivity of an electrical device's apparatus such as printer heads, cameras, camcorders, TVs, mobile handsets, and tablets. For some of our flexible PCB customers, we also assemble components onto the flexible PCBs we manufacture.

Rigid-flex PCBs

Rigid-flex circuitry provides a simple means to integrate multiple PCB assemblies and other elements such as display, input or storage devices without wires, cables or connectors, replacing them with thin, light composites that integrate wiring in ultra-thin, flexible ribbons between rigid sections. In rigid-flex packaging, a flexible circuit substrate provides a backbone of wiring with rigid multilayer circuit sections built up as modules where needed.

Since the ribbons can be bent or folded, rigid-flex provides a means to compactly package electronics in three dimensions with dynamic or static bending functions as required, enabling miniaturization and thinness of product design. The simplicity of rigid-flex integration also generally reduces the number of parts and interconnections required, which can improve reliability. The increasing popularity of mobile electronics coupled with the design trend of developing increasingly thinner, lighter and more feature-rich products, is expected to further drive growth in the rigid-flex and flex sectors, where these PCBs are the backbone of miniaturization.

Rigid-flex technology is essential to a broad range of applications including aerospace and defense, industrial and transportation systems requiring high reliability; hand-held and wearable electronics such as mobile phones, video cameras and music players where thinness and mechanical articulation are essential; and ultra-miniaturized products such as headsets, medical implants and semiconductor packaging where size and reliability are paramount.

Custom assemblies and system integration

Our assembly facilities produce custom electronic assemblies as well as fully integrated electronic systems. Custom electronic assemblies refers to a variety of PCB assemblies such as backplane and midplane assemblies, flexible and rigid-flex assemblies and RF assemblies. Each of these assemblies involves mounting electronic components to a printed circuit board and then testing the assembly for electrical continuity. Our services also go beyond the PCB assembly to fully integrated systems. A fully integrated system often includes installing the PCB assembly into a metal enclosure and adding fans for cooling the system, a power supply and cable assemblies to create a fully assembled and tested system that will be shipped to our customers.

IC substrates

IC substrates provide the mechanical support and electrical interconnect used to package ICs (integrated circuits or semiconductors) either in single chip packages or multi-chip modules. IC substrates, also known as chip carriers, are highly miniaturized circuits manufactured by a process largely similar to that for PCBs but requiring the use of ultra-thin materials and including micron-scale features, because they must bridge the gap between sub-micron IC features and millimeter scale PCBs. Consequently, IC substrates are generally manufactured in a clean room environment to ensure products are free of defects and contamination and employs advanced HDI processes such as mSAP.

Passive RF Components

Our line of products consists of off-the-shelf surface mount microwave components which provide passive microwave signal distribution functions. These products were developed to provide a low-cost high performance signal distribution component, which could be placed on standard printed circuit boards with automated production equipment. The primary applications of these products are in equipment for cellular base stations and in WLAN, Bluetooth, and satellite television. In cellular base stations, our surface mount products are utilized in RF power amplifiers, and are also found in low-noise amplifiers and radios.

Advanced Ceramic RF Components

Our ceramic offerings include standard and etched thick-film ceramic substrates. Etched thick-film ceramic circuits compete favorably with thin-film ceramic circuits in cost while providing comparable performance. These products are generally customer designed in close cooperation with our engineering staff to ensure the highest performance and manufacturability possible. These capabilities are aimed at high performance applications in the medical, industrial, and defense markets.

Hi-Reliability Multi-Chip Modules

We offer custom hybrid and multi-chip modules, high-performance radiation-hardened and space-qualified micro-electronics and power management and control electronics.

Beamforming and Switching Networks

Our beamforming technologies are used in military and aerospace applications, offering a variety of active and passive high-performance RF assemblies, including L-band/LEO and L- and S-band/GEO space beamformers, UHF thru Ka-band radar AESA RF networks, Butler matrices, multi-octave, and more.

Quick turnaround services

We refer to our rapid delivery services as “quick turnaround” or “QTA”, because we provide custom-fabricated PCBs to our customers within as little as 24 hours to ten days. As a result of our ability to rapidly and reliably respond to the critical time requirements of our customers, we generally receive premium pricing for our QTA services as compared to standard lead time prices.

- *Prototype production.* In the design, testing, and launch phase of a new electronic product’s life cycle, our customers typically require limited quantities of PCBs in a very short period of time. We satisfy this need by manufacturing prototype PCBs in small quantities, with delivery times ranging from as little as 24 hours to ten days.
- *Ramp-to-volume production.* After a product has successfully completed the prototype phase, our customers introduce the product to the market and require larger quantities of PCBs in a short period of time. This transition stage between low-volume prototype production and volume production is known as ramp-to-volume. Our ramp-to-volume services typically include manufacturing up to a few hundred PCBs per order with delivery times ranging from five to 15 days.

Thermal management

Increased component density on circuit boards often requires improved thermal dissipation to reduce operating temperatures. We produce printed circuits with heavy copper cores and both embedded and press-fit coins. In addition, we produce PCBs with electrically passive heat sinks laminated externally on a circuit board or between two circuit boards, as well as PCBs with electrically active thermal cores.

Manufacturing Technologies

The market for our products is characterized by rapidly evolving technology. In recent years, the trend in the electronic products industry has been to increase the speed, complexity, and performance of components while reducing their size. We believe our technological capabilities allow us to address the needs of manufacturers to bring complicated electronic products to market faster.

To manufacture PCBs, we generally receive circuit designs directly from our customers in the form of computer data files, which we review to ensure data accuracy and product manufacturability. Processing these data files with computer aided manufacturing (CAM) technology, we generate images of the circuit patterns that we then physically develop on individual layers, using advanced photographic and direct imaging processes. Through a variety of plating and etching processes, we selectively add and remove conductive materials to form horizontal layers of thin circuitry, which are separated by electrical insulating material. A multilayer circuit board is produced by laminating together multiple layers of circuitry, using intense heat and pressure under vacuum. Vertical connections between layers are achieved by drilling and plating through small holes, called vias. Vias are made by highly specialized drilling equipment capable of achieving extremely fine tolerances with high accuracy. We specialize in high layer count PCBs with extremely fine geometries and tolerances. Because of the tolerances involved, we employ clean rooms in certain manufacturing processes where tiny particles might otherwise create defects on the circuit patterns. We also use automated optical inspection systems and electrical testing systems to ensure consistent quality of the circuits we produce.

We believe that our highly specialized equipment and advanced manufacturing processes enable us to reliably produce PCBs with the following characteristics:

- *High layer count.* Manufacturing PCBs with a large number of layers is difficult to accomplish due to the accumulation of manufacturing tolerances and registration systems required. In our PCB reportable segment, we regularly manufacture PCBs with more than 30 layers on a quick-turn and volume basis.
- *Blind and buried vias*. Vias are drilled holes that provide electrical connectivity between layers of circuitry in a PCB. Blind vias connect the surface layer of the PCB to an internal layer and terminate at the internal layer. Buried vias are holes that do not reach either surface of the PCB but allow inner layers to be interconnected. Products with blind and buried vias can be made thinner, smaller, lighter and with higher component density and more functionality than products with traditional vias.
- *Microvias*. HDI technology utilizes microvias, which are small vias with diameters generally less than 0.15 mm after plating. Advanced HDI products may also require the microvias to be fully filled using a specialized plating process so that additional microvia structures can be stacked to form more complex interconnections. These microvias consume much less space on the layers they connect, thereby providing for greater wiring densities and flexibility, and also providing closer spacing of components and their attachment pads. The fabrication of PCBs with microvias requires specialized equipment, such as laser drills, and highly developed process knowledge. Applications such as handheld wireless devices employ microvias to obtain a higher degree of functionality from a given surface area.
- *Embedded passives.* Embedded passive technology involves embedding either capacitive or resistive elements inside the PCB, which allows for removal of passive components from the surface of the PCB and thereby leaves more surface area for active components. Use of this technology provides greater surface area for surface-mounted ICs and better signal performance, as well as increased functionality of products with higher component density.
- *Fine line traces and spaces.* Traces are the connecting copper lines between the different components of the PCB, and spaces are the distances between traces. The smaller the traces and the tighter the spaces, the higher the density of the PCB and the greater the expertise required to achieve a desired final yield performance level. We are able to manufacture PCBs with traces and spaces less than 0.030 mm.
- *High aspect ratios.* The aspect ratio is the ratio between the thickness of the PCB and the diameter of a drilled hole. As the aspect ratio increases, it becomes increasingly more difficult to consistently and reliably form, electroplate and finish all the holes on a PCB. In production, we are able to provide aspect ratios of up to 30:1.
- *Thin core processing.* A core is the basic inner-layer building block material from which PCBs are constructed. A core consists of a flat sheet of material comprised of glass-reinforced resin with copper foil laminated on either side. The thickness of inner-layer cores is typically determined by the overall thickness of the PCB and the number of layers required. The demand for thinner cores derives from the requirements for thinner PCBs, higher layer counts and various electrical parameters. Core thickness in our PCBs ranges from as little as 0.025 mm up to 1.57 mm.
- *Advanced hole fill processes.* Our advanced hole fill processes provide designers the opportunity to increase the density of component placements by reducing the surface area required to place many types of components. In traditional design, components are routed from their surface interfaces through via connections in order to access power and ground connections and the internal circuitry used to connect to other discrete components. Our advanced hole fill processes provide methods to allow for vias to be placed inside their respective surface mount pads by filling the vias with a thermoset epoxy and plating flat copper surface mount pads directly over the filled hole.

- *Advanced materials.* We manufacture circuit boards using a wide variety of advanced dielectric materials. These high-performance materials offer electrical, thermal, and long-term reliability advantages over conventional materials but are more difficult to manufacture. We are certified by Underwriters Laboratories to manufacture PCBs using many types and combinations of these specialty materials. This broad offering allows us to manufacture PCBs for a wide array of end-use applications, including highly complex PCBs for niche and high-end commercial and aerospace and defense markets.
- *Quick Turn Manufacturing*. In addition, in circumstances where our customers require time critical engineering and manufacturing services, we are able to meet our customers' need with our quick-turn manufacturing capabilities.

Our RF Engineering organization principally designs and manufactures state-of-the-art microwave-based hardware for use in advanced radar systems, advanced jamming systems, missiles and decoys, electronic surveillance systems and satellite and ground based communication systems. Several core manufacturing technology areas include:

- *Microwave Assembly Technology.* Our Microwave product capabilities include simple isolator components for large scale phased array radars to very complex highly integrated Electronic Warfare Line Replaceable Units. All products are designed internally to customer specifications using the latest versions of microwave design and simulation software, coupled with an extensive internal design library. Our radar beamforming solutions are realized through internal design, manufacturing and highly automated test processes for circulators, RF distribution and manifold assemblies. Automated pick-and-place, surface mount reflow, fully automated visual inspection and automated test stands ensure highly repeatable integrated microwave assembly performance. Our environmental lab test capability is used for product qualification and Highly Accelerated Life Testing when required.
- *Analog Hybrid Module Technology.* Analog Hybrid Modules are assembled in our Microelectronics Center of Excellence, which is certified to MIL-PRF-38534 and -38535 Class H and Class K. We continue to invest in state-of-the-art equipment for precision microelectronic assembly processes including custom ceramic substrate manufacturing, eutectic die attach, automated epoxy dispense, wire bonding, lid attach and lead forming. All parts are electrically tested for performance and subjected to environmental testing as may be required.
- *Ceramic Technology.* Low Temperature Co-fired Ceramic (LTCC) circuits are well-suited for high performance RF packages for multi-function applications such as transmit-receive modules or other RF integrated modules. We developed proprietary processes to allow for the use of less expensive conductors (Silver vs. traditional Gold) in the LTCC product thus providing significantly lower cost options to our customers. We developed a proprietary etched thick film process resulting in thin film performance at a much reduced cost. We recently deployed customized equipment to support automated test, visual and electrical inspection, and final tape-and-reel for ceramic resistor products significantly reducing cost and enhancing product quality.

Drawing on our vertical manufacturing capabilities, E-M Solutions delivers system integration solutions that power, protect, cool and enable our customers' products to function as intended. These in-house vertical capabilities include Higher Level Assemblies (HLA) incorporating TTM produced printed circuit boards and backplanes, PCB assemblies and backplane assemblies, fabricated precision sheet metal chassis, enclosures and weldments. As a contract manufacturer, we also selectively procure such products and services from third providers on an exception basis.

E-M Solutions manufacture a wide range of products for customers in the Automotive / Electric Vehicle, Energy, Industrial and Network Communications segments.

Our customers provide us data packages that may include: 3D models, 2D drawings, wiring diagrams, circuit design computer data files, circuit assembly computer data files and multi-level bills of material. Also included are testing requirement specifications for PCB assemblies, backplane assemblies and HLA, and qualification / verification requirements for the product.

When processing the data package, our Engineering and Operations teams ensure data accuracy and product manufacturability. Detailed reviews at both component and assembly levels are conducted at E-M Solutions to ensure repeatable and controlled manufacturing and assembly process.

The E-M solutions PCB assemblies and backplane assemblies manufacturing capability has been developed to support high reliability products. Automated Optical Inspection (AOI) capabilities encompass solder paste and component placement and ensure the precise alignment of components both before and after the reflow soldering process, Through Hole Placing (THP), selective solder, 3D x-ray, hi-pot testing, in-circuit testing, functional circuit testing and selective conformal coating.

Chassis, enclosures and weldments are manufactured in-house utilizing smart flexible manufacturing techniques that deliver cost effective products with minimal up-front investment.

Our smart HLA lines deliver precise repeatable processes. A complete manufacturing history report is automatically generated during the HLA process that includes verification of serialized parts, full traceability of: materials; torque levels; in-line tests; in-process checks; start and finish time of each step throughout the process while providing real time visibility tracking of product output versus plan.

Customers and Markets

Our customers include both OEMs and EMS companies that primarily serve the aerospace and defense, automotive, cellular phone, computing, medical/industrial/instrumentation, and networking/communications end markets of the electronics industry. Included in the end markets that our OEM and EMS customers serve is the U.S. government. As a result, we are a supplier, primarily as a subcontractor, to the U.S. government.

The following table shows the percentage of our net sales in each of the principal end markets we served for the periods indicated:

	For the Year Ended		
End Markets (1)	December 31, 2018 (3)	January 1, 2018	January 2, 2017
Aerospace and Defense	22 %	16 %	15 %
Automotive	18	19	20
Cellular Phone (2)	13	18	14
Computing/Storage/Peripherals (2)	14	13	12
Medical/Industrial/Instrumentation	14	14	14
Networking/Communications	17	18	23
Other (2)	2	2	2
Total	100 %	100 %	100 %

(1) Sales to EMS companies are classified by the end markets of their OEM customers.

(2) Smartphones are included in the Cellular Phone end market, tablets are included in the Computing/Storage/Peripherals end market and other consumer devices that include wearables, portable video devices and personal headphones are included in the Other end market.

(3) Amounts include activity of Anaren since acquisition which occurred on April 18, 2018.

Sales attributable to our five largest OEM customers, which can vary from year to year, collectively accounted for 32%, 37%, and 33%, of our net sales in fiscal years 2018, 2017 and 2016, respectively. Our five largest OEM customers in 2018 were, in alphabetical order, Apple Inc., Collins Aerospace, Huawei Technology Co. Ltd., Raytheon Company and Robert Bosch GmbH. For the fiscal year 2018, Apple accounted for 15% of our net sales. Sales attributed to OEMs include sales made through EMS providers. Sales to EMS providers comprised approximately 37%, 32%, and 35% of our net sales in fiscal years 2018, 2017 and 2016, respectively. Although our contractual relationships are with the EMS companies, we typically negotiate price and volume requirements directly with the OEMs. In addition, we are on the approved vendor lists of several of our EMS providers. This positions us to participate in business that is awarded at the discretion of the EMS provider.

Our sales and marketing strategy focuses on building long-term relationships with our customers' engineering and new product introduction personnel early in the product development phase, frequently through strategic account management teams. Traditional build to print opportunities involve TTM engineering with design for manufacture reviews and recommendations for both manufacturability and cost without impacting specifications. Prototype builds to verify design ensue, along with the early stages of production. As the product then matures from the prototype stage to volume production, we shift our focus to the customers' procurement departments in order to capture sales at each point in the product's life cycle. The addition of Anaren's design to specification capabilities allows us to engage at the onset in the engineering cycle at critical aerospace and defense, automotive, telecom, and networking customers as they begin the process of specifying an RF requirement. At that stage, we are able to support our customers by designing a complete or specific portions of an RF solution as well as providing early prototyping and test support for that solution. TTM will then provide the ramp to volume and volume production requirements for our customers.

Our staff of engineers, sales support personnel, and managers assists our sales representatives in advising customers with respect to manufacturing feasibility, design review, and technological capabilities through direct communication and visits. We combine our sales efforts with customer service personnel at each facility to better serve our customers. Each large customer is typically assigned an account manager to coordinate all of the Company's services across all of our facilities. Additionally, the largest and most strategic customers are also supported by select program management and engineering teams. Our global sales force is comprised of direct sales personnel, complemented by commission-based independent representatives, and supports customers throughout North America, Europe, Asia and the Middle East.

Our North America footprint comprises a significant amount of our PCB reportable segment with seventeen PCB fabrication plants located in California, Colorado, Connecticut, New Hampshire, New York, Ohio, Oregon, Utah, Virginia, Wisconsin, and Ontario, Canada. The footprint includes two facilities that provide follow-on value-added services.

Our China footprint includes facilities from both our PCB and E-M Solutions reportable segments with nine PCB fabrication plants located in Hong Kong, Huiyang, Dongguan, Guangzhou, Shanghai, Suzhou and Zhongshan, China, and three custom assembly and system integration operations in Shanghai and Shenzhen, China.

For certain risk attendant to our foreign operations, see Item 1A, *Risk Factors*.

For information regarding credit to customers, see Note 12 of the Notes to Consolidated Financial Statements.

Suppliers

The primary raw materials we use in PCB manufacturing include copper-clad laminate, chemical solutions such as copper and gold for plating operations, photographic film, carbide drill bits, and plastic for testing fixtures. Although we have preferred suppliers for some raw materials used in the manufacture of PCBs, most of our raw materials are generally readily available in the open market from numerous other potential suppliers.

The primary raw materials we use in RF components, RF subsystems, backplane assemblies and other PCB assemblies are manufactured components such as PCBs, ceramic and ferrite substrates, connectors, capacitors, resistors, diodes and integrated circuits, many of which are custom made and controlled by our customers' approved vendors. The more complicated RF subsystems may require us to purchase integrated sub-assemblies and super-components such as RF Oscillators, Frequency Converters, Power Supplies and Microprocessors. These components for backplane assemblies and other PCB assemblies in some cases have limited or sole sources of supply. For example, in some instances, our customers will require us to use a specific component from a particular supplier or require us to use a component provided by the customer itself, in which case we may have a single or limited number of suppliers for these specific components. The backplane assemblies, PCB assemblies and precision metal fabricated chassis and enclosures produced by us may be incorporated into a fully integrated and tested system delivered to our customer. These products often incorporate procured power, thermal, interconnect and mechanical components sourced from customer directed or our selected suppliers.

We typically use just-in-time procurement practices to maintain our raw materials inventory at low levels and work closely with our suppliers to obtain technologically advanced raw materials. In addition, we periodically seek alternative supply sources to ensure that we are receiving competitive pricing and service. Adequate amounts of all raw materials have been available in the past, and we believe this availability will continue into the foreseeable future.

Competition

Despite industry consolidation, the PCB industry remains fragmented and characterized by intense competition. There are several competitive factors our customers consider when choosing their supplier including, but not limited to, technical capabilities, pricing, service, support, reliability, and quality production. Our principal PCB and substrate competitors include AT&S (Austria Technologie & Systemtechnik AG), Chin Poon Industrial Co., Ltd., Compeq Manufacturing Co., Ltd., IBIDEN Co., Ltd., ISU Petasys Co., Ltd., Multek Corporation, Sanmina Corporation, Tripod Technology Corp., Unimicron Technology Corp., and Wus Printed Circuit Co., Ltd. Our principal E-M Solutions competitors include Amphenol Corporation, Flex, Jabil, Inc. and Sanmina Corporation. Our competition for RF products include Cobham, Crane, TRM Microwave, Mercury Systems, AVX, Molex, and Smiths.

We believe that our key competitive strengths include:

Leading global PCB manufacturer. We are one of the largest and most diversified PCB manufacturers in the world and enjoy significant economies of scale, with net sales of $2.8 billion for fiscal 2018. The PCB industry is highly fragmented with the top 20 PCB providers comprising approximately 51% of market share in 2017, according to NTI. As our customers consolidate their supply base, we offer the technology breadth and scale to emerge as a preferred partner.

Breadth of technology and products. We offer a wide range of PCB and RF products as well as electro-mechanical solutions, including HDI PCBs, conventional PCBs, flexible PCBs, rigid-flex PCBs, custom assemblies, passive RF components, advanced ceramic RF components, hi-reliability multi-chip modules, beamforming and switching networks, and integrated circuit (IC) substrates. We also offer certain value-added services to support our customers' needs. These include RF design to specification capability, design for manufacturability (DFM), PCB layout design, simulation and testing services, and QTA services. By providing these value-added services to customers, we are able to provide our customers with a "one-stop" manufacturing solution, which we believe enhances our relationships with our customers.

Diversified business model. Our sales are diversified by a well-balanced portfolio of end markets which we serve and by the customers we sell to within those end markets. We believe this diversity reduces our exposure to, and reliance on, any single end market or customer. We enjoy a large and diverse customer base with over 2,200 customers, as well as long-term relationships in excess of ten years with our ten largest customers. For fiscal 2018, net sales to our top five customers represented approximately 32% of our total net sales. Furthermore, for fiscal 2018, our largest five customers are not concentrated in any single end market, but rather are represented across four of our end markets.

Focused on attractive end markets with a favorable growth outlook and dependence on sophisticated product capabilities. We believe that our global manufacturing footprint and breadth of capabilities enables us to serve several key end markets for the PCB industry. The automotive industry in particular provides an opportunity for us as we combine our traditional market strength in core automotive engine controls with the advanced technologies and RF capabilities we offer for growing requirements in safety systems, automated driving and infotainment.

One-stop solution for customers. We are capable of providing a one-stop manufacturing solution to our customers from engineering support and prototype development through final volume production around the globe. This one-stop manufacturing solution allows us to better serve our customers, many of whom are based in time-critical high growth markets, enabling our customers to reduce the time required to develop new products and bring them to market. We utilize a facility specialization strategy in which each customer is directed to the facility best suited to the customer's product type, delivery time, complexity and volume needs, which enables us to reduce the time from order placement to delivery. As our customers ramp to volume, we are positioned to seamlessly transition them to one of our volume facilities in China.

Leading aerospace and defense supplier. We provide the aerospace and defense industry with products in North America from our broad North American footprint. We have passed OEM and government certification processes, and administrative requirements associated with participation in government and commercial aerospace programs. When supplying various departments and agencies of the U.S. government, we are required to maintain facility security clearances under the National Industrial Security Program Operating Manual and International Traffic in Arms Regulations. Along with supply of traditional and RF PCBs, we offer a variety of RF components and sub-assemblies, as well as our engineering services and assembly capabilities which allow us to bring additional value to our customers.

Seasonality

Orders for our products generally correspond to the production schedules of our customers. We historically experience higher net sales in the third and fourth quarters due to end customer demand in the fourth quarter for consumer electronics products. Seasonal fluctuations also include the Chinese New Year holidays in the first quarter, which typically results in lower net sales. We attribute this decline to shutdowns of our customers' and our own China based manufacturing facilities surrounding the Chinese New Year public holidays, which normally occur in January or February of each year.

Backlog

Backlog consists of purchase orders received, including, in some instances, demand agreements released for production under customer contracts. We obtain firm purchase orders from our customers for all products. However, for some of these purchase orders, customers do not make firm schedules for delivery more than 90 days in advance. Therefore, we measure backlog as orders with deliveries scheduled over the next 90 days. At December 31, 2018, total backlog was $458.4 million, compared with $481.9 million at the end of 2017. Substantially all backlog at December 31, 2018 is expected to be converted to sales in the first quarter of 2019. Additionally, we typically experience a higher amount of backlog in the second half of the year due to increased end customer demand for consumer electronics products in the fourth quarter, which is consistent with our seasonal patterns as discussed above.

Intellectual Property

The Anaren business that we acquired designs and manufactures products for its existing customer base and also designs off-the-shelf products for the customers we serve. With the Anaren acquisition, we acquired an additional thirty-six patents to complement our existing patent portfolio. Because our PCB business depends on the effectiveness of our fabrication techniques, proprietary PCB structures, and our ability to continually improve our manufacturing processes, we have strategically limited patent and trade secret protection for our PCB products and manufacturing processes relative to our size as a company. We rely on the collective experience of our employees in the manufacturing process to ensure that we continuously evaluate and adopt new technologies available within our industry. In addition, we depend on robust training, recruiting, and retention of our employees, who are required to be knowledgeable in the operation of advanced equipment and complicated manufacturing processes. In regards to our RF products, the vast majority are proprietary and protected or covered by thirty-six patents and eleven currently pending patent applications directed towards products for both the wireless infrastructure and aerospace and defense markets. Following the Anaren acquisition, we now have a total of 112 patents.

National Security Matters

A portion of our business consists of manufacturing defense and defense-related items for various departments and agencies of the U.S. government, including the U.S. Department of Defense (DoD), which requires that we maintain facility security clearances under the National Industrial Security Program Operating Manual, or NISPOM. The NISPOM requires that a corporation with significant foreign ownership maintaining a facility security clearance take steps to prevent foreign control or influence, referred to as "FOCI." Pursuant to these laws and regulations, effective October 2010, we entered into a Special Security Agreement (SSA) with the DoD; Su Sih (BVI) Limited, or Su Sih (a foreign owner of our capital stock), and Mr. Tang Hsiang Chien (as the beneficial owner of Su Sih). At that time, Su Sih owned approximately 35% of the total outstanding shares of our common stock. The purpose of the SSA is to deny Mr. Tang, Su Sih, and other persons affiliated with our China operations, unauthorized access to classified and export controlled unclassified information and to mitigate any influence over our business or management in a manner that could result in the compromise of classified information or could adversely affect the performance of classified contracts. As of December 31, 2018, Su Sih ownedapproximately 5.9% of the total outstanding shares ofour common stock.

Other Governmental Regulations

Our operations, particularly those in North America, are subject to a broad range of regulatory requirements relating to export control, environmental compliance, waste management, and health and safety matters. In particular, we are subject to the following:

- U.S. Department of State regulations, including the Arms Export Control Act (AECA) and International Traffic In Arms Regulations (ITAR) located at 22 CFR Parts 120-130;
- U.S. Department of Commerce regulations, including the Export Administration Regulations (EAR) located at 15 CFR Parts 730-744;
- Office of Foreign Asset Control (OFAC) regulations located at 31 CFR Parts 500-599;
- U.S. Occupational Safety and Health Administration (OSHA), and state OSHA and Department of Labor laws pertaining to health and safety in the workplace;
- U.S. Environmental Protection Agency regulations pertaining to air emissions; waste water discharges; and the use, storage, discharge, and disposal of hazardous chemicals used in the manufacturing processes; the reporting of chemical releases to the environment; and the reporting of chemicals manufactured in by-products that are beneficially recycled;
- Department of Homeland Security regulations regarding the storage of certain chemicals of interest;
- corresponding state laws and regulations, including site investigation and remediation;
- corresponding U.S., county and city agencies;
- corresponding regulations and agencies in China for our Chinese facilities;
- material content directives and laws that ban or restrict certain hazardous substances in products sold in member states of the European Union, China, and other countries and jurisdictions;
- SEC rules that require reporting of the use of certain metals (conflict minerals) originating in the Democratic Republic of the Congo and the 9 countries surrounding it pursuant to Section 1502 of the Dodd-Frank Act; and
- reporting requirements of the California Transparency in Supply Chains Act of 2010 that requires reporting on efforts to eradicate slavery and human trafficking in retailers' and manufacturers' supply chains.

The process to manufacture PCBs requires adherence to domestic and foreign environmental regulations regarding the storage, use, handling, recycling, and disposal of chemicals, solid wastes and other hazardous materials, as well as compliance with air quality standards and chemical use reporting. We believe that our facilities in the United States and Canada comply in all material respects with applicable environmental laws and regulations. In China, governmental authorities have adopted new rules and regulations governing environmental issues. Our plants in China are not yet in full compliance with the newly adopted environmental regulations. We have developed plans in response to the new regulation and we are in the process of implementing these plans. We have established and enacted an investment plan related to the efforts to come into full compliance with the new regulations. There can be no assurance that violations will not occur in the future.

Employees

As of December 31, 2018, we had approximately27,000 employees. Of our employees, approximately 25,100 were involved in manufacturing and engineering, 690 worked in sales and marketing, and approximately 1,210 worked in accounting, information systems and other support capacities. None of our North American employees are represented by unions. In China, approximately 18,000 employees are members of the All-China Federation of Trade Unions and accordingly are considered to be represented by a labor union. We have not experienced any labor problems resulting in a work stoppage and we believe that we have good relations with our employees.

Availability of Reports Filed with the Securities and Exchange Commission

We are a Delaware corporation founded in 1998, with our principal executive offices located at 1665 Scenic Avenue, Suite 250, Costa Mesa, CA 92626. Our telephone number is (714) 327-3000. Our website address is *www.ttm.com*. Information included on our website is not incorporated into this report. Our annual reports on Form 10-K, quarterly reports on Form 10-Q, current reports on Form 8-K and amendments to those reports are available without charge on our website at https://investors.ttm.com/, as soon as reasonably practicable after they are filed or furnished electronically with the Securities and Exchange Commission (SEC). Our SEC filings are also available to the public at www.sec.gov. Copies are also available without charge by (i) telephonic request by calling our Investor Relations Department at (714) 327-3000, (ii) e-mail request to investor@ttmtech.com, or (iii) a written request to TTM Technologies, Inc., Attention: Investor Relations, 1665 Scenic Avenue, Suite 250, Costa Mesa, CA 92626.

ITEM 1A. *RISK FACTORS.*

An investment in our common stock involves a high degree of risk. You should carefully consider the factors described below, in addition to those discussed elsewhere in this report, in analyzing an investment in our common stock. If any of the events described below occurs, our business, financial condition, and results of operations would likely suffer, the trading price of our common stock could fall, and you could lose all or part of the money you paid for our common stock. The risk factors described below are not the only ones we face. Risks and uncertainties not known to us currently, or that may appear immaterial, also may have a material adverse effect on our business, financial condition, and results of operations.

In addition, the following risk factors and uncertainties could cause our actual results to differ materially from those projected in our forward-looking statements, whether made in this report or the other documents we file with the SEC, or our annual or quarterly reports to stockholders, future press releases, or orally, whether in presentations, responses to questions, or otherwise.

Risks Related to our Business

Uncertainty and adverse changes in the economy and financial markets could have an adverse impact on our business and operating results.

Uncertainty or adverse changes in the economy could lead to a significant decline in demand for the end products manufactured by our customers, which, in turn, could result in a decline in the demand for our products and pressure to reduce our prices. Any decrease in demand for our products could have an adverse impact on our financial condition, operating results and cash flows. Uncertainty and adverse changes in the economy could also increase the cost and decrease the availability of potential sources of financing and increase our exposure to losses from bad debts, either of which could have a material adverse effect on our financial condition, operating results and cash flows.

The Company may experience cash flow volatility.

We experience fluctuations in our revenues and cost structure and the resulting cash flows and expect that this will continue to occur in the future. We experience fluctuations in our cash flows for reasons that include (i) the types and complexity, number, size, timing and duration of client engagements; (ii) the timing of revenue recognition under U.S. GAAP; (iii) the seasonality of our business; (iv) fluctuations in costs of labor; (v) fluctuations in the cost and availability of raw materials; (vi) fluctuations in demand for our products; (vii) the length of billing and collection cycles and changes in amounts that may become uncollectible; (viii) changes in the frequency and complexity of government regulatory and enforcement activities; (ix) timing of customer payments; (x) fluctuations in the exchange rates of various currencies against the U.S. dollar; and (xi) economic factors beyond our control. Such fluctuations could affect our ability to meet our obligations including debt repayments. Any failure to meet our financial obligations could have a material adverse effect on our financial position and results of operations.

We serve customers and have manufacturing facilities outside the United States and are subject to the risks characteristic of international operations, including recently imposed tariffs.

We have significant manufacturing operations in Asia and Canada and sales offices located in Asia and Europe, and we continue to consider additional opportunities to make foreign investments and construct new foreign facilities.

For the year ended December 31, 2018, we generated approximately 66% of our net sales from non-U.S. operations, and a significant portion of our manufacturing material was provided by international suppliers during this period. The United States' trade policies and those of foreign countries are subject to change which could adversely affect our ability to purchase and sell goods and materials without significant tariffs, taxes or duties that may be imposed on the materials we purchase or the goods we sell, thereby increasing the cost of such materials and potentially decreasing our margins. Further, our revenues could be impacted if our customers' ability to sell their goods is reduced by such tariffs, taxes or duties. Both the U.S. and Chinese governments have included PCBs among items subjected to tariffs imposed on imports from such countries, which may negatively impact our revenue and profitability. In addition, we are subject to risks relating to significant international operations, including but not limited to:

- managing international operations;
- imposition of governmental controls;
- unstable regulatory environments;
- compliance with employment laws;
- implementation of disclosure controls, internal controls, financial reporting systems, and governance standards to comply with U.S. accounting and securities laws and regulations;
- limitations on imports or exports of our product offerings;
- fluctuations in the value of local currencies;
- inflation or changes in political and economic conditions;

- labor unrest, rising wages, difficulties in staffing, and geographical labor shortages;
- government or political unrest;
- longer payment cycles;
- language and communication barriers, as well as time zone differences;
- cultural differences;
- increases in duties and taxation levied on our products;
- other potentially adverse tax consequences;
- imposition of restrictions on currency conversion or the transfer of funds;
- travel restrictions;
- expropriation of private enterprises;
- the potential reversal of current favorable policies encouraging foreign investment and trade; and
- the potential for strained trade relationships between the United States and its trading partners, including trade tariffs which could create competitive pricing risk.

We have substantial outstanding indebtedness, and our outstanding indebtedness could adversely impact our liquidity and flexibility in obtaining additional financing, our ability to fulfill our debt obligations and our financial condition and results of operations.

We have substantial debt and, as a result, we have significant debt service obligations. We maintain $250.0 million of Convertible Senior Notes due 2020 at an interest rate of 1.75%, a $835.9 million Term Loan Facility due 2024 (Term Loan Facility) at a floating rate of LIBOR plus 2.5%, $375.0 million of Senior Notes due 2025 (Senior Notes) at an interest rate of 5.63%, $40.0 million outstanding under a $200.0 million U.S. Asset-Based Lending Credit Agreement (U.S. ABL), and $30.0 million outstanding under a $150.0 million Asia Asset-Based Lending Credit Agreement (Asia ABL). We and a number of our direct and indirect subsidiaries also have various credit facilities and letters of credit. Such agreements also contain certain financial covenants which require us to maintain, under the occurrence of certain events, a consolidated fixed charge coverage ratio.

Subject to the limits contained in the credit agreements governing the Term Loan Facility, the U.S. ABL, the Asia ABL, the indenture governing the Senior Notes, and our other debt instruments, we may be able to incur substantial additional debt from time to time to finance working capital, capital expenditures, investments or acquisitions, or for other purposes. If we do so, the risks related to our high level of debt could intensify. Specifically, our high level of debt could have important consequences to us and our shareholders. For example, it could:

- make it more difficult for us to satisfy our obligations with respect to our indebtedness, which could in turn result in an event of default on such indebtedness;
- require us to use a substantial portion of our cash flow from operations for debt service payments, thereby reducing the availability of cash for working capital, capital expenditures, acquisitions and other general corporate purposes;
- impair our ability to obtain additional financing in the future for working capital, capital expenditures, acquisitions and other investments or general corporate purposes, which may limit our ability to execute our business strategy;
- diminish our ability to withstand a downturn in our business, the industry in which we operate or the economy generally and restrict us from exploiting business opportunities or making acquisitions;
- limit our flexibility in planning for, or reacting to, changes in our business and the industry in which we operate or the general economy;
- increase our vulnerability to general adverse economic and industry conditions, including movements in interest rates, which could result in increased borrowing costs;
- limit management’s discretion in operating our business; and
- place us at a competitive disadvantage as compared to our competitors that have less debt as it could limit our ability to capitalize on future business opportunities and to react to competitive pressures or adverse changes.

In addition, the indenture governing the Senior Notes and the credit agreements governing the Term Loan Facility, the U.S. ABL and the Asia ABL contain restrictive covenants that will limit our ability to engage in activities that may be in our long-term best interest. Our failure to comply with those covenants could result in an event of default which, if not cured or waived, could result in the acceleration of all our debt.

Servicing our debt requires a significant amount of cash and we may not be able to generate sufficient cash toservice all of our debt and may be forced to take other actions to satisfy our obligations under our debt, which may not be successful.

During 2018, after the closing of our April 18, 2018 incremental loans facility, we made optional debt principal prepayments of $110.0 million. As a result of our prepayments, we are no longer required to make any quarterly scheduled payments. However, based on certain parameters defined in the term loan facilities, including a First Lien Leverage Ratio, we may be required to make an additional principal payment on an annual basis.

Our ability to make scheduled payments on or to refinance our debt obligations and to fund planned capital expenditures and expansion efforts depends on our ability to generate cash in the future and our financial condition and operating performance, which are subject to prevailing economic and competitive conditions and to certain regulatory, competitive, financial, business and other factors beyond our control. We cannot assure you that we will maintain a level of cash flows from operating activities sufficient to permit us to pay the principal, premium, if any, and interest on our debt.

If our cash flows and capital resources are insufficient to fund our debt service obligations, we could face substantial liquidity problems and could be forced to reduce or delay investments and capital expenditures or to dispose of material assets or operations, seek additional capital (which could include obtaining additional equity capital on terms that may be onerous or highly dilutive) or restructure or refinance our indebtedness. We may not be able to effect any such alternative measures, if necessary, on commercially reasonable terms or at all and, even if successful, those alternative actions may not allow us to meet our scheduled debt service obligations. The credit agreements governing the Term Loan Facility, the U.S. ABL and the Asia ABL, the indenture governing the Senior Notes will restrict our ability to dispose of assets and use the proceeds from those dispositions and may also restrict our ability to raise debt or equity capital to be used to repay other indebtedness when it becomes due. We may not be able to consummate those dispositions or to obtain proceeds in an amount sufficient to meet any debt service obligations then due.

In addition, we conduct certain of our operations through our subsidiaries. Accordingly, repayment of our indebtedness may be dependent on the generation of cash flow by our subsidiaries and their ability to make such cash available to us, by dividend, debt repayment or otherwise. Unless they are guarantors of the Senior Notes or our other indebtedness, our subsidiaries do not have any obligation to pay amounts due on our indebtedness or to make funds available for that purpose. Our subsidiaries may not be able to, or may not be permitted to, make distributions to enable us to make payments in respect of our indebtedness. Each subsidiary is a distinct legal entity, and under certain circumstances, legal and contractual restrictions may limit our ability to obtain cash from our subsidiaries. While the indenture governing the Senior Notes and the credit agreements governing the Term Loan Facility, the U.S. ABL and the Asia ABL will limit the ability of our subsidiaries to incur consensual restrictions on their ability to pay dividends or make other intercompany payments to us, these limitations are subject to qualifications and exceptions. In the event that we do not receive distributions from our subsidiaries, we may be unable to make required principal and interest payments on our indebtedness.

Our inability to generate sufficient cash flows to satisfy our debt obligations, or to refinance our indebtedness on commercially reasonable terms or at all, would materially and adversely affect our financial position and results of operations and our ability to satisfy our obligations under our indebtedness.

If we cannot make scheduled payments on our debt, we will be in default and holders of the Senior Notes could declare all outstanding principal and interest to be due and payable, the lenders under the Term Loan Facility, the U.S. ABL and the Asia ABL could terminate their commitments to loan money, the lenders could foreclose against the assets securing their borrowings and we could be forced into bankruptcy or liquidation.

Despite our current level of indebtedness, we and our subsidiaries may still be able to incur substantially more debt. This could further exacerbate the risks to our financial condition described above.

We and our subsidiaries may be able to incur significant additional indebtedness in the future. Although the indenture governing the Senior Notes and the credit agreements governing the Term Loan Facility, the U.S. ABL and the Asia ABL will contain restrictions on the incurrence of additional indebtedness, these restrictions are subject to a number of qualifications and exceptions, and the additional indebtedness incurred in compliance with these restrictions could be substantial. These restrictions also will not prevent us from incurring obligations that do not constitute indebtedness.

Our variable rate indebtedness subjects us to interest rate risk, which could cause our debt service obligations to increase significantly.

Borrowings under the Term Loan Facility, the U.S. ABL and the Asia ABL are at variable rates of interest and expose us to interest rate risk. If interest rates were to increase, our debt service obligations on the variable rate indebtedness would increase even though the amount borrowed remained the same, and our net income and cash flows, including cash available for servicing our indebtedness, will correspondingly decrease. On May 15, 2018, we entered into an interest rate swap arrangement with a notional amount of $400.0 million, which expires on June 1, 2022, in order to reduce interest rate volatility exposure. This arrangement effectively converts $400.0 million of our variable rate debt to fixed rate. Under the terms of the interest rate swap, we would pay a fixed rate of 2.84% and would receive floating 1-month LIBOR during the swap period.

For illustrative purposes and assuming all loans under the Term Loan Facility, the U.S. ABL and the Asia ABL were fully drawn, each quarter point change in interest rates would result in a $2.0 million change in annual interest expense on our indebtedness under the Term Loan Facility, the U.S. ABL and the Asia ABL, after giving effect to our interest rate swap.

A lowering or withdrawal of the ratings assigned to our debt securities by rating agencies may increase our future borrowing costs and reduce our access to capital.

Our debt has a non-investment grade rating, and any rating assigned could be lowered or withdrawn entirely by a rating agency if, in that rating agency's judgement, future circumstances relating to the basis of rating, such as adverse changes, so warrant. Any future lowering of our ratings likely would make it more difficult or more expensive for us to obtain additional debt financing.

Possible replacement of the LIBOR benchmark interest rate may have an impact on our financial condition or results of operations.

On July 27, 2017, the Financial Conduct Authority (FCA), a regulator of financial services firms in the United Kingdom, announced that it intends to stop persuading or compelling banks to submit LIBOR rates after 2021. The FCA and the submitting LIBOR banks have indicated they will support the LIBOR indices through 2021 to allow for an orderly transition to an alternative reference rate. In the United States, efforts to identify a set of alternative U.S. dollar reference interest rates include proposals by the Alternative Reference Rates Committee of the Federal Reserve Board. Other financial services regulators and industry groups are evaluating the possible phase-out of LIBOR and the development of alternate reference rate indices or reference rates. Many of our assets and liabilities are indexed to LIBOR. We are evaluating the potential impact of the possible replacement of the LIBOR benchmark interest rate, but are not able to predict whether LIBOR will cease to be available after 2021, whether the alternative rates the Federal Reserve Board proposes to publish will become market benchmarks in place of LIBOR, or what the impact of such a transition will have on our financial condition or results of operations.

If we are unable to maintain satisfactory capacity utilization rates, our business, financial condition, and results of operations would be materially adversely affected.

Given the high fixed costs of our operations, decreases in capacity utilization rates can have a significant effect on our business. Accordingly, our ability to maintain or enhance gross margins will continue to depend, in part, on maintaining satisfactory capacity utilization rates. In turn, our ability to maintain satisfactory capacity utilization will depend on the demand for our products, the volume of orders we receive, and our ability to offer products that meet our customers' requirements at competitive prices. If current or future production capacity fails to match current or future customer demands, our facilities would be underutilized, our sales may not fully cover our fixed overhead expenses, and we would be less likely to achieve expected gross margins. If forecasts and assumptions used to support the realizability of our long-lived assets change in the future, significant impairment charges could result that would materially adversely affect our business, financial condition, and results of operations.

In addition, we generally schedule our quick turnaround production facilities at less than full capacity to retain our ability to respond to unexpected additional quick-turn orders. However, if these orders are not received, we may forego some production and could experience continued excess capacity. If we conclude we have significant, long-term excess capacity, we may decide to permanently close one or more of our facilities and lay off some of our employees. Closures or lay-offs could result in our recording restructuring charges such as severance, other exit costs, and asset impairments, as well as potentially causing disruptions in our ability to supply customers.

We participate in a competitive and cyclical industry, which is subject to economic volatility and strict quality control standards. Failure to forecast demand and production to meet desired sales levels and quality standards may adversely affect our business, financial condition and results of operations.

A significant portion of our sales are to customers within the telecommunications and automotive industry. The telecommunications industry is characterized by intense competition, relatively short product life cycles, and significant fluctuations in product demand, which is heavily dependent on the end markets it serves and therefore can be affected by the demand patterns of those markets. If the volatility in the telecommunications industry continues, it may have a material adverse effect on our business, financial condition and result of operations. The automotive industry has historically experienced multi-year cycles of growth and decline. In recent years, we have generally witnessed a growth cycle with the exception of unit sales decline evident in the last two quarters of 2018. If sales of automobiles should decline or go into a cyclical down turn, our sales could decline and this could have a materially adverse impact on our business, financial condition and result of operations.

In addition, for safety reasons, automotive customers have strict quality standards that generally exceed the quality requirements of other customers. If such products do not meet these quality standards, our business, financial condition, and results of operations may be materially adversely affected. These automotive customers may require long periods of time to evaluate whether our manufacturing processes and facilities meet their quality standards. If we were to lose automotive customers due to quality control issues, we might not be able to regain those customers or gain new automotive customers for long periods of time, which could have a material adverse effect on our business, financial condition, and results of operations. Moreover, we may be required under our contracts with automotive industry customers to indemnify them for the cost of warranties and recalls relating to our products.

We are exposed to the credit risk of some of our customers and to credit exposures in weakened markets.

Most of our sales are on an "open credit" basis, with standard industry payment terms. We monitor individual customer payment capability in granting such open credit arrangements, seek to limit such open credit to amounts we believe the customers can pay, and maintain reserves we believe are adequate to cover exposure for doubtful accounts. During periods of economic downturn in the electronics industry and the global economy, our exposure to credit risks from our customers increases. Although we have programs in place to monitor and mitigate the associated risks, such programs may not be effective in reducing our credit risks.

Additionally, our OEM customers often direct a significant portion of their purchases through a relatively limited number of EMS companies. Sales to EMS companies represented approximately 37%, 32% and 35% of our net sales for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively. Our contractual relationship is often with the EMS companies, who are obligated to pay us for our products. Because we expect our OEM customers to continue to direct our sales to EMS companies, we expect to continue to be subject to this credit risk with a limited number of EMS customers. If one or more of our significant customers were to become insolvent or were otherwise unable to pay us, our business, financial condition, and results of operations would be materially adversely affected.

We rely on the cellular phone and mobile technology industry for a significant portion of sales. The economic volatility in this industry has had, and may continue to have, a material adverse effect on our ability to forecast demand and production and to meet desired sales levels.

A large percentage of our business is conducted with customers who are in the cellular phone and mobile technology industry. This industry is characterized by intense competition, short product life cycles, seasonality, particularly around the year-end holiday season, and significant fluctuations in consumer demand. This industry is heavily dependent on consumers and therefore can be affected by their demand patterns. If the volatility in this industry continues, it may have a material adverse effect on our business, financial condition, and results of operations.

We depend upon a relatively small number of OEM customers for a large portion of our sales, and a decline in sales to major customers would materially adversely affect our business, financial condition, and results of operations.

A small number of customers are responsible for a significant portion of our sales. Our five largest OEM customers accounted for approximately 32%, 37% and 33% of our net sales for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively, and one customer represented 15% of our net sales for the year ended December 31, 2018. Sales attributed to OEMs include both direct sales as well as sales that the OEMs place through EMS providers. Our customer concentration could fluctuate, depending on future customer requirements, which will depend in large part on market conditions in the electronics industry segments in which our customers participate. The loss of one or more significant customers or a decline in sales to our significant customers would materially adversely affect our business, financial condition, and results of operations. In addition, we generate significant accounts receivable in connection with providing manufacturing services to our customers. If one or more of our significant customers were to become insolvent or were otherwise unable to pay for the manufacturing services provided by us, our business, financial condition, and results of operations would be materially adversely affected.

In addition, during industry downturns, we may need to reduce prices to limit the level of order losses, and we may be unable to collect payments from our customers. There can be no assurance that key customers would not cancel orders, that they would continue to place orders with us in the future at the same levels as experienced by us in prior periods, that they would be able to meet their payment obligations, or that the end-products that use our products would be successful. This concentration of customer base may materially adversely affect our business, financial condition, and results of operations due to the loss or cancellation of business from any of these key customers, significant changes in scheduled deliveries to any of these customers, or decreases in the prices of the products sold to any of these customers.

We are heavily dependent upon the worldwide electronics industry, which is characterized by economic cycles and fluctuations in product demand. A downturn in the electronics industry or prolonged global economic crisis could result in decreased demand for our manufacturing services and materially adversely affect our business, financial condition, and results of operations.

A majority of our revenue is generated from the electronics industry, which is characterized by intense competition, relatively short product life cycles, and significant fluctuations in product demand. The industry is subject to economic cycles and recessionary periods. Due to the uncertainty in the end markets served by most of our customers, we have a low level of visibility with respect to future financial results. Consequently, our past operating results, earnings, and cash flows may not be indicative of our future operating results, earnings, and cash flows.

Changes in prices or availability of raw materials could have a material adverse effect on our business, financial condition, and results of operations and reduce our gross margins.

To manufacture PCBs, we use raw materials such as laminated layers of fiberglass, copper foil, chemical solutions, gold, copper and other commodity products, which we order from our suppliers. For RF components, we use various high performance materials such as ceramics and printed circuit board materials. In the case of backplane assemblies, components include connectors, sheet metal, capacitors, resistors and diodes, many of which are custom made and controlled by our customers' approved vendors.

If raw material and component prices increase or if there is inflationary pressure on the cost of the metals that we use to produce our product, especially copper, it may reduce our gross margins. Should the supply of materials used in our above manufacturing processes become limited, our ability to obtain the quantities necessary to meet our customers' demand may be impacted which could cause us to encounter reduced revenue levels or price increases which would impact our profit margins. If either of these situations occurs, our financial condition and results of operations could be negatively impacted.

Our operations in China subject us to risks and uncertainties relating to the laws and regulations of China.

Under its current leadership, the government of China has been pursuing economic reform policies, including the encouragement of foreign trade and investment and greater economic decentralization. No assurance can be given, however, that the government of China will continue to pursue such policies, that such policies will be successful if pursued, or that such policies will not be significantly altered from time to time, particularly in light of the increasingly tense trade climate with the United States. Despite progress in developing its legal system, China does not have a comprehensive and highly developed system of laws, particularly with respect to foreign investment activities and foreign trade. Enforcement of existing and future laws and contracts is uncertain, and implementation and interpretation thereof may be inconsistent. As the Chinese legal system develops, the promulgation of new laws, changes to existing laws, and the preemption of local regulations by national laws may adversely affect foreign investors. Further, any litigation in China may be protracted and may result in substantial costs and diversion of resources and management's attention. In addition, though changes in government policies and rules are timely published or communicated, there is usually no indication of the duration of any grace period before which full implementation and compliance will be required. As a result, we may operate our business in violation of new rules and policies before full compliance can be achieved. These uncertainties could limit the legal protections available to us and adversely impact our results of operations.

We depend on the U.S. government for a significant portion of our business, which involves unique risks. Changes in government defense spending or regulations could have a material adverse effect on our business, financial condition, and results of operations.

A significant portion of our revenues is derived from products and services that are ultimately sold to the U.S. government by our OEM and EMS customers and is therefore affected by, among other things, the federal government budget process. We are a supplier, primarily as a subcontractor, to the U.S. government and its agencies, as well as foreign governments and agencies. The contracts between our direct customers and the government end user are subject to political and budgetary constraints and processes, changes in short-range and long-range strategic plans, the timing of contract awards, the congressional budget authorization and appropriation processes, the government's ability to terminate contracts for convenience or for default, as well as other risks, such as contractor suspension or debarment in the event of certain violations of legal and regulatory requirements.

For the year ended December 31, 2018, aerospace and defense sales accounted for approximately 22% of our total net sales. The substantial majority of aerospace and defense sales are related to both U.S. and foreign military and defense programs. While we do not sell any significant volume of products directly to the U.S. government, we are a supplier to the U.S. government and its agencies, as well as foreign governments and agencies. Consequently, our sales are affected by changes in the defense budgets of the U.S. and foreign governments and may be affected by federal budget sequestration measures.

The domestic and international threat of terrorist activity, emerging nuclear states, and conventional military threats have led to an increase in demand for defense products and services and homeland security solutions in the recent past. The U.S. government, however, is facing unprecedented budgeting constraints and political strife, including the longest partial government shutdown in history. The termination or failure to fund one or more significant contracts by the U.S. government due to these uncertain activities could have a material adverse effect on our business, financial condition, and results of operations.

Future changes to the U.S. Munitions List could reduce or eliminate restrictions that currently apply to some of the products we produce. If these regulations or others are changed in a manner that reduces restrictions on products being manufactured overseas, we would likely face an increase in the number of competitors and increased price competition from overseas manufacturers, who are restricted by the current export laws from manufacturing products for U.S. defense systems.

We may be unable to hire and retain sufficient qualified personnel, and the loss of any of our key executive officers could materially adversely affect our business, financial condition, and results of operations.

We believe that our future success will depend in large part on our ability to attract and retain highly skilled, knowledgeable, sophisticated, and qualified managerial and professional personnel. We may not be able to retain our executive officers and key personnel or attract additional qualified management in the future. We can make no assurances that future changes in executive management will not have a material adverse effect on our business, financial condition, or results of operations. Our business also depends on our continuing ability to recruit, train, and retain highly qualified employees, particularly engineering and sales and marketing personnel. The competition for these employees is intense, and the loss of these employees could harm our business. Further, our ability to successfully integrate acquired companies depends in part on our ability to retain key management and existing employees at the time of the acquisition.

Increasingly, our customers are requesting that we enter into supply agreements with them that have restrictive terms and conditions. These agreements typically include provisions that increase our financial exposure, which could result in significant costs to us.

Increasingly, our customers are requesting that we enter into supply agreements with them. These agreements typically do not include volume commitments, but do include provisions that generally serve to increase our exposure for product liability and limited sales returns, which could result in higher costs to us as a result of such claims. In addition, these agreements typically contain provisions that seek to limit our operational and pricing flexibility and extend payment terms, which could materially adversely affect our cash flow, business, financial condition, and results of operations.

We may need additional capital in the future to fund investments in our operations, refinance our indebtedness, and to maintain and grow our business, and such capital may not be available on a timely basis, on acceptable terms, or at all.

Our business is capital-intensive, and our ability to increase revenue, profit, and cash flow depends upon continued capital spending. To the extent that the funds generated by our ongoing operations are insufficient to cover our liquidity requirements, we may need to raise additional funds through financings. If we are unable to fund our operations and make capital expenditures as currently planned or if we do not have sufficient liquidity to service the interest and principal payments on our debt, it would have a material adverse effect on our business, financial condition, and results of operations. If we do not achieve our expected operating results, we would need to reallocate our sources and uses of operating cash flows. This may include borrowing additional funds to service debt payments, which may impair our ability to make investments in our business. Looking ahead at long-term needs, we may need to raise additional funds for a number of purposes, including the following:

- to fund capital equipment purchases to increase production capacity, upgrade and expand our technological capabilities and replace aging equipment or introduce new products;
- to refinance our existing indebtedness;
- to fund our operations beyond 2019;
- to fund working capital requirements for future growth that we may experience;
- to enhance or expand the range of services we offer;
- to increase our sales and marketing activities; or
- to respond to competitive pressures or perceived opportunities, such as investment, acquisition, and international expansion activities.

Should we need to raise funds through incurring additional debt, we may become subject to covenants even more restrictive than those contained in our current debt instruments. There can be no assurance that additional capital, including any future equity or debt financing, would be available on a timely basis, on favorable terms, or at all. If such funds are not available to us when required or on acceptable terms, our business, financial condition, and results of operations could be materially adversely affected.

The complete integration of Anaren presented significant challenges to TTM, and although TTM has realized some of the expected cost savings and synergies, TTM may not realize all of such benefits as quickly as expected.

TTM and Anaren operated independently until consummation of the acquisition on April 18, 2018. Specifically, the following issues and potential risks, among others, must be addressed in continuing the integration of the operations of TTM and Anaren in order to fully realize the anticipated benefits of the acquisition so the combined company performs as expected:

- combining the businesses of TTM and Anaren and meeting the capital requirements of the combined company in a manner that permits the combined company to achieve the cost savings or revenue synergies anticipated to result from the acquisition, the failure of which would result in the anticipated benefits of the acquisition not being realized in the time frame currently anticipated or at all;
- harmonizing the companies' operating practices, employee development and compensation programs, internal controls, and other policies, procedures, and processes;
- potential deterioration in the financial performance of TTM and acquired Anaren business, including any potential deviation in results of operations from historical levels;

- demands on management related to the increase in the size of our company after the acquisition;
- difficulties and risks in the integration of departments and systems (including accounting, health information and management information systems), technologies (including software), books and records and procedures, as well as in maintaining uniform standards and controls (including internal control over financial reporting and related procedures and policies); and
- other unanticipated issues, expenses, or liabilities that could materially adversely affect our ability to realize any expected synergies on a timely basis, or at all.

If we cannot successfully finish the integration of the acquisition of Anaren, we may experience material negative consequences to our business, financial condition, or results of operations. Successful integration of TTM and Anaren depends on our ability to manage these operations, to realize opportunities for revenue growth and to eliminate redundant and excess costs. Because of difficulties in combining the two companies, we may not be able to achieve all of the benefits that we expected to achieve as a result of the acquisition.

We are subject to risks of currency fluctuations.

A portion of our cash, other current assets and current liabilities is held in currencies other than the U.S. dollar. Changes in exchange rates among other currencies and the U.S. dollar will affect the value of these assets or liabilities as re-measured to U.S. dollars on our balance sheet. To the extent that we ultimately decide to repatriate some portion of these funds to the United States, the actual value transferred could be impacted by movements in exchange rates. Any such type of movement could negatively impact the amount of cash available to fund operations or to repay debt. Additionally, we have revenues and costs denominated in currencies other than the U.S. dollar (primarily the RMB). Fluctuations in the exchange rates between the U.S. dollar and the RMB could result in increases or decreases in our costs or revenues which could negatively impact our business, financial condition, and results of operations. Significant inflation or disproportionate changes in foreign exchange rates could occur as a result of general economic conditions, acts of war or terrorism, changes in governmental monetary or tax policy, or changes in local interest rates Further, China's government imposes controls over the convertibility of RMB into foreign currencies, which subjects us to further currency exchange risk.

Our results of operations are often subject to demand fluctuations and seasonality. With a high level of fixed operating costs, even small revenue shortfalls would decrease our gross margins.

Our results of operations fluctuate for a variety of reasons, including:

- timing of orders from and shipments to major customers;
- the levels at which we utilize our manufacturing capacity;
- price competition;
- changes in our mix of revenues generated from quick-turn versus standard delivery time services;
- expenditures, charges or write-offs, including those related to acquisitions, facility restructurings, or asset impairments; and
- expenses relating to expanding existing manufacturing facilities.

A significant portion of our operating expenses is relatively fixed in nature, and planned expenditures are based in part on anticipated orders. Accordingly, unexpected revenue shortfalls may decrease our gross margins. In addition, we have experienced sales fluctuations due to seasonal patterns in the capital budgeting and purchasing cycles, as well as inventory management practices of our customers and the end markets we serve. In particular, the seasonality of the cellular phone and tablet industries and quick-turn ordering patterns affect the overall PCB industry. These seasonal trends have caused fluctuations in our operating results in the past and may continue to do so in the future. Results of operations in any period should not be considered indicative of the results that may be expected for any future period. In addition, our future quarterly operating results may fluctuate and may not meet the expectations of securities analysts or investors.

If we are unable to respond to rapid technological change and process development, we may not be able to compete effectively.

The market for our manufacturing services is characterized by rapidly changing technology and continual implementation of new production processes. The future success of our business will depend in large part upon our ability to maintain and enhance our technological capabilities, to manufacture products that meet changing customer needs, and to successfully anticipate or respond to technological changes on a cost-effective and timely basis. We expect that the investment necessary to maintain our technological position will increase as customers make demands for products and services requiring more advanced technology on a quicker turnaround basis. For example, in 2019 we expect to continue to make significant capital expenditures to expand our HDI, mSAP, and other advanced manufacturing capabilities. We may not be able to obtain access to additional sources of funds in order to respond to technological changes as quickly as our competitors. In addition, failure to adopt and implement technological improvements quickly may cause inefficiencies as our product yields or quality may decrease, resulting in increased costs.

In addition, the PCB industry could encounter competition from new or revised manufacturing and production technologies that render existing manufacturing and production technology less competitive or obsolete. We may not respond effectively to the technological requirements of the changing market. If we need new technologies and equipment to remain competitive, the development, acquisition, and implementation of those technologies and equipment will require us to make significant capital investments.

Products we manufacture may contain design or manufacturing defects, which could result in reduced demand for our services and liability claims against us.

We manufacture products to our customers' specifications, which are highly complex and may contain design or manufacturing errors or failures, despite our quality control and quality assurance efforts. Defects in the products we manufacture, whether caused by a design, manufacturing, or materials failure or error, may result in delayed shipments, customer dissatisfaction, a reduction or cancellation of purchase orders, or liability claims against us. If these defects occur either in large quantities or too frequently, our business reputation may be impaired. Since our products are used in products that are integral to our customers' businesses, errors, defects, or other performance problems could result in financial or other damages to our customers beyond the cost of the PCB, for which we may be liable. Although our invoices and sales arrangements generally contain provisions designed to limit our exposure to product liability and related claims, existing or future laws or unfavorable judicial decisions could negate these limitation of liability provisions. In addition, we manufacture products for a range of automotive customers. If any of our products are or are alleged to be defective, we may be required to participate in a recall of such products. As suppliers become more integral to the vehicle design process and assume more of the vehicle assembly functions, vehicle manufacturers are increasingly looking to their suppliers for contributions when faced with product liability claims or recalls. In addition, vehicle manufacturers, which have traditionally borne the costs associated with warranty programs offered on their vehicles, are increasingly requiring suppliers to guarantee or warrant their products and may seek to hold us responsible for some or all of the costs related to the repair and replacement of parts supplied by us to the vehicle manufacturer.

Our results can be adversely affected by rising labor costs.

There is uncertainty with respect to rising labor costs, particularly within China, where we have most of our manufacturing facilities. In recent periods there have been regular and significant increases in the minimum wage payable in various provinces of China. In addition, we have experienced very high employee turnover in our manufacturing facilities in China, generally after the Chinese New Year, and we are experiencing ongoing difficulty in recruiting employees for these facilities. Furthermore, labor disputes and strikes based partly on wages have in the past slowed or stopped production by certain manufacturers in China. In some cases, employers have responded by significantly increasing the wages of workers at such plants. Any increase in labor costs due to minimum wage laws or customer requirements about scheduling and overtime that we are unable to recover in our pricing to our customers could materially adversely affect our business, financial condition, and results of operations. In addition, the high turnover rate and our difficulty in recruiting and retaining qualified employees and the other labor trends we are noting in China could result in a potential for defects in our products, production disruptions or delays, or the inability to ramp production to meet increased customer orders, resulting in order cancellation or imposition of customer penalties if we are unable to deliver products in a timely manner.

To respond to competitive pressures and customer requirements, we may further expand internationally in lower-cost locations. If we pursue such expansions, we may be required to make additional capital expenditures. In addition, the cost structure in certain countries that are now considered to be favorable may increase as economies develop or as such countries join multinational economic communities or organizations, causing local wages to rise. As a result, we may need to continue to seek new locations with lower costs and the employee and infrastructure base to support PCB manufacturing. We cannot assure investors that we will realize the anticipated strategic benefits of our international operations or that our international operations will contribute positively to our operating results.

In North America, low unemployment rates are making it difficult to recruit and retain employees and we are experiencing wage inflation pressures, some of which are mandated by local and state governments. Further, we are experiencing rising health care costs. While we strive to manage these challenges, there can be no assurance that our efforts will succeed which would result in higher costs and lower profits.

Unanticipated changes in our tax rates or in our assessment of the realizability of our deferred income tax assets or exposure to additional income tax liabilities could affect our business, financial condition, and results of operations.

We are subject to income taxes in the United States and various foreign jurisdictions. Significant judgment is required in determining our provision for income taxes and, in the ordinary course of business, there are many transactions and calculations in which the ultimate tax determination is uncertain. Our effective tax rates could be materially adversely affected by changes in the mix of earnings in countries and states with differing statutory tax rates, changes in the valuation of deferred income tax assets and liabilities, changes in tax laws, as well as other factors. Our tax determinations are regularly subject to audit by tax authorities, and developments in those audits could adversely affect our income tax provision. Although we believe that our tax estimates are reasonable, the final determination of tax audits or tax disputes may be different from what is reflected in our historical income tax provisions, which could materially adversely affect our business, financial condition, and results of operations.

On December 22, 2017, the President of the United States signed into law H.R. 1 (the "U.S. Tax Act"). The U.S. Tax Act includes a number of provisions, including the lowering of the U.S. corporate tax rate from 35% to 21%, effective January 1, 2018. There are also provisions that partially offset the benefit of such rate reduction, such as the repeal of the deduction for domestic production activities, limitations on interest deductibility, limitations on executive compensation, changes impacting the recognition of revenue for tax purposes and other provisions. The U.S. Tax Act also includes international provisions, which generally establish a quasi-territorial-style system for taxing foreign-source income of domestic multinational corporations, also having the effect of partially offsetting the benefit of the rate reduction. Financial statement impacts include adjustments for the re-measurement of deferred tax assets (liabilities) and possible increased tax expense.

If our net earnings do not remain at or above recent levels, or we are not able to predict with a reasonable degree of probability that they will continue, we may have to record a valuation allowance against our net deferred income tax assets.

Our U.S. entities and certain of our foreign subsidiaries have deferred income tax assets. Based on our forecast for future taxable earnings, we believe we will utilize the deferred income tax assets in future periods except with respect to certain amounts where we have recorded valuation allowances. During the fourth quarter of 2018, our expectations for future U.S. taxable income improved resulting in the release of a valuation allowance of approximately $43.6 million recorded against our U.S. net deferred tax assets. Additionally, during the second quarter of 2018, $76.7 million of valuation allowance previously recorded against our U.S. net deferred tax assets was released due to the net deferred tax liability acquired as a result of the Anaren acquisition. If our estimates of future earnings decline, we may have to increase our valuation allowance against our net deferred income tax assets, resulting in a higher income tax provision, which would reduce our results of operations.

Issues arising during the upgrade of our enterprise resource planning system could affect our operating results and ability to manage our business effectively.

We are continuing the process of upgrading our enterprise resource planning, or ERP, management system to enhance operating efficiencies and provide more effective management of our business operations. We are investing significant financial and personnel resources into this project. However, there is no assurance that the system upgrade will meet our current or future business needs or that it will operate as designed. The transition to the new ERP system will affect numerous systems necessary for our operation. If we fail to correctly implement one or more components of the ERP system, we could experience significant disruption to our operations. Such disruptions could include, among other things, temporary loss of data, inability to process certain orders, failure of systems to communicate with each other and the inability to track or reconcile key data. We are heavily dependent on automated management systems, and any significant failure or delay in the system upgrade could cause a substantial interruption to our business and additional expense, which could result in an adverse impact on our operating results, cash flows or financial condition.

We have a significant amount of goodwill and other intangible assets on our consolidated balance sheet. If our goodwill or other intangible assets become impaired in the future, we would be required to record a non-cash charge to earnings, which may be material and would also reduce our stockholders' equity.

As of December 31, 2018, our consolidated balance sheet included $1,143.0 million of goodwill and definite-lived intangible assets. We periodically evaluate whether events and circumstances have occurred, such that the potential for reduced expectations for future cash flows coupled with further decline in the market price of our stock and market capitalization may indicate that the remaining balance of goodwill and definite-lived intangible assets may not be recoverable. If factors indicate that assets are impaired, we would be required to reduce the carrying value of our goodwill and definite-lived intangible assets, which could harm our results during the periods in which such a reduction is recognized.

Adverse judgments or settlements resulting from legal proceedings in which we may be involved in the normal course of our business could reduce our profitability or limit our ability to operate our business.

In the normal course of our business, we have been, and may in the future be subject to employee claims based on, among other things, discrimination, minimum wage, overtime pay and other employment related matters. We cannot predict with certainty the cost of defense, the cost of prosecution or the ultimate outcome of these legal proceedings. Any significant adverse determinations, judgments or settlements could reduce our profitability and could materially adversely affect our business, financial condition and results of operations, limit our ability to operate our business or harm our reputation.

Our failure to comply with the requirements of environmental laws could result in litigation, fines, revocation of permits necessary to our manufacturing processes, or debarment from our participation in federal government contracts.

Our operations are regulated under a number of domestic and foreign environmental and safety laws and regulations that govern, among other things, the discharge of hazardous materials into the air and water, as well as the handling, storage, recycling, and disposal of such materials. These laws and regulations include the Clean Air Act, the Clean Water Act, the Resource Conservation and Recovery Act, the Superfund Amendment and Reauthorization Act, the Comprehensive Environmental Response, Compensation and Liability Act, the Toxic Substances Control Act, and the Federal Motor Carrier Safety Improvement Act, as well as analogous state, local, and foreign laws. Compliance with these environmental laws is a major consideration for us because our manufacturing processes use and generate materials classified as hazardous. Because we use hazardous materials and generate hazardous wastes in our manufacturing processes, we may be subject to potential financial liability for costs associated with the investigation and remediation of our own sites, or sites at which we have arranged for the disposal of hazardous wastes, if such sites become contaminated. Even if we fully comply with applicable environmental laws and are not directly at fault for the contamination, we may still be liable. The wastes we generate include spent ammoniacal and cupric etching solutions, metal stripping solutions, waste acid solutions, waste alkaline cleaners, waste oil, and waste waters that contain heavy metals such as copper, tin, lead, nickel, gold, silver, cyanide, and fluoride, and both filter cake and spent ion exchange resins from equipment used for on-site waste treatment.

Environmental law violations, including the failure to maintain required environmental permits, could subject us to fines, penalties, and other sanctions, including the revocation of our effluent discharge permits. This could require us to cease or limit production at one or more of our facilities and could have a material adverse effect on our business, financial condition, and results of operations. Even if we ultimately prevail, environmental lawsuits against us would be time consuming and costly to defend.

Environmental laws have generally become more stringent and we expect this trend to continue over time, especially in developing countries, imposing greater compliance costs and increasing risks and penalties associated with violation. We operate in environmentally sensitive locations, and we are subject to potentially conflicting and changing regulatory agendas of political, business, and environmental groups. Changes or restrictions on discharge limits, emissions levels, material storage, handling, or disposal might require a high level of unplanned capital investment or relocation to another global location where prohibitive regulations do not exist. It is possible that environmental compliance costs and penalties from new or existing regulations may materially adversely affect our business, financial condition, and results of operations.

We are increasingly required to certify compliance with various material content restrictions in our products based on laws of various jurisdictions or territories such as the Restriction of Hazardous Substances (RoHS) and Registration, Evaluation, Authorization and Restriction of Chemicals, or REACH directives in the European Union and China's RoHS legislation. Similar laws have been adopted in other jurisdictions and may become increasingly prevalent. In addition, we must also certify as to the non-applicability of the EU's Waste Electrical and Electronic Equipment directive for certain products that we manufacture. The REACH directive requires the identification of Substances of Very High Concern, or SVHCs periodically. We must survey our supply chain and certify to the non-presence or presence of SVHCs to our customers. As with other types of product certifications that we routinely provide, we may incur liability and pay damages if our products do not conform to our certifications.

We are also subject to an increasing variety of environmental laws and regulations in China, which impose limitations on the discharge of pollutants into the air and water and establish standards for the treatment, storage, and disposal of solid and hazardous wastes for us and our vendors that assist us in managing the waste generated by our manufacturing processes. The manufacturing of our products generates gaseous chemical wastes, liquid wastes, waste water, and other industrial wastes from various stages of the manufacturing process. Production sites, waste collectors, and vendors in China are subject to increasing regulation and periodic monitoring by the relevant environmental protection authorities. Environmental claims or the failure to comply with current or future regulations could result in the assessment of damages or imposition of fines against us, suspension of production, or cessation of operations.

The process to manufacture PCBs requires adherence to domestic and foreign environmental regulations regarding the storage, use, handling, recycling, and disposal of chemicals, solid wastes, and other hazardous materials, as well as compliance with air quality standards and chemical use reporting. We rely on our vendors for the transportation and disposal of our solid and hazardous wastes generated by our manufacturing processes. If we are not able to find such services, our ability to conduct our business and our results of operations may be adversely impacted. In China, governmental authorities have adopted new rules and regulations governing environmental issues. An update to Chinese environmental waste water law was issued in late 2012, allowing for an interim period in which plants subject to such law may install equipment that meet the new regulatory regime. Our plants in China are not yet in full compliance with the newly adopted environmental regulations. We have developed plans for these new regulations and we are in the process of implementing these plans. However, there can be no assurance that violations will not occur in the future.

Employee strikes and other labor-related disruptions may materially adversely affect our business, financial condition, and results of operations.

Our business is labor intensive, utilizing large numbers of engineering and manufacturing personnel. Strikes or labor disputes with our unionized employees, primarily in China, may adversely affect our ability to conduct our business. If we are unable to reach agreement with any of our unionized work groups on future negotiations regarding the terms of their collective bargaining agreements, we may be subject to work interruptions or stoppages. Any of these events could be disruptive to our operations and could result in negative publicity, loss of contracts, and a decrease in revenues. We may also become subject to additional collective bargaining agreements in the future if more employees or segments of our workforce become unionized, including any of our employees in the United States.

We rely on suppliers and equipment manufacturers for the timely delivery of raw materials, components, equipment and spare parts used in manufacturing our PCBs and E-M Solutions. If a raw material supplier or equipment manufacturer goes bankrupt, liquidates, consolidates out of existence or fails to satisfy our product quality standards, it could harm our ability to purchase new manufacturing equipment, service the equipment we have, or timely produce our products, thereby affecting our customer relationships.

Consolidations and restructuring in our supplier base and equipment fabricators related to our raw materials purchases or the manufacturing equipment we use to fabricate our products may result in adverse changes in pricing of materials due to reduction in competition among our raw material suppliers or an elimination or shortage of equipment and spare parts from our manufacturing equipment supply base. Suppliers and equipment manufacturers may be impacted by otherevents outside our control including macro-economic, financial instability, environmental occurrences, or supplier interruptions due to fire, natural catastrophes or otherwise. Suppliers and equipment manufacturers may extend lead times, limit supplies, or increase prices due to capacity constraints or other factors, which could harm our ability to deliver our products on a timely basis and negatively impact our financial results. In addition, in extreme circumstances, the suppliers we purchase from could cease production due to a fire, natural disaster, consolidation or liquidation of their businesses. As such, this may impact our ability to deliver our products on a timely basis and harm our customer relationships and negatively impact our financial results.

We have pursued and intend to continue to pursue acquisitions of other businesses and may encounter risks associated with these activities, which could harm our business and operating results.

As part of our business strategy, we expect that we will continue to grow by pursuing acquisitions of businesses, technologies, assets, or product lines that complement or expand our business. Risks related to an acquisition may include:

- the potential inability to successfully integrate acquired operations and businesses or to realize anticipated synergies, economies of scale, or other expected value;
- diversion of management's attention from normal daily operations of our existing business to focus on integration of the newly acquired business;
- unforeseen expenses associated with the integration of the newly acquired business;
- difficulties in managing production and coordinating operations at new sites;
- the potential loss of key employees of acquired operations;
- the potential inability to retain existing customers of acquired companies when we desire to do so;
- insufficient revenues to offset increased expenses associated with acquisitions;
- the potential decrease in overall gross margins associated with acquiring a business with a different product mix;
- the inability to identify certain unrecorded liabilities;
- the potential need to restructure, modify, or terminate customer relationships of the acquired company;
- an increased concentration of business from existing or new customers; and
- the potential inability to identify assets best suited to our business plan.

Acquisitions may cause us to:

- enter lines of business and/or markets in which we have limited or no prior experience;
- issue debt and be required to abide by stringent loan covenants;
- assume liabilities; record goodwill and intangible assets that will be subject to impairment testing and potential periodic impairment charges;
- become subject to litigation and environmental issues, which include product material content certifications related to conflict minerals;
- incur unanticipated costs;
- incur large and immediate write-offs; and
- incur substantial transaction-related costs, whether or not a proposed acquisition is consummated.

Acquisitions of high technology companies are inherently risky, and no assurance can be given that our recent or future acquisitions will be successful. Failure to manage and successfully integrate acquisitions we make could have a material adverse effect on our business, financial condition, and results of operations. Even when an acquired company has already developed and marketed products, product enhancements may not be made in a timely fashion. In addition, unforeseen issues might arise with respect to such products after any such acquisition.

We are subject to the requirements of the National Industrial Security Program Operating Manual for our facility security clearance, which is a prerequisite to our ability to perform on classified contracts for the U.S. government.

A facility security clearance is required in order to be awarded and perform on classified contracts for the Department of Defense and certain other agencies of the U.S. government. As a cleared entity, we must comply with the requirements of the National Industrial Security Program Operating Manual (NISPOM), and any other applicable U.S. government industrial security regulations. Further, due to the fact that a portion of our voting equity is owned by a non-U.S. entity, we are required to be governed by and operate in accordance with the terms and requirements of the Special Security Agreement (SSA). The terms of the SSA have been previously disclosed in our SEC filings.

If we were to violate the terms and requirements of the SSA, the NISPOM, or any other applicable U.S. government industrial security regulations (which may apply to us under the terms of classified contracts), we could lose our security clearance. We cannot be certain that we will be able to maintain our security clearance. If for some reason our security clearance is invalidated or terminated, we may not be able to continue to perform on classified contracts and would not be able to enter into new classified contracts, which could materially adversely affect our business, financial condition, and results of operations.

Competition in the PCB market is intense, and we could lose market share if we are unable to maintain our current competitive position in end markets using our quick-turn, high technology, and high-mix manufacturing services.

The PCB industry is intensely competitive, highly fragmented, and rapidly changing. We expect competition to continue, which could result in price reductions, reduced gross margins, and loss of market share. Our principal PCB and substrate competitors include AT&S (Austria Technologie & Systemtechnik AG), Chin Poon Industrial Co., LTD., Compeq Manufacturing Co., Ltd., IBIDEN Co., Ltd., ISU Petasys Co., Ltd., Multek Corporation, Sanmina Corporation, Tripod Technology Corp., Unimicron Technology Corp., and Wus Printed Circuit Co., Ltd. Our principal E-M Solutions competitors include Amphenol Corp, Flex, Jabil, Inc. and Sanmina Corporation. Our competition for RF products include Cobham, Crane, TRM Microwave, Mercury Systems, AVX, Molex, and Smiths. In addition, we increasingly compete on an international basis, and new and emerging technologies may result in new competitors entering our markets.

Some of our competitors and potential competitors have advantages over us, including:

- greater financial and manufacturing resources that can be devoted to the development, production, and sale of their products;
- more established and broader sales and marketing channels;
- more manufacturing facilities worldwide, some of which are closer in proximity to OEMs;
- manufacturing facilities that are located in countries with lower production costs;
- lower capacity utilization, which in peak market conditions can result in shorter lead times to customers;
- ability to add additional capacity faster or more efficiently;
- preferred vendor status with existing and potential customers;
- greater name recognition; and
- larger customer bases.

In addition, these competitors may respond more quickly to new or emerging technologies or adapt more quickly to changes in customer requirements than we do. We must continually develop improved manufacturing processes to meet our customers' needs for complex products, and our manufacturing process technology is generally not subject to significant proprietary protection. During recessionary periods in the electronics industry, our strategy of providing quick-turn services, an integrated manufacturing solution, and responsive customer service may take on reduced importance to our customers. As a result, we may need to compete more on the basis of price, which would cause our gross margins to decline.

If we are unable to provide our customers with high-end technology, high-quality products, and responsive service, or if we are unable to deliver our products to our customers in a timely manner, our business, financial condition, and results of operations may be materially adversely affected.

In order to maintain our existing customer base and obtain business from new customers, we must demonstrate our ability to produce our products at the level of technology, quality, responsiveness of service, timeliness of delivery, and cost that our customers require. If our products are of substandard quality, if they are not delivered on time, if we are not responsive to our customers' demands, or if we cannot meet our customers' technological requirements, our reputation as a reliable supplier of our products would likely be damaged. If we are unable to meet anticipated product and service standards, we may be unable to obtain new contracts or keep our existing customers, and this would have a material adverse effect on our business, financial condition, and results of operations.

Outages, computer viruses, break-ins, and similar events could disrupt our operations, and breaches of our security systems may cause us to incur significant legal and financial exposure.

We rely on information technology networks and systems, some of which are owned and operated by third parties, to collect, process, transmit, and store electronic information. In particular, we depend on our information technology infrastructure for a variety of functions, including worldwide financial reporting, inventory management, procurement, invoicing, and email communications. Any of these systems may be susceptible to outages due to fire, floods, power loss, telecommunications failures, hacking, terrorist attacks, and similar events. In addition, in the ordinary course of our business, we collect and store sensitive data in our data centers and on our networks, including intellectual property, our proprietary and confidential business information and that of our customers, suppliers and business partners, and personally identifiable information of our employees. The secure collection, processing, storage, maintenance and transmission of this information is critical to our operations. Despite the implementation of network security measures, our systems and those of third parties on which we rely may also be vulnerable to computer viruses, break-ins, cyber-attacks, attacks by hackers or breaches due to employee or third party (including suppliers and business partners) error, malfeasance or other disruptions. If we or our vendors are unable to prevent such outages and breaches, our operations could be disrupted. If unauthorized parties gain access to our information systems or such information is used in an unauthorized manner, misdirected, altered, lost, or stolen during transmission, any theft or misuse of such information could result in, among other things, unfavorable publicity, governmental inquiry and oversight, difficulty in marketing our services, allegations by our customers that we have not performed our contractual obligations, loss of customers, litigation by affected parties, and possible financial obligations for damages related to the theft or misuse of such information, any of which could have a material adverse effect on our business, financial condition, and results of operations.

Damage to our manufacturing facilities due to fire, natural disaster, or other events could materially adversely affect our business, financial condition, and results of operations.

The destruction or closure of any of our facilities for a significant period of time as a result of fire, explosion, blizzard, act of war or terrorism, flood, tornado, earthquake, lightning, other natural disasters, an outbreak of epidemics such as Ebola or severe acute respiratory syndrome, required maintenance, or other events could harm us financially, increasing our costs of doing business and limiting our ability to deliver our manufacturing services on a timely basis.

Our insurance coverage with respect to damages to our facilities or our customers' products caused by natural disasters is limited and is subject to deductibles and coverage limits. Such coverage may not be adequate or continue to be available at commercially reasonable rates and terms.

In the event one or more of our facilities is closed on a temporary or permanent basis as a result of a natural disaster, required maintenance or other event, or in the event that an outbreak of a serious epidemic results in quarantines, temporary closures of offices or manufacturing facilities, travel restrictions or the temporary or permanent loss of key personnel, our operations could be significantly disrupted. Such events could delay or prevent product manufacturing and shipment for the time required to transfer production or repair, rebuild or replace the affected manufacturing facilities. This time frame could be lengthy and result in significant expenses for repair and related costs. While we have disaster recovery plans in place, there can be no assurance that such plans will be sufficient to allow our operations to continue in the event of every natural or man-made disaster, pandemic, required repair or other extraordinary event. Any extended inability to continue our operations at unaffected facilities following such an event would reduce our revenue and potentially damage our reputation as a reliable supplier.

We face constant pricing pressure from our customers and competitors, which may decrease our profit margins.

Competition in the PCB market is intense, and we expect that competition will continue to increase, thereby creating a highly aggressive pricing environment. We and some of our competitors have reduced average selling prices in the past. In addition, competitors may reduce their average selling prices faster than our ability to reduce costs, which can also accelerate the rate of decline of our selling prices. When prices decline, we may also be required to write down the value of our inventory.

The effects of such pricing pressures on our business may be exacerbated by inflationary pressures that affect our costs of supply. When we are unable to extract comparable concessions from our suppliers on prices they charge us, this in turn reduces gross profit if we are unable to raise prices. Further, uncertainty or adverse changes in the economy could also lead to a significant decline in demand for our products and pressure to reduce our prices. Recently, many businesses have taken a more conservative stance in ordering inventory. Any decrease in demand for our products, coupled with pressure from the market and our customers to decrease our prices, would materially adversely affect our business, financial condition, and results of operations.

The pricing pressure we face on our products requires us to introduce new and more advanced technology products to maintain average selling prices or reduce any declines in average selling prices. As we shift production to more advanced, higher-density PCBs, we tend to make significant investments in plants and other capital equipment and incur higher costs of production, which may not be recovered.

The prominence of EMS companies as our customers could reduce our gross margins, potential sales, and customers.

Sales to EMS companies represented approximately 37%, 32% and 35% of our net sales for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively. Sales to EMS providers include sales directed by OEMs as well as orders placed with us at the EMS providers' discretion. EMS providers source on a global basis to a greater extent than OEMs. The growth of EMS providers increases the purchasing power of such providers and has in the past, and could in the future, result in increased price competition or the loss of existing OEM customers. In addition, some EMS providers, including some of our customers, have the ability to directly manufacture PCBs and create backplane assemblies. If a significant number of our other EMS customers were to acquire these abilities, our customer base might shrink, and our sales might decline substantially. Moreover, if any of our OEM customers outsource the production of PCBs and creation of backplane assemblies to these EMS providers, our business, financial condition, and results of operations may be materially adversely affected.

If we are unable to manage our growth effectively, our business, financial condition, and results of operations could be materially adversely affected.

We have experienced, and expect to continue to experience, growth in the scope and complexity of our operations. This growth may strain our managerial, financial, manufacturing, and other resources. In order to manage our growth, we may be required to continue to implement additional operating and financial controls and hire and train additional personnel. There can be no assurance that we will be able to do so in the future, and failure to do so could jeopardize our expansion plans and seriously harm our operations. In addition, growth in our capacity could result in reduced capacity utilization and a corresponding decrease in gross margins.

Our international sales are subject to laws and regulations relating to corrupt practices, trade, and export controls and economic sanctions. Any non-compliance could have a material adverse effect on our business, financial condition, and results of operations.

We operate on a global basis and are subject to anti-corruption, anti-bribery, and anti-kickback laws and regulations, including restrictions imposed by the Foreign Corrupt Practices Act (the FCPA). The FCPA and similar anti-corruption, anti-bribery, and anti-kickback laws in other jurisdictions generally prohibit companies and their intermediaries and agents from making improper payments to government officials or any other persons for the purpose of obtaining or retaining business. We operate and sell our products in many parts of the world that have experienced governmental corruption to some degree and, in certain circumstances, strict compliance with anti-corruption, anti-bribery, and anti-kickback laws may conflict with local customs and practices. We also, from time to time, undertake business ventures with state-owned companies or enterprises.

Our global business operations must also comply with all applicable domestic and foreign export control laws, including International Traffic In Arms Regulations (ITAR), and Export Administration Regulations (EAR). Some items we manufacture are controlled for export by the U.S. Department of Commerce's Bureau of Industry and Security under EAR.

We train our employees concerning anti-corruption, anti-bribery, and anti-kickback laws and compliance with international regulations regarding trades and exports, and we have policies in place that prohibit employees from making improper payments. We cannot provide assurances that our internal controls and procedures will guarantee compliance by our employees or third parties with whom we work. If we are found to be liable for violations of the FCPA or similar anti-corruption, anti-bribery, or anti-kickback laws in international jurisdictions or for violations of ITAR, EAR, or other similar regulations regarding trades and exports, either due to our own acts or out of inadvertence, or due to the inadvertence of others, we could suffer criminal or civil fines or penalties or other repercussions, including reputational harm, which could have a material adverse effect on our business, financial condition, and results of operations.

Our global business operations also must be conducted in compliance with applicable economic sanctions laws and regulations, such as laws administered by the U.S. Department of the Treasury's Office of Foreign Asset Control, the U.S. State Department, and the U.S. Department of Commerce. We must comply with all applicable economic sanctions laws and regulations of the United States and other countries. Violations of these laws or regulations could result in significant additional sanctions including criminal or civil fines or penalties, more onerous compliance requirements, more extensive debarments from export privileges, or loss of authorizations needed to conduct aspects of our international business.

In certain countries, we may engage third-party agents or intermediaries, such as customs agents, to act on our behalf, and if these third-party agents or intermediaries violate applicable laws, their actions may result in criminal or civil fines or penalties or other sanctions being assessed against us. We take certain measures designed to ensure our compliance with U.S. export and economic sanctions laws, anti-corruption laws and regulations, and export control laws. However, it is possible that some of our products were sold or will be sold to distributors or other parties, without our knowledge or consent, in violation of applicable law. There can be no assurances that we will be in compliance in the future. Any such violation could result in significant criminal or civil fines, penalties, or other sanctions and repercussions, including reputational harm, which could have a material adverse effect on our business, financial condition, and results of operations.

Employee theft or fraud could result in loss.

Certain of our employees have access to, or signature authority with respect to, bank accounts or other company assets, which could expose us to fraud or theft. In addition, certain employees have access to certain precious metals used in connection with our manufacturing and key information technology infrastructure and to customer and other information that is commercially valuable. Should any employee, for any reason, steal any such precious metals (which has occurred from time to time), compromise our information technology systems, or misappropriate customer or other information, we could incur losses, including losses relating to claims by our customers against us, and the willingness of customers to do business with us may be damaged. Additionally, in the case of our defense business, we could be barred from future participation in government programs. Any such losses may not be fully covered by insurance.

Because we sell on a purchase order basis, we are subject to uncertainties and variability in demand by our customers that could decrease revenues and harm our operating results.

Although we have long-term contracts with many customers, those contracts generally do not contain volume commitments. We generally sell to customers on a purchase order basis. Our quick-turn orders are subject to particularly short lead times. Consequently, our sales are subject to short-term variability in demand by our customers. Customers submitting purchase orders may cancel, reduce, or delay their orders for a variety of reasons, subject to negotiations. The level and timing of orders placed by our customers may vary due to:

- customer attempts to manage inventory;
- changes in customers' manufacturing strategies, such as a decision by a customer to either diversify or consolidate the number of PCB manufacturers or backplane assembly service providers used or to manufacture or assemble its own products internally;
- variation in demand for our customers' products; and
- changes in new product introductions.

We have periodically experienced terminations, reductions, and delays in our customers' orders. Further terminations, reductions, or delays in our customers' orders could materially adversely affect our business, financial condition, and results of operations.

Our business has benefited from OEMs deciding to outsource their PCB manufacturing and backplane assembly needs to us. If OEMs choose to provide these services in-house or select other providers, our business could suffer.

Our future revenue growth partially depends on new outsourcing opportunities from OEMs. Current and prospective customers continuously evaluate our performance against other providers. They also evaluate the potential benefits of manufacturing their products themselves. To the extent that outsourcing opportunities are not available either due to OEM decisions to produce these products themselves or to use other providers, our financial results and future growth could be materially adversely affected.

Consolidation among our customers could materially adversely affect our business, financial condition, and results of operations.

Recently, some of our large customers have consolidated, and further consolidation of customers may occur. Depending on which organization becomes the controller of the supply chain function following the consolidation, we may not be retained as a preferred or approved supplier. In addition, product duplication could result in the termination of a product line that we currently support. While there is potential for increasing our position with the combined customer, there does exist the potential for decreased revenue if we are not retained as a continuing supplier. We also face the risk of increased pricing pressure from the combined customer because of its increased market share.

Our operations could be materially adversely affected by a shortage of utilities or a discontinuation of priority supply status offered for such utilities.

The manufacturing of PCBs requires significant quantities of electricity and water. Our operations in Asia have historically purchased substantially all of the electrical power for their manufacturing plants in China from local power plants. Because China's economy has recently been in a state of growth, the strain on the nation's power plants is increasing, which has led to continuing power outages in various parts of the country. There may be times when our operations in China may be unable to obtain adequate sources of electricity to meet production requirements. Various regions in China have in the past experienced shortages of both electricity and water and unexpected interruptions of power supply. From time to time, the Chinese government rations electrical power, which can lead to unscheduled production interruptions at our manufacturing facilities.

In addition, certain areas in which our North America operations have manufacturing facilities, particularly in California, have experienced power and resource shortages from time to time, including mandatory periods without electrical power, changes to water availability, and significant increases in utility and resource costs.

We do not generally maintain any back-up power generation facilities or reserves of water for our operations, so if we were to lose supplies of power or water at any of our facilities, we would be required to cease operations until such supply was restored. Any resulting cessation of operations could materially adversely affect our ability to meet our customers' orders in a timely manner, thus potentially resulting in a loss of business, along with increased costs of manufacturing, and under-utilization of capacity. In addition, the sudden cessation of our power or water supply could damage our equipment, resulting in the need for costly repairs or maintenance, as well as damage to products in production, resulting in an increase in scrapped products.

Our manufacturing processes depend on the collective industry experience of our employees. If a significant number of these employees were to leave us, it could limit our ability to compete effectively and could materially adversely affect our business, financial condition, and results of operations.

We have limited patent or trade secret protection for our manufacturing processes. We rely on the collective experience of our employees involved in our manufacturing processes to ensure that we continuously evaluate and adopt new technologies in our industry.

Although we are not dependent on any one employee or a small number of employees, if a significant number of our employees involved in our manufacturing processes were to leave our employment, and we were not able to replace these people with new employees with comparable experience, our manufacturing processes might suffer as we might be unable to keep up with innovations in the industry. As a result, we may lose our ability to continue to compete effectively. For example, we have experienced a signif icant amount of employee attrition in our China operations each year, which has negatively impacted our yield, costs of production, and service times.

Infringement of our intellectual property rights could negatively affect us, and we may be exposed to intellectual property infringement claims from third parties that could be costly to defend, could divert management's attention and resources, and if successful, could result in liability.

We rely on a combination of copyright, patent, trademark, and trade secret laws, confidentiality procedures, contractual provisions, and other measures to establish and protect our proprietary and confidential information. All of these measures afford only limited protection. These measures may be invalidated, circumvented, breached, or challenged, and others may develop intellectual property, technologies or processes that are similar, or superior to, our intellectual property or technology. We may not have adequate controls and procedures in place to protect our proprietary and confidential information. Despite our efforts to protect our intellectual property and proprietary rights, unauthorized parties may attempt to copy, and succeed in, copying, our products or may obtain or use information that we regard as proprietary or confidential. If it becomes necessary for us to resort to litigation to protect our intellectual property rights, any proceedings could be burdensome, costly, and distracting to management, and we may not prevail. Further, adequate remedies may not be available in the event of an unauthorized use or disclosure of our proprietary or confidential information. Failure to successfully establish or enforce our intellectual property rights could materially and adversely affect our business, financial condition, and results of operations. Furthermore, there is a risk that we may infringe on the intellectual property rights of others. As is the case with many other companies in the PCB industry, we from time to time receive communications from third parties asserting patent rights over our products and enter into discussions with such third parties. Irrespective of the validity or the successful assertion of such claims, we could incur costs in either defending or settling any intellectual property disputes alleging infringement. If any claims, whether or not they have merit, are brought against our customers for such infringement, we could be required to expend significant resources in defending such claims. In the event we are subject to any infringement claims, we may be required to spend a significant amount of money to develop non-infringing alternatives or obtain licenses. We may not be successful in developing such alternatives or in obtaining such licenses on reasonable terms, or at all, and may be required to modify or cease marketing our products or services, which could disrupt the production processes, damage our reputation, and materially and adversely affect our business, financial condition, and results of operations.

Our business, financial condition, and results of operations could be materially adversely affected by climate change initiatives.

Our manufacturing processes require that we purchase significant quantities of energy from third parties, which results in the generation of greenhouse gases, either directly on-site or indirectly at electric utilities. Both domestic and international legislation to address climate change by reducing greenhouse gas emissions could create increases in energy costs and price volatility. Considerable international attention is now focused on development of an international policy framework to guide international action to address climate change. Proposed and existing legislative efforts to control or limit greenhouse gas emissions could affect our energy sources and supply choices, as well as increase the cost of energy and raw materials that are derived from sources that generate greenhouse gas emissions.

Our ability to use net operating loss carryforwards to offset future taxable income for U.S. federal income tax purposes is subject to limitations, and future transfers of shares of our common stock, when aggregated with the November 2016 and February 2017 secondary sales of our shares, could cause us to experience an "ownership change" that could further limit our ability to utilize our net operating losses.

Under U.S. federal income tax law, a corporation's ability to utilize its net operating losses (NOL's) to offset future taxable income may be significantly limited if it experiences an "ownership change" as defined in Section 382 of the Internal Revenue Code of 1986, as amended (the Code). In general, an ownership change will occur if there is a cumulative change in a corporation's ownership by "5-percent shareholders" that exceeds 50 percentage points over a rolling three-year period.

A corporation that experiences an ownership change will generally be subject to an annual limitation on its pre-ownership change NOLs equal to the value of the corporation immediately before the ownership change, multiplied by the long-term tax-exempt rate (subject to certain adjustments). The annual limitation for a taxable year is generally increased by the amount of any "recognized built-in gains" for such year and the amount of any unused annual limitation in a prior year. As a result of our acquisition of Viasystems, the NOLs acquired were subject to this limitation. In February 2017 and November 2016, 4,000,000 and 13,800,000 shares of common stock, respectively, were sold by Su Sih, our largest shareholder and a "5-percent shareholder." Additional future transfers or sales of our common stock during the rolling period by "5-percent shareholders" could cause us to experience an ownership change under Section 382, which could further limit our use of NOLs.

We are subject to risks for the use of certain metals from “conflict minerals” originating in the Democratic Republicof the Congo.

During the third quarter of 2012, the SEC adopted rules implementing the Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank). These rules impose diligence and disclosure requirements regarding the use of “conflict minerals” mined from the Democratic Republic of Congo and neighboring countries. While these new rules continue to be the subject of ongoing litigation and, as a result, uncertainty, we submitted a conflict minerals report on Form SD with the SEC for the past four years, most recently on May 25, 2018. Compliance with these rules results in additional costs and expenses, including costs and expenses incurred for due diligence to determine and verify the sources of any conflict minerals used in our products, in addition to the costs and expenses of remediation and other changes to products, processes, or sources of supply as a consequence of such verification efforts. These rules may also affect the sourcing and availability of minerals used in the manufacture of our PCBs, as there may be only a limited number of suppliers offering “conflict free” minerals that can be used in our products. There can be no assurance that we will be able to obtain such minerals in sufficient quantities or at competitive prices. Also, since our supply chain is complex, we may, at a minimum, face reputational challenges with our customers, stockholders, and other stakeholders if we are unable to sufficiently verify the origins of the minerals used in our products. We may also encounter customers who require that all of the components of our products be certified as conflict free. If we are not able to meet customer requirements, such customers may choose to disqualify us as a supplier, which could impact our sales and the value of portions of our inventory.

ITEM 1B. ***UNRESOLVED STAFF COMMENTS***

None.

ITEM 2. *PROPERTIES*

The following table describes our principal manufacturing facilities and our drilling and tooling process facility.

U.S. Locations	Operating Segment	Leased Square Feet	Owned Square Feet	Total Square Feet
Anaheim, CA (ANA)	PCB	—	96,000	96,000
Costa Mesa, CA (1)	Headquarters	11,775	—	11,775
Chippewa Falls, WI (CF)	PCB	—	281,000	281,000
Forest Grove, OR (FG)	PCB	—	280,300	280,300
Littleton, CO (DEN) (2)	PCB	45,136	53,502	98,638
Logan, UT (LG)	PCB	—	141,300	141,300
North Jackson, OH (NJ)	PCB	8,800	66,276	75,076
San Diego, CA (SD)	PCB	40,536	—	40,536
San Jose, CA (SJ)	PCB	42,344	—	42,344
Santa Ana, CA (SA)	PCB	9,416	82,550	91,966
Santa Clara, CA (SC)	PCB	18,536	49,115	67,651
Salem, NH (SNH)	PCB	33,000	—	33,000
Stafford, CT (ST)	PCB	—	126,924	126,924
Stafford Springs, CT (SS)	PCB	30,251	85,328	115,579
Sterling, VA (STE)	PCB	100,896	—	100,896
Syracuse, NY (SYN)	PCB	23,257	156,000	179,257
Total		363,947	1,418,295	1,782,242

Foreign Locations	Operating Segment	Leased Square Feet	Owned Square Feet	Total Square Feet
Canada				
Toronto (TOR)	PCB	15,500	99,960	115,460
China				
Hong Kong	Asia Headquarters	—	24,640	24,640
Hong Kong (OPCM)	PCB	4,757	128,432	133,189
Dongguan (DMC)	PCB	—	1,069,129	1,069,129
Guangzhou (GME)	PCB	—	1,468,372	1,468,372
Guangzhou (GZ)	PCB	—	2,237,318	2,237,318
Huiyang (HY)	PCB	—	503,935	503,935
Shanghai (SH)	E-M Solutions	85,745	—	85,745
Shanghai (SH E-MS)	E-M Solutions	—	402,200	402,200
Shanghai (SME)	PCB	—	316,750	316,750
Shanghai (SMST/SP)	PCB	—	760,502	760,502
Shanghai (SKE) (3)	PCB	—	110,971	110,971
Shenzhen (SZ)	E-M Solutions	430,000	—	430,000
Suzhou (SUZ)	PCB	64,500	—	64,500
Zhongshan (ZS)	PCB	—	1,198,368	1,198,368
Total		600,502	8,320,577	8,921,079

We maintain our properties in good operating condition. We believe that our properties are suitable and adequate for us to operate at present levels, and the productive capacity and extent of utilization of the facilities are appropriate for our existing manufacturing requirements.

(1) Location of our headquarters and not a manufacturing facility

(2) Location includes two manufacturing facilities

(3) Drilling and tooling process facility

ITEM 3. *LEGAL PROCEEDINGS*

From time to time, we may become a party to various legal proceedings arising in the ordinary course of our business. There can be no assurance that we will prevail in any such litigation. We believe that the amount of any reasonably possible loss for known matters would not be material to our financial statements; however, the outcome of these actions is inherently difficult to predict. In the event of an adverse outcome, the ultimate potential loss could have a material adverse effect on our financial condition, results of operations, or cash flows in a particular period.

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 and Dividend Policy

Our common stock has been listed on the Nasdaq Global Select Market under the symbol "TTMI" since September 21, 2000.

As of February 21, 2019, there were approximately 286 holders of record of our common stock. The closing sale price of our common stock on the Nasdaq Global Select Market on February 21, 2019 was $12.26.

TTM Technologies, Inc. does not anticipate paying any cash dividends in the foreseeable future. TTM Technologies, Inc. presently intends to retain any future earnings to service debt and to finance future operations and the expansion of its business. In addition, TTM Technologies, Inc. debt agreements contain restrictions and limitations on the declaration and payment of dividends and distributions.

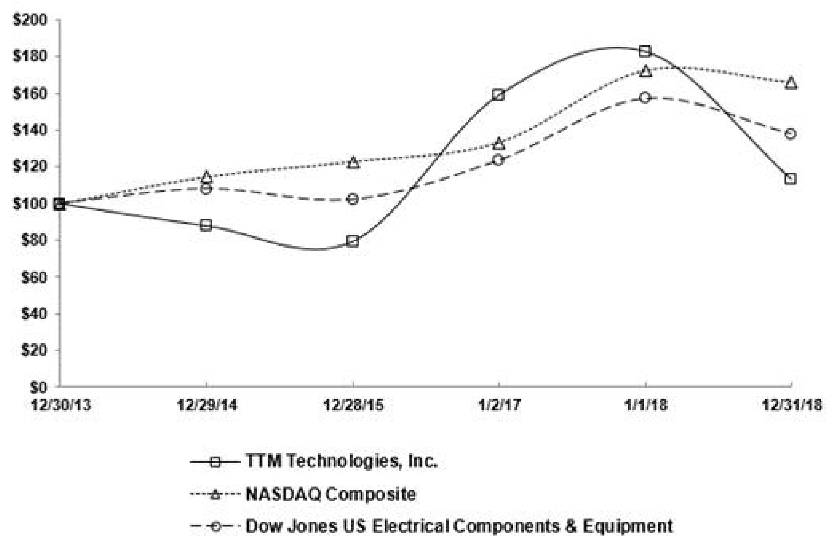
STOCK PRICE PERFORMANCE GRAPH

The performance graph below compares, for the period from December 30, 2013 to December 31, 2018, the cumulative total stockholder return on our common stock against the cumulative total return of:

- the NASDAQ Composite Index; and
- the Dow Jones U.S. Electrical Components & Equipment Index.

The graph assumes $100 was invested in our common stock on December 30, 2013, and an investment in NASDAQ Composite Index and the Dow Jones US Electrical Components & Equipment Index. The stock performance shown on the graph below represents historical stock performance and is not necessarily indicative of future stock performance.

COMPARISON OF 5 YEAR CUMULATIVE TOTAL RETURN*
Among TTM Technologies, Inc., the NASDAQ Composite Index
and the Dow Jones US Electrical Components & Equipment Index



* $100 invested on December 30, 2013 in stock or index, including reinvestment of dividends.

	12/30/2013	12/29/2014	12/28/2015	1/2/2017	1/1/2018	12/31/2018
TTM Technologies, Inc.	100.00	87.89	79.28	158.67	182.42	113.27
NASDAQ Composite	100.00	114.62	122.81	133.19	172.11	165.84
Dow Jones US Electrical Components & Equipment	100.00	107.94	101.94	123.34	157.20	137.91

The performance graph above shall not be deemed "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section. The performance graph above will not be deemed incorporated by reference into any filing of our company under the Securities Act of 1933, as amended, or the Exchange Act.

ITEM 6. *SELECTED FINANCIAL DATA*

The selected historical financial data presented below are derived from our consolidated financial statements. The selected financial data should be read in conjunction with "Item 7. Management's Discussion and Analysis of Financial Condition and Results of Operations" and our consolidated financial statements and the notes thereto included elsewhere in this report.

	For the Year Ended				
	December 31, 2018 (2)	January 1, 2018	January 2, 2017	December 28, 2015 (3)	December 29, 2014
	(In thousands, except per share data)				
Consolidated Statement of Operations Data (1):					
Net sales	$ 2,847,261	$ 2,658,592	$ 2,533,359	$ 2,095,488	$ 1,325,717
Cost of goods sold	2,390,227	2,229,011	2,109,744	1,785,351	1,131,028
Gross profit	457,034	429,581	423,615	310,137	194,689
Operating expenses:					
Selling and marketing	73,313	65,856	66,366	57,361	36,919
General and administrative	159,437	126,141	147,247	167,669	100,999
Amortization of definite-lived intangibles	59,681	23,634	24,252	18,888	8,387
Restructuring charges	5,518	1,190	8,951	7,381	—
Impairment of long-lived assets	—	—	3,346	—	1,845
Gain on sale of assets	—	—	—	(2,504)	—
Total operating expenses	297,949	216,821	250,162	248,795	148,150
Operating income	159,085	212,760	173,453	61,342	46,539
Other income (expense):					
Interest expense	(78,958)	(53,898)	(76,008)	(59,753)	(23,830)
Loss on extinguishment of debt	—	(768)	(47,767)	(802)	(506)
Other, net	9,641	(18,136)	17,324	8,189	88
Total other expense, net	(69,317)	(72,802)	(106,451)	(52,366)	(24,248)
Income before income taxes	89,768	139,958	67,002	8,976	22,291
Income tax benefit (provision)	83,816	(15,231)	(31,427)	(34,594)	(7,598)
Net income (loss)	173,584	124,727	35,575	(25,618)	14,693
Less: Net income attributable to the noncontrolling interest	—	(513)	(714)	(264)	—
Net income (loss) attributable to TTM Technologies, Inc. stockholders	$ 173,584	$ 124,214	$ 34,861	$ (25,882)	$ 14,693
Earnings (loss) per common share attributable to TTM Technologies, Inc. stockholders:					
Basic	$ 1.68	$ 1.22	$ 0.35	$ (0.28)	$ 0.18
Diluted	$ 1.38	$ 1.04	$ 0.34	$ (0.28)	$ 0.18
Weighted average common shares:					
Basic	103,355	101,580	100,099	92,675	83,238
Diluted	134,036	132,476	101,482	92,675	83,941
Other Financial Data:					
Depreciation of property, plant and equipment	$ 162,708	$ 150,809	$ 156,229	$ 133,508	$ 95,349

(1) We operate on a 52 or 53 week year ending on the Monday nearest December 31. Fiscal year 2018, 2017, 2015 and 2014 were 52 weeks ended December 31, 2018, January 1, 2018, December 28, 2015, and December 29, 2014, respectively. Fiscal year 2016 consisted of 53 weeks ended on January 2, 2017 with the additional week included in the fourth quarter. We estimate the additional week contributed approximately $29.2 million of additional revenue and approximately $1.1 million of additional operating income for the year ended January 2, 2017.

(2) Our results for the year ended December 31, 2018 include activity of Anaren, which we acquired on April 28, 2018. Additionally, our results include$13.3 million of bank fees and legal, accounting, and other professional service costs primarily associated with the acquisition of Anaren.

(3) Our results for the year ended December 28, 2015 include activity of Viasystems, which we acquired on May 31, 2015. Additionally, our results include $34.4 million of bank fees and legal, accounting, and other professional service costs associated with the acquisition of Viasystems.

	As of				
	December 31, 2018 (1)	January 1, 2018 (1)	January 2, 2017 (1)	December 28, 2015 (1)	December 29, 2014
	(In thousands)				
Consolidated Balance Sheet Data:					
Working capital	$ 533,700	$ 500,951	$ 323,776	$ 277,526	$ 302,111
Total assets	3,457,503	2,781,882	2,500,076	2,640,133	1,601,289
Long-term debt, including current maturities	1,492,425	980,057	1,019,682	1,170,786	502,687
TTM Technologies, Inc. stockholders' equity	1,227,087	1,011,380	820,847	819,105	715,464

	For the Year Ended				
	December 31, 2018	January 1, 2018	January 2, 2017	December 28, 2015	December 29, 2014
	(In thousands)				
Supplemental Data:					
Adjusted EBITDA (2)	$ 438,838	$ 388,566	$ 395,445	$ 285,673	$ 166,044
Net cash provided by operating activities	273,138	332,755	298,336	237,462	129,810
Net cash used in investing activities	(746,192)	(124,090)	(77,968)	(247,660)	(108,571)
Net cash provided by (used in) financing activities	321,056	(58,976)	(217,109)	(5,756)	(77,141)

(1) Reflects adoption of Financial Accounting Update 2015-03, *Imputation of Interest*, which requires that debt issuance costs related to debt be reported as a direct reduction from the face amount of the debt. Accordingly, as of December 31, 2018, January 1, 2018 and January 2, 2017, approximately $16.3 million, $12.5 million and $4.7 million, respectively, of unamortized debt issuance costs were presented as a reduction of long-term debt on our balance sheet. Furthermore, we reclassified approximately $31.2 million of unamortized debt issuance costs that had been presented as other non-current assets as of December 28, 2015 as a reduction of long-term debt.

(2) "EBITDA" means earnings before interest expense, income taxes, depreciation and amortization. Adjusted EBITDA means earnings before interest expense, income taxes, depreciation, amortization, stock-based compensation, gain on sale of certain assets associated with the closure of manufacturing facilities and on the sale of certain subsidiaries, inventory markup, acquisition-related costs, and impairments, restructuring and other charges. This is a non-GAAP financial measurement used by us to enhance the understanding of our operating results. Adjusted EBITDA is a key measure we use to evaluate our operations. We provide our adjusted EBITDA because we believe that investors and securities analysts will find adjusted EBITDA to be a useful measure for evaluating our operating performance and comparing our operating performance with that of similar companies that have different capital structures and for evaluating our ability to meet our future debt service, capital expenditures, and working capital requirements. However, adjusted EBITDA should not be considered as an alternative to cash flows from operating activities as a measure of liquidity or as an alternative to net income as a measure of operating results in accordance with accounting principles generally accepted in the United States. The following provides a reconciliation of adjusted EBITDA to the financial information in our consolidated statements of operations.

	For the Year Ended				
	December 31, 2018	January 1, 2018	January 2, 2017	December 28, 2015	December 29, 2014
	(In thousands)				
Net income (loss)	$ 173,584	$ 124,727	$ 35,575	$ (25,618)	$ 14,693
Add back items:					
Income tax (benefit) provision	(83,816)	15,231	31,427	34,594	7,598
Interest expense	78,958	53,898	76,008	59,753	23,830
Depreciation of property, plant and equipment	162,708	150,809	156,229	133,508	95,349
Amortization of definite-lived intangible assets	63,026	23,634	24,252	18,888	8,387
EBITDA	394,460	368,299	323,491	221,125	149,857
Stock-based compensation	20,681	18,290	11,090	9,661	7,800
Gain on sale of assets	—	(2,348)	(1,472)	(2,504)	—
Inventory markup	4,900	—	—	—	—
Acquisition-related costs	13,279	2,266	1,688	34,448	5,981
Loss on extinguishment of debt	—	768	47,767	802	506
Impairments, restructuring, and other charges	5,518	1,291	12,881	22,141	1,900
Adjusted EBITDA	$ 438,838	$ 388,566	$ 395,445	$ 285,673	$ 166,044

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

This financial review presents our operating results for each of our three most recent fiscal years and our financial condition at December 31, 2018. Except for historical information contained herein, the following discussion contains forward-looking statements which are subject to known and unknown risks, uncertainties and other factors that may cause our actual results to differ materially from those expressed or implied by such forward-looking statements. We discuss such risks, uncertainties and other factors throughout this report and specifically under Item 1A of Part I of this report, Risk Factors. In addition, the following discussion should be read in connection with the information presented in our consolidated financial statements and the related notes to our consolidated financial statements.

COMPANY OVERVIEW

We are a leading global printed circuit board (PCB) manufacturer, focusing on quick-turn and volume production of technologically complex PCBs, backplane assemblies and electro-mechanical solutions (E-M Solutions) as well as a global designer and manufacturer of radio-frequency (RF) and microwave components and assemblies. We focus on providing time-to-market and volume production of advanced technology products and offer a one-stop design, engineering and manufacturing solution to our customers from engineering support to prototype development through final mass production. This one-stop design and manufacturing solution allows us to align technology development with the diverse needs of our customers and to enable them to reduce the time required to develop new products and bring them to market. We serve a diversified customer base consisting of approximately 2,200 customers in various markets throughout the world, including aerospace and defense, automotive components, smartphones and touchscreen tablets, high-end computing, medical, industrial and instrumentation related products, as well as networking/communications infrastructure products. Our customers include both original equipment manufacturers (OEMs) and electronic manufacturing services (EMS) providers.

RECENT DEVELOPMENTS

On April 18, 2018, we acquired all of the equity interests of Anaren, Inc. (Anaren) for total consideration of $787.9 million. Anaren is a leading provider of mission-critical RF solutions, microelectronics, and microwave components and assemblies for the wireless infrastructure and aerospace and defense electronics markets.

Additionally, on April 18, 2018 we closed our $600.0 million commitment for incremental loans concurrent with the completion of our acquisition of Anaren. We used the proceeds of the incremental loans, along with cash on hand to fund the purchase price of the acquisition and to pay related fees and expenses.

FINANCIAL OVERVIEW

For the fiscal year 2018, we experienced higher demand in our Aerospace and Defense, Computing/Storage/Peripherals and Medical/Industrial/Instrumentation end markets and additional sales from Anaren, partially offset by lower demand in our Cellular Phone and Networking/Communications end markets.

While our customers include both OEMs and EMS providers, we measure customers based on OEM companies as they are the ultimate end customers. Sales to our five largest customers accounted for 32%, 37% and 33% of our net sales in fiscal years 2018, 2017 and 2016, respectively. We sell to OEMs both directly and indirectly through EMS providers.

The following table shows the percentage of our net sales attributable to each of the principal end markets we served for the periods indicated:

End Markets (1)	For the Year Ended December 31, 2018 (3)	January 1, 2018	January 2, 2017
Aerospace and Defense	22 %	16 %	15 %
Automotive	18	19	20
Cellular Phone (2)	13	18	14
Computing/Storage/Peripherals (2)	14	13	12
Medical/Industrial/Instrumentation	14	14	14
Networking/Communications	17	18	23
Other (2)	2	2	2
Total	100 %	100 %	100 %

(1) Sales to EMS companies are classified by the end markets of their OEM customers.

(2) Smartphones are included in the Cellular Phone end market, tablets are included in the Computing/Storage/Peripherals end market and other consumer devices that include wearables, portable video devices and personal headphones are included in the Other end market.

(3) Amounts include activity of Anaren since acquisition which occurred on April 18, 2018.

We derive revenues primarily from the sale of PCBs, custom electronic assemblies using customer-supplied engineering and design plans as well as the design and manufacture of RF and microwave components and assemblies. Most orders for products generally correspond to the production schedules of our customers and are supported with firm purchase orders. Most of our customers have continuous control of the work in progress and finished goods throughout the PCB manufacturing process, as PCBs are built to customer specifications with no alternative use, and there is an enforceable right to payment for work performed to date. As a result, and in light of our adoption of the new over time revenue standard beginning in the first quarter of 2018, we recognize revenue progressively over time based on the extent of progress towards completion of the performance obligation rather than upon shipment as we had in the past. We recognize revenue under these contracts based on the cost-to-cost method as it best depicts the transfer of control to the customer which takes place as we incur costs. Under the cost-to-cost measure of progress, the extent of progress toward completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. Revenues are recorded proportionally as costs are incurred.

Additionally, we have certain long-term contracts related to the manufacture of components, assemblies, and subsystems which service the aerospace and defense electronics market. These long-term contracts, many of which provide for periodic payments, are recognized over time under the percentage-of completion method. Estimated manufacturing cost-at-completion for these contracts are reviewed on a periodic basis, and adjustments are made as needed to the estimated cost-at-completion, based on actual costs incurred, progress made, and estimates of costs required to complete the contractual requirements. When the estimated manufacturing cost-at-completion exceeds the contract value, the contract is written down to its net realizable value and the loss resulting from the cost overruns are immediately recognized.

We also manufacture certain components, assemblies, and subsystems which service our wireless communications customers. We recognize revenue at a point in time upon transfer of control of the products to our customer. Point in time recognition was determined as our customers do not simultaneously receive or consume the benefits provided by our performance and the asset being manufactured has alternative uses to us.

Net sales consist of gross sales less an allowance for returns, which typically have been less than 2% of gross sales. We provide our customers a limited right of return for defective PCBs including components, subsystems and assemblies. We record an estimate for sales returns and allowances at the time of sale based on historical results and anticipated returns.

Cost of goods sold consists of materials, labor, outside services, and overhead expenses incurred in the manufacture and testing of our products. Shipping and handling fees and related freight costs and supplies associated with shipping products are also included as a component of cost of goods sold. Many factors affect our gross margin, including capacity utilization, product mix, production volume, and yield. While we have entered into supply assurance agreements with some of our key suppliers to maintain the continuity of supply of some of the key materials we use, we generally do not participate in any significant long-term contracts with suppliers, and we believe there are a number of potential suppliers for the raw materials we use.

Selling and marketing expenses consist primarily of salaries, labor related benefits, and commissions paid to our internal sales force, independent sales representatives, and our sales support staff, as well as costs associated with marketing materials and trade shows.

General and administrative costs primarily include the salaries for executive, finance, accounting, information technology, facilities, research and development, and human resources personnel, as well as expenses for accounting and legal assistance, incentive compensation expense, and gains or losses on the sale or disposal of property, plant and equipment.

CRITICAL ACCOUNTING POLICIES AND ESTIMATES

Our consolidated financial statements included in this report have been prepared in accordance with accounting principles generally accepted in the United States of America. The preparation of these financial statements requires us to make estimates and assumptions that affect the reported amounts of assets, liabilities, net sales and expenses, and related disclosure of contingent assets and liabilities.

A critical accounting policy is defined as one that is both material to the presentation of our consolidated financial statements and requires us to make judgments that could have a material effect on our financial condition or results of operations. These policies require us to make assumptions about matters that are highly uncertain at the time of the estimate. Different estimates we could reasonably have used, or changes in the estimates that are reasonably likely to occur, could have a material effect on our financial condition or results of operations.

We base our estimates on historical experience and on various other assumptions 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. Management has discussed the development, selection and disclosure of these estimates with the audit committee of our board of directors. Actual results may differ from these estimates under different assumptions or conditions.

Our critical accounting policies include impairment of goodwill and intangible assets; realizability of deferred tax assets; and valuation of assets acquired and liabilities assumed from business combinations.

Goodwill and Intangible Assets

We have significant goodwill and definite-lived intangibles. We review these assets for impairment whenever events or changes in circumstances indicate that the carrying amount of such assets may not be recoverable. In addition, we perform an impairment test related to goodwill at least annually. As necessary, we make judgments regarding future cash flow forecasts in the assessment of impairment.

We have two reportable segments consisting of PCB and E-M Solutions. There is only goodwill in our PCB reportable segment. Goodwill is allocated to our reporting units, which are our operating segments or one level below our operating segments (the component level). Reporting units are determined by the discrete financial information available for the component and whether it is regularly reviewed by segment management. Components are aggregated into a single reporting unit if they share similar economic characteristics. Our PCB reportable segment is made up of five reporting units. The Company evaluates its goodwill on an annual basis in the fourth quarter or more frequently if it believes indicators of impairment exist. We assess qualitative factors to determine whether it is more likely than not that the fair value of a reporting unit is less than its carrying amount or perform its annual impairment test. When tested quantitatively, we compare the fair value of the applicable reporting unit with its carrying value. We estimate the fair values of our reporting units using a combination of the income and market approach. If the carrying amount of a reporting unit exceeds the reporting unit’s fair value, the amount by which the carrying value exceeds the fair value is recognized as an impairment loss. In the fourth quarter of 2018, we performed our annual impairment test quantitatively and concluded that goodwill was not impaired.

In performing the impairment test, we determined the fair value of our reporting units by using discounted cash flow (DCF) and market analyses. For the portions of our business related to our acquisition of Anaren, it was determined that fair value was equivalent to carrying value due to the recent valuation in the second quarter of 2018 and results and forecasts in line with our forecasted cash flow at the time of acquisition. Determining fair value requires us to make judgments about appropriate discount rates, terminal value growth rates and the amount and timing of expected future cash flows. The cash flows employed in the DCF analysis for each reporting unit are based on the reporting unit's budget, long-term business plan, and recent operating performance. Discount rate assumptions are based on an assessment of the risk inherent in the future cash flows of the respective reporting unit and market conditions. Under the market approach, we use revenue and earnings multiples based on comparable industry multiples to estimate the fair value of the reporting units. For the fourth quarter 2018 test, excluding the impact of the acquisition of Anaren, the fair value of the reporting units tested exceeded the respective carrying values by 10% to 34%. Significant assumptions used in the DCF included terminal value growth rates and discount rates that ranged from 15% to 25%. An increase in the discount rate and decrease in the long-term growth rates of 0.5% would result in the fair value of the reporting units exceeding their respective carrying values by 9% to 25%. Given the inherent uncertainty in determining the assumptions underlying a DCF and market analysis, actual results may differ from those used in our valuations. In assessing the reasonableness of the determined fair values, we also reconciled the aggregate determined fair value of the Company to the Company's market capitalization, which, at the date of our fourth quarter 2018 impairment test, included a 28% control premium on a normalized basis.

Management will continue to monitor the reporting units for changes in the business environment that could impact recoverability. The recoverability of goodwill is dependent upon the continued growth of cash flows from our business activities. If the economy or business environment falter and we are unable to achieve our assumed revenue growth rates or profit margin percentages, our projections used would need to be re-measured, which could impact the carrying value of our goodwill in one or more of our reporting units.

We also assess definite-lived intangibles for potential impairment given similar impairment indicators. When indicators of impairment exist related to our definite-lived intangible assets, we use an estimate of the undiscounted cash flows in measuring whether the carrying amount of the assets is recoverable. Measurement of the amount of impairment, if any, is based upon the difference between the asset's carrying value and estimated fair value. Fair value is determined through various valuation techniques, including cost-based, market and income approaches as considered necessary, which involve judgments related to future cash flows and the application of the appropriate valuation model.

Income Taxes

Deferred income tax assets are reviewed for recoverability, and valuation allowances are provided, when necessary, to reduce deferred income tax assets to the amounts that are more likely than not to be realized based on our estimate of future taxable income. At December 31, 2018, we had a net noncurrent deferred income tax asset of $13.7 million, which is comprised of a net deferred tax asset of $174.8 million and a net deferred tax liability of $161.1 million. At December 31, 2018, our deferred income tax asset of $174.8 million was net of a valuation allowance of approximately $27.4 million. Should our expectations of taxable income change in future periods, it may be necessary to adjust our valuation allowance, which could affect our results of operations in the period such a determination is made.

Effects of the Tax Cuts and Jobs Act

On December 22, 2017, U.S. Tax Act was enacted. Accounting Standards Codification (ASC) Topic 740, *Accounting for Income Taxes*, requires companies to recognize the effect of tax law changes in the period of enactment regardless of the effective date of those tax law changes. Certain provisions of U.S. Tax Act are effective September 27, 2017, December 31, 2017 and January 1, 2018.

U.S. Tax Act included provisions requiring a "deemed" one-time mandatory repatriation transition tax on the net accumulated earnings and profits of a U.S. taxpayer's foreign subsidiaries earned post 1986. We have performed an earnings and profits analysis with consideration given to foreign loss carryforwards acquired as a result of our acquisitions and determined that there was no income tax effect in the current or any prior or future period.

Other significant provisions that are effective and for which we have considered their impact on income taxes include: limitations on certain entertainment expenses, the inclusion of commissions and performance based compensation in determining the excessive compensation limitation, limitation on the current deductibility of net interest expense in excess of 30 percent of adjusted taxable income, an incremental tax (base erosion anti-abuse tax or BEAT) on excessive amounts paid to foreign related parties, a minimum tax on certain foreign earnings in excess of 10 percent of the foreign subsidiaries tangible assets (i.e., global intangible low-taxed income or GILTI), the benefit related to foreign derived intangible income (FDII), the required capitalization of research and development expenditures and the impact of requiring tax conformity with Accounting Standard Update (ASU) 2014-09, *Revenue from Contracts with Customers*. We have made a policy election to treat the GILTI tax as a period expense.

In addition, we are subject to income taxes in the United States and foreign jurisdictions. Significant judgment is required in determining our worldwide provision for income taxes. In the ordinary course of our business, there are many transactions for which the ultimate tax determination is uncertain. Additionally, our calculations of income taxes are based on our interpretations of applicable tax laws in the jurisdictions in which we file.

Business Combinations

The application of acquisition accounting to a business acquisition requires that we identify the individual assets acquired and liabilities assumed and estimate the fair value of each. The fair value of assets acquired and liabilities assumed in a business acquisition are recognized at the acquisition date, with the purchase price exceeding the fair values being recognized as goodwill. Determining fair value of identifiable assets, particularly intangibles, liabilities acquired and contingent obligations assumed requires management to make estimates. In certain circumstances, the allocations of the purchase price are based upon preliminary estimates and assumptions and subject to revision when we receive final information, including appraisals and other analysis. Accordingly, the measurement period for such purchase price allocations will end when the information, or the facts and circumstances, becomes available, but will not exceed twelve months. We will recognize measurement-period adjustments during the period of resolution, including the effect on earnings of any amounts that would have been recorded in previous periods if the accounting had been completed at the acquisition date.

Goodwill and intangible assets often represent a significant portion of the assets acquired in a business combination. We recognize the fair value of an acquired intangible apart from goodwill whenever the intangible arises from contractual or other legal rights, or when it can be separated or divided from the acquired entity and sold, transferred, licensed, rented or exchanged, either individually or in combination with a related contract, asset or liability. Intangible assets consist primarily of customer relationships, developed technology, and backlog acquired in business combinations. We generally assess the estimated fair values of acquired intangibles using a combination of valuation techniques. To estimate fair value, we are required to make certain estimates and assumptions, including future economic and market conditions

RESULTS OF OPERATIONS

We operate on a 52 or 53 week year ending on the Monday nearest December 31. Fiscal year 2018 and 2017 were 52 weeks ended December 31, 2018 and January 1, 2018, respectively. Fiscal year 2016 consisted of 53 weeks ended on January 2, 2017 with the additional week included in the fourth quarter. We estimated the additional week contributed approximately $29.2 million of additional revenue and approximately $1.1 million of additional operating income for the year ended January 2, 2017.

The following table sets forth the relationship of various items to net sales in our consolidated statements of operations:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
Net sales	100.0 %	100.0 %	100.0 %
Cost of goods sold	83.9	83.8	83.3
Gross profit	16.1	16.2	16.7
Operating expenses:			
Selling and marketing	2.6	2.5	2.6
General and administrative	5.6	4.7	5.8
Amortization of definite-lived intangibles	2.1	1.0	1.0
Restructuring charges	0.2	—	0.4
Impairment of long-lived assets	—	—	0.1
Total operating expenses	10.5	8.2	9.9
Operating income	5.6	8.0	6.8
Other income (expense):			
Interest expense	(2.7)	(2.0)	(3.0)
Loss on extinguishment of debt	—	—	(1.9)
Other, net	0.3	(0.7)	0.7
Total other expense, net	(2.4)	(2.7)	(4.2)
Income before income taxes	3.2	5.3	2.6
Income tax benefit (provision)	2.9	(0.6)	(1.2)
Net income	6.1	4.7	1.4
Less: Net income attributable to the noncontrolling interest	—	—	—
Net income attributable to TTM Technologies, Inc. stockholders	6.1 %	4.7 %	1.4 %

The Anaren acquisition occurred on April 18, 2018. Accordingly, our fiscal year 2018 only includes Anaren's 2018 results of operations since the acquisition date.

We have two reportable segments: PCB and E-M Solutions. The PCB reportable segment is comprised of multiple operating segments. Factors considered in determining whether operating segments can be aggregated into reportable segments included similarity regarding economic characteristics, products, production process, type or class of customers, distribution methods and regulatory environments.

Net Sales

Total net sales increased $188.7 million, or 7.1%, from $2,658.6 million for the year ended January 1, 2018 to $2,847.3million for the year ended December 31, 2018. Net sales for the PCB reportable segment increased $172.8 million, or 7.1%, from $2,448.5 million for the year ended January 1, 2018 to $2,621.3 million for the year ended December 31, 2018. This increase was primarily due to the acquisition of Anaren, which accounted for $191.0 million in net sales in 2018, as well as higher demand in the Aerospace and Defense, Computing/Storage/Peripherals and Medical/Industrial/Instrumentation end markets compared to the year ended January 1, 2018, partially offset by a decline in demand in our Cellular Phone, Networking/Communications and Automotive end markets. These changes resulted in an average PCB selling price increase of 8.1%, driven mainly by product mix shift, however the resulting increase in net sales was partially offset by a 6.9% decrease in the volume of PCB shipments as compared to the year ended January 1, 2018. Net sales for the E-M Solutions reportable segment increased $15.8 million, or 7.5%, from $210.1 million for the year ended January 1, 2018 to $225.9 million for the year ended December 31, 2018. The increase was primarily due to higher demand in our Automotive and Networking/Communications end markets.

Total net sales increased $125.2 million, or 4.9%, from $2,533.4 million for the year ended January 2, 2017 to $2,658.6 million for the year ended January 1, 2018. Net sales for the PCB reportable segment increased $113.6 million, or 4.9%, from $2,334.9 million for the year ended January 2, 2017 to $2,448.5 million for the year ended January 1, 2018. This increase was primarily due to higher demand in our Cellular Phone, Computing/Storage/Peripherals and Aerospace and Defense end markets compared to the year ended January 2, 2017, partially offset by lower demand in our Networking/Communications end market. While these changes resulted in essentially no change in PCB shipments as compared to the year ended January 2, 2017, average PCB selling price increased by 4.9% as a result of higher average PCB selling price in our Cellular Phone end market, which is primarily due to a more complex technology at a higher cost. Net sales for the E-M Solutions reportable segment increased $11.6 million, or 5.8%, from $198.5 million for the year ended January 2, 2017 to $210.1 million for the year ended January 1, 2018. This increase was primarily due to higher demand in our Automotive end market.

For information regarding net sales by country, see Note 18 of the Notes to Consolidated Financial Statements.

Gross Margin

Overall gross margin decreased from 16.2% for the year ended January 1, 2018 to 16.1% for the year ended December 31, 2018. Gross margin for the PCB reportable segment was 17.2% for both the years ended January 1, 2018 and December 31, 2018, primarily due to the acquisition of Anaren and higher capacity utilization at our Aerospace & Defense focused facilities, offset by decreased volumes at our Cellular Phone focused facilities. Gross margin for the PCB reportable segment included a charge of $4.9 million to cost of goods sold associated with inventory resulting from purchase accounting. Gross margin for the E-M Solutions reportable segment decreased from 8.1% for the year ended January 1, 2018 to 8.0% for the year ended December 31, 2018.

Overall gross margin decreased from 16.7% for the year ended January 2, 2017 to 16.2% for the year ended January 1, 2018. Gross margin for the PCB reportable segment decreased from 17.7% for the year ended January 2, 2017 to 17.2% for the year ended January 1, 2018, primarily due to the change in classification of certain facilities and labor support related costs from general and administrative expenses to cost of goods sold as a result of changes in our business structure, partially offset by higher margins in our Cellular Phone focused facilities. Gross margin for the E-M Solutions reportable segment decreased from 9.1% for the year ended January 2, 2017 to 8.1% for the year ended January 1, 2018 primarily due to mix shift toward higher direct material content work.

Capacity utilization is a key driver for us, particularly in our high volume Asia facilities, as a significant portion of our operating costs are fixed in nature. Capacity utilization for the year ended January 1, 2018 in our Asia and North America PCB facilities was 86% and 54%, respectively, compared to 75% and 60%, respectively, for the year ended December 31, 2018.

Selling and Marketing Expenses

Selling and marketing expenses increased $7.4 million from $65.9 million for the year ended January 1, 2018 to $73.3 million for the year ended December 31, 2018. As a percentage of net sales, selling and marketing expenses were 2.5% for the year ended January 1, 2018 as compared to 2.6% for the year ended December 31, 2018. The increase in selling and marketing expenses in 2018 was primarily related to the acquisition of Anaren on April 18, 2018.

Selling and marketing expenses decreased $0.5 million from $66.4 million for the year ended January 2, 2017 to $65.9 million for the year ended January 1, 2018. As a percentage of net sales, selling and marketing expenses were 2.6% for the year ended January 2, 2017 as compared to 2.5% for the year ended January 1, 2018. The decrease in selling and marketing expense as a percentage of net sales for the periods noted was primarily due to higher net sales and lower travel expenses.

General and Administrative Expenses

General and administrative expenses increased $33.3 million from $126.1 million, or 4.7% of net sales, for the year ended January 1, 2018 to $159.4 million, or 5.6% of net sales, for the year ended December 31, 2018. The increase in expense was primarily related to general and administrative expenses incurred by Anaren post acquisition and $13.3 million of acquisition-related costs during the year ended December 31, 2018 primarily associated with the acquisition of Anaren on April 18, 2018.

General and administrative expenses decreased $21.1 million from $147.2 million, or 5.8% of net sales, for the year ended January 2, 2017 to $126.1 million, or 4.7% of net sales, for the year ended January 1, 2018. The decrease in expense is primarily related to the change in classification of certain facilities and labor support related costs to cost of goods sold due to changes in our business structure.

Restructuring and Impairment Charges

For the years ended December 31, 2018, January 1, 2018, and January 2, 2017, we incurred restructuring charges of $5.5 million, $1.2 million, and $8.9 million, respectively, related to integration and other efficiency and cost saving measures following the acquisition of Anaren on April 18, 2018 and closure of our facilities in Cleveland, Ohio, Milpitas, California, and Juarez, Mexico and other global realignment efforts following the acquisition of Viasystems on May 31, 2015.

During the year ended December 31, 2018, we recognized restructuring charges of $2.0 million and $3.5 million in our PCB reportable segment and Corporate, respectively. For the year ended January 1, 2018, we recognized restructuring charges of $0.3 million and $0.5 million in our PCB and E-M Solutions reportable segments, respectively, and $0.4 million in Corporate. For the year ended January 2, 2017, we recognized restructuring charges of $3.7 million and $4.5 million in our PCB and E-M Solutions reportable segments, respectively, and $0.7 million in Corporate. These charges primarily represent employee separation and contract termination and other costs associated with the restructuring plans. As of December 31, 2018, we had incurred approximately $23.0 million of restructuring charges since the inception of the restructuring plans.

Additionally, as a result of the above mentioned plant closures and other plant realignment efforts, we also recognized impairment charges of $3.3 million for the year ended January 2, 2017, of which $1.4 million were recognized in our PCB reportable segment and $1.9 million were recognized in the Corporate. The impairment charge for the PCB reportable segment related to machinery and equipment while the impairment charge for Corporate related to the write-off of capitalized software costs.

If forecasts and assumptions used to support the realizability of our long-lived assets change in the future, significant restructuring or impairment charges could result that would adversely affect our results of operations and financial condition.

Other Income (Expense)

Other expense, net decreased $3.5 million from $72.8 million for the year ended January 1, 2018 to $69.3 million for the year ended December 31, 2018. The decrease in other expense, net was primarily due to:

- a decrease in expense of $26.3 million due to $3.5 million of foreign exchange gains for the year ended December 31, 2018 compared to $22.8 million foreign exchange losses for the year ended January 1, 2018, primarily resulting from a weakening Chinese Renminbi relative to the U.S. dollar,
- partially offset by an increase in interest expense of $25.1 million, primarily related to the $600.0 million incremental borrowing in conjunction with the Anaren acquisition, $23.0 million draw on our U.S. Asset-Based Lending Credit (U.S. ABL), higher amortization of debt issuance costs and debt discount and additional interest expense from our interest rate swap.

Other expense, net decreased $33.7 million from $106.5 million for the year ended January 2, 2017 to $72.8 million for the year ended January 1, 2018. The decrease in other expense, net was primarily due to:

- the absence of the 2016 loss on extinguishment of debt of $47.8 million related to the full repayment of the 2015 Term Loan Credit Agreement,
- a decrease in interest expense of $22.1 million, due to overall lower amount of principal outstanding, a lower Term Loan Facility interest rate margin by 175 basis points, and three quarters of comparatively lower amortization of debt issuance costs and debt discount after the full repayment of our 2016 Term Loan in the fourth quarter of 2016, and
- partially offset by an increase from a change in foreign exchange expense of $36.3 million resulting from a $22.8 million foreign exchange losses for the year ended January 1, 2018 compared to a $13.5 million of foreign exchange gains for the year ended January 2, 2017 primarily resulting from a weakening U.S. dollar relative to the Chinese Renminbi.

Income Taxes

The provision for income taxes decreased $99.1 million from an income tax expense of $15.2 million for the year ended January 1, 2018 to an income tax benefit of $83.9 million for the year ended December 31, 2018. The decrease in income tax expense in 2018 was primarily due to a release of the valuation allowance in the U.S. and certain foreign entities and an increase in tax incentives in China, partially offset by an increase to tax expense for the establishment of a deferred tax liability related to unremitted foreign earnings.

Our tax expense is primarily impacted by tax rates in China and Hong Kong, the U.S. federal income tax rate, apportioned state income tax rates, generation of other credits and deductions available to us, changes in our valuation allowance, and certain non-deductible items. Certain losses generated are not more likely than not to be realizable, and thus no income tax benefit has been recognized on these losses. We had a net deferred income tax asset of approximately $13.7 million and $4.9 million deferred tax liability as of December 31, 2018 and January 1, 2018, respectively. Based on our forecast for future taxable earnings in the U.S. and certain foreign jurisdictions, we believe it is more likely than not that we will utilize the deferred income tax assets in future periods.

The provision for income taxes decreased $16.2 million from an income tax expense of $31.4 million for the year ended January 2, 2017 to $15.2 million for the year ended January 1, 2018. The decrease in income tax expense in 2017 was primarily due to a release of the valuation allowance in certain foreign entities and an increase in tax incentives in China.

Liquidity and Capital Resources

Our principal sources of liquidity have been cash provided by operations, the issuance of convertible senior notes, term debt, senior notes and revolving debt. Our principal uses of cash have been to finance capital expenditures, finance acquisitions (including the acquisition of Anaren in fiscal 2018), meet debt service requirements, fund working capital requirements, and refinance existing debt. We anticipate that servicing debt, financing capital expenditures, financing acquisitions, and funding working capital requirements will continue to be the principal demands on our cash in the future.

Cash flow provided by operating activities during the year ended December 31, 2018 was $273.1 million as compared to $332.8 million in the same period in 2017. The decrease in cash flow was primarily due to increased working capital. As of December 31, 2018, we had net working capital of approximately $533.7 million compared to $501.0 million as of January 1, 2018.

Net cash used in investing activities was approximately $746.2 million for the year ended December 31, 2018 primarily reflecting $596.4 million for the acquisition of Anaren, net of debt assumed, and $150.1 million for purchases of property, plant and equipment.

Net cash provided by financing activities was approximately $321.1 million for the year ended December 31, 2018, primarily reflecting proceeds of $623.0 million from the incremental term and revolving loan borrowings, offset by the repayment of assumed long-term debt related to the acquisition of Anaren of $178.6 million, repayment of long-term debt of $114.4 million, and payment of debt issuance costs and original issue discount of $9.2 million associated with the Term Loan Facility and Senior Notes.

As of December 31, 2018, we had cash and cash equivalents of approximately $256.4 million, of which approximately $213.9 million was held by our foreign subsidiaries, primarily in Asia.

Our 2019 capital expenditure plan is expected to be in the range of $130.0 million to $150.0 million.

Long-term Debt and Letters of Credit

Term Loan Facility

On April 18, 2018, we closed our $600.0 million commitment of incremental loans concurrent with the completion of our acquisition of Anaren. At issuance, these incremental loans increased the existing balance of our Term Loan Facility due 2024 from $348.3 million to $948.3 million. As of December 31, 2018, the Term Loan Facility had an outstanding balance of $835.9 million, of which $30.0 million is included in short-term debt and $805.9 million is included in long-term debt. The Term Loan Facility was issued at a weighted average discount of 99.7% and bears interest, at our option, at a floating rate of LIBOR, plus an applicable interest margin of 2.50%, or an alternate base rate, (defined as the greater of the JP Morgan prime, the New York Fed bank rate plus 0.5% or LIBOR plus 1.0%), subject to a 1.0% floor plus an applicable margin of 1.5%. At December 31, 2018 the interest rate on the outstanding borrowings under the Term Loan Facility was 5.00%. There is no provision, other than an event of default, for the interest margin to increase. The Term Loan Facility will mature on September 28, 2024. The Term Loan Facility is secured by a significant amount of our domestic assets and a pledge of 65% of voting stock of our first tier foreign subsidiaries and is structurally senior to our Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notes below.

During 2018, after the closing of our April 18, 2018 incremental loans facility, we made a $2.4 million quarterly scheduled principal payment and $110.0 million optional debt principal prepayments. Subsequent to December 31, 2018, we made an optional debt principal prepayment of $30.0 million. As a result of the principal prepayments, we are no longer required to make any quarterly scheduled payments. However, based on certain parameters defined in the Term Loan Facility, including a First Lien Leverage Ratio, we may be required to make an additional principal payment on an annual basis beginning after fiscal year 2018. For 2019, we are not required to make an additional principal payment as our First Lien Leverage Ratio was less than 2.0. Any remaining outstanding balance under the Term Loan Facility is due at the maturity date of September 28, 2024.

Borrowings under the Term Loan Facility are subject to certain affirmative and negative covenants, including limitations on indebtedness, corporate transactions, investments and dispositions, and share payments. At December 31, 2018, we were in compliance with the covenants under the Term Loan Facility.

Senior Notes

The $375.0 million of Senior Notes issued, which is included in long-term debt, bear interest at a rate of 5.63% per annum. Interest is payable semiannually in arrears on April 1 and October 1 of each year beginning April 1, 2018. The Senior Notes will mature on October 1, 2025.

Borrowings under the Senior Notes are subject to certain affirmative and negative covenants, including limitations on indebtedness, corporate transactions, investments and dispositions, and share payments. At December 31, 2018, we were in compliance with the covenants under the Senior Notes.

Convertible Senior Notes due 2020

We maintain 1.75% convertible senior notes in the amount of $250.0 million due December 15, 2020. The convertible senior notes bear interest at a rate of 1.75% per annum. Interest is payable semiannually in arrears on June 15 and December 15 of each year. The convertible senior notes are senior unsecured obligations and rank equally to our future unsecured senior indebtedness and senior in right of payment to any of our future subordinated indebtedness. Offering expenses are being amortized to interest expense over the term of the convertible senior notes.

Conversion: At any time prior to March 15, 2020, holders may convert their convertible senior notes into cash and, if applicable, into shares of our common stock based on a conversion rate of 103.7613 shares of our common stock per $1,000 principal amount of convertible senior notes, subject to adjustment, under the following circumstances: (1) during any calendar quarter beginning after March 31, 2015 (and only during such calendar quarter), if the last reported sale price of our common stock for at least 20 trading days during the 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the applicable conversion price on each applicable trading day of such preceding calendar quarter; (2) during the five business day period after any 10 consecutive trading day period in which the trading price per note for each day of that 10 consecutive trading day period was less than 98% of the product of the last reported sale price of our common stock and the conversion rate on such day; or (3) upon the occurrence of specified corporate transactions described in the indenture governing the notes. In 2018, the conversion criteria had been met allowing holders to give notice of conversion during the year. However, as of December 31, 2018, the conversion criteria that would allow holders to give notice of conversion in the first quarter of 2019 had not been met.

On or after March 15, 2020 until the close of business on the third scheduled trading day preceding the maturity date, holders may convert their notes at any time, regardless of the foregoing circumstances. Upon conversion, for each $1,000 principal amount of notes, we will pay shares of our common stock, cash or a combination of cash and shares of our common stock at our election, if applicable, based on a daily conversion value calculated on a proportionate basis for each day of the 80 trading day observation period. All conversions occurring on the same date or on or after March 15, 2020 shall be settled using the same settlement method. Additionally, in the event of a fundamental change as defined in the indenture governing the notes, or other conversion rate adjustments such as share splits or combinations, other distributions of shares, cash or other assets to stockholders, including self-tender transactions (Other Conversion Rate Adjustments), the conversion rate may be modified to adjust the number of shares per $1,000 principal amount of the notes. As of December 31, 2018, none of the criteria for a fundamental change or a conversion rate adjustment had been met.

The maximum number of shares issuable upon conversion, including the effect of a fundamental change and subject to Other Conversion Rate Adjustments, would be 32.4 million.

Note Repurchase: We are not permitted to redeem the convertible senior notes at any time prior to maturity. In the event of a fundamental change or certain default events, as defined in the indenture governing the notes, holders may require us to repurchase for cash all or a portion of their convertible senior notes at a price equal to 100% of the principal amount, plus any accrued and unpaid interest.

Convertible Note Hedge and Warrant Transaction: In connection with the issuance of the convertible senior notes due 2020, we entered into a convertible note hedge and warrant transaction (Call Spread Transaction), with respect to our common stock. The convertible note hedge consists of our option to purchase up to 25.9 million common stock shares at a price of $9.64 per share. The hedge expires on December 15, 2020 and can only be executed upon the conversion of the above mentioned convertible senior notes due 2020. Additionally, we sold warrants to purchase 25.9 million shares of our common stock at a price of $14.26 per share. The warrants expire ratably from March 2021 through January 2022. The Call Spread Transaction has no effect on the terms of the convertible senior notes due 2020 and reduces potential dilution by effectively increasing the conversion price of the convertible senior notes due 2020 to $14.26 per share of our common stock.

Asset-Based Lending Agreements

We maintain a $200.0 million U.S. ABL, and a $150.0 million Asia Asset-Based Lending Credit Agreement (Asia ABL) (collectively the ABL Revolving Loans).

The U.S. ABL consists of three tranches comprised of a revolving credit facility of up to $200.0 million, a letter of credit facility for up to $50.0 million, and swingline loans for up to $30.0 million, provided that at no time may amounts outstanding under the tranches exceed in aggregate $200.0 million or the applicable borrowing base, which is a percentage of the principal amount of Eligible Accounts, as defined in the U.S. ABL agreement. Borrowings under the U.S. ABL bear interest at either a floating rate of LIBOR plus a margin of 150 basis points or JP Morgan Chase Bank’s prime rate plus a margin of 50 basis points, at our option. At December 31, 2018, the interest rate on the outstanding borrowings under the U.S. ABL was 4.00%. The applicable margin can vary based on the remaining availability of the facility, from 125 to 175 basis points for LIBOR-based loans and from 25 to 75 basis points for JP Morgan Chase Bank’s prime rate-based loans. Other than availability and an event of default, there are no other provisions for the interest margin to increase. The U.S. ABL will mature on May 31, 2020. Loans made under the U.S. ABL are secured first by all of our domestic cash, receivables and certain inventories as well as by a second position against a significant amount of our domestic assets and a pledge of 65% of voting stock of our first tier foreign subsidiaries and are structurally senior to our Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notes above. At December 31, 2018, $40.0 million of the U.S. ABL was outstanding and classified as long-term debt, which is consistent with its maturity date.

The Asia ABL consists of two tranches comprised of a revolving credit facility for up to $150.0 million and a letter of credit facility for up to $100.0 million, provided that at no time may amounts outstanding under both tranches exceed in aggregate $150.0 million or the applicable borrowing base, which is a percentage of the principal amount of Eligible Accounts, as defined in the Asia A BL agreement. Borrowings under the Asia ABL bear interest at a floating rate of LIBOR plus 140 basis points. At December 31, 2018, the interest rate on the outstanding borrowings under the Asia ABL was 3.90%. There is no provision, other than an event of default, for the interest margin to increase. The Asia ABL will mature on May 22, 2020. Loans made under the Asia ABL are secured by a portion of our Asia Pacific cash and receivables and are structurally senior to our domestic obligations, including the Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notesabove. At December 31, 2018, $30.0 million of the Asia ABL was outstanding and classified as long-term debt, which is consistent with its maturity date.

We have up to $50.0 million and $100.0 million Letters of Credit Facilities under the U.S. ABL and the Asia ABL, respectively. As of December 31, 2018, letters of credit in the amount of $10.1 million were outstanding under the U.S. ABL and $12.1million were outstanding under the Asia ABL with various expiration dates through May 2020. Available borrowing capacity under the U.S. ABL and the Asia ABL was $149.9 million and $107.9 million, respectively, which considers letters of credit outstanding at December 31, 2018.

We are required to pay a commitment fee of 0.25% to 0.375% per annum on any unused portion of the ABL Revolving Loans. We paid commitment fees of $1.0 million, $0.8 million and $0.7 million for the years ended December 31, 2018, January 1, 2018, and January 2, 2017, respectively. Under the occurrence of certain events, the ABL Revolving Loans are subject to various financial and operational covenants, including maintaining minimum fixed charge coverage ratios. At December 31, 2018, we were in compliance with the covenants under the ABL Revolving Loans.

Other Credit Facility

Additionally, we are party to a revolving loan credit facility (Chinese Revolver) with a lender in China. Under this arrangement, the lender has made available to us approximately $30.5 million in unsecured borrowing with all terms of the borrowing to be negotiated at the time the Chinese Revolver is drawn upon. There are no commitment fees on the unused portion of the Chinese Revolver, and this arrangement expires in June 2019. As of December 31, 2018, the Chinese Revolver had not been drawn upon.

Based on our current level of operations, we believe that cash generated from operations, cash on hand and cash from the issuance of term and revolving debt will be adequate to meet our currently anticipated capital expenditure, debt service, and working capital needs for the next 12 months.

Contractual Obligations and Commitments

The following table provides information on our contractual obligations as of December 31, 2018:

Contractual Obligations (1)	Total	Less Than 1 year	1 - 3 Years	4 - 5 Years	After 5 Years
			(In thousands)		
Long-term debt obligations	$ 1,280,879	$ 30,000	$ 70,000	$ —	$ 1,180,879
Convertible debt obligations	249,985	—	249,985	—	—
Interest on debt obligations	398,927	72,774	130,014	123,715	72,424
Derivative liabilities	5,595	1,222	3,720	653	—
Purchase obligations	112,553	102,228	1,213	686	8,426
Operating lease commitments	24,141	7,282	8,107	4,580	4,172
Total contractual obligations	$ 2,072,080	$ 213,506	$ 463,039	$ 129,634	$ 1,265,901

(1) Unrecognized uncertain tax benefits of $37.9 million are not included in the table above as the settlement timing is uncertain.

Off-Balance Sheet Arrangements

We do not have any relationships with unconsolidated entities or financial partnerships, such as entities often referred to as structured finance or special purpose entities, which would have been established for the purpose of facilitating off-balance sheet arrangements or other contractually narrow or limited purposes. In addition, we do not engage in trading activities involving non-exchange traded contracts. As a result, we are not materially exposed to any financing, liquidity, market, or credit risk that could arise if we had engaged in these relationships.

Seasonality

Orders for our products generally correspond to the production schedules of our customers. We historically experience higher net sales in the third and fourth quarters due to end customer demand in the fourth quarter for consumer electronics products. Seasonal fluctuations also include the Chinese New Year holidays in the first quarter, which typically results in lower net sales. We attribute this decline to shutdowns of our customers' and our own China based manufacturing facilities surrounding the Chinese New Year public holidays, which normally occur in January or February of each year.

Recently Issued Accounting Standards

For a description of recently adopted and issued accounting standards, including the respective dates of adoption and expected effects on our results of operations and financial condition, see Note 1 of the Notes to Consolidated Financial Statements.

ITEM 7A. *QUANTITATIVE AND QUALITATIVE DISCLOSURES ABOUT MARKET RISK*

Foreign currency risks

In the normal course of business we are exposed to risks associated with fluctuations in foreign currency exchange rates associated with transactions that are denominated in currencies other than our functional currencies, as well as the effects of translating amounts denominated in a foreign currency to the U.S. Dollar as a normal part of our financial reporting process. Most of our foreign operations have the U.S. Dollar as their functional currency, however, two of our China facilities utilize the Renminbi (RMB), which results in recognition of translation adjustments included as a component of other comprehensive income. Our foreign exchange exposure results primarily from employee-related and other costs of running our operations in foreign countries, foreign currency denominated purchases and translation of balance sheet accounts denominated in foreign currencies. Our primary foreign exchange exposure is to the RMB. Except for certain equipment purchases, we do not engage in hedging to manage foreign currency risk. However, we may consider the use of derivatives in the future. In general, our Chinese customers pay us in RMB, which partially mitigates this foreign currency exchange risk.

We enter into foreign currency forward contracts to mitigate the impact of changes in foreign currency exchange rates and to reduce the volatility of purchases and other obligations generated in currencies other than our functional currencies. Our foreign subsidiaries may at times purchase forward exchange contracts to manage foreign currency risks in relation to certain purchases of machinery denominated in foreign currencies other than our functional currencies. The notional amount of the foreign exchange contracts at December 31, 2018 and January 1, 2018 was approximately $4.3 million and $10.9 million, respectively. We designated certain of these foreign exchange contracts as cash flow hedges.

The table below presents information about certain of the foreign currency forward contracts at December 31, 2018 and January 1, 2018:

	As of December 31, 2018		As of January 1, 2018	
	Notional Amount	Average Contract Rate or Strike Amount	Notional Amount	Average Contract Rate or Strike Amount
	(In thousands)			
Receive foreign currency/pay USD				
Japanese Yen	$ 4,313	0.01	$ 9,687	0.01
Euro	—	—	1,240	1.11
	$ 4,313		$ 10,927	
Estimated fair value, net liability	$ (139)		$ (44)	

Interest rate risk

Our business is exposed to interest rate risk resulting from fluctuations in interest rates. Our interest expense is more sensitive to fluctuations in the general level of LIBOR interest rates than to changes in rates in other markets. Increases in interest rates would increase interest expense relating to our outstanding variable rate borrowings and increase the cost of debt. Fluctuations in interest rates can also lead to significant fluctuations in the fair value of our debt obligations.

On May 15, 2018, we entered into a four-year pay-fixed, receive floating (1-month LIBOR), interest rate swap arrangement with a notional amount of $400.0 million for the period beginning June 1, 2018 and ending on June 1, 2022. At inception, we designated the interest rate swap as a cash flow hedge and the fair value of the interest rate swap was zero. As of December 31, 2018, the fair value of the interest rate swap was recorded as a liability and as a component of other long-term liabilities in the amount of $4.7 million. Under the terms of the interest rate swap, we pay a fixed rate of 2.84% against the first interest payments of a portion of our LIBOR-based debt and receive floating 1-month LIBOR during the swap period. No ineffectiveness was recognized for the year ended December 31, 2018. During the year ended December 31, 2018, the interest rate swap increased interest expense by $1.6 million.

As of December 31, 2018, approximately 67.0% of our long term debt was based on fixed rates. Based on our borrowings as of December 31, 2018, an assumed 100 basis point change in variable rates would cause our annual interest cost to change by $5.1 million.

On July 27, 2017, the Financial Conduct Authority announced the desire to phase out the use of LIBOR by the end of 2021, which may affect us adversely. If LIBOR is discontinued, we may need to renegotiate the terms of certain of our capital securities and credit instruments, which utilize LIBOR as a benchmark in determining the interest rate, to replace LIBOR with the new standard that is established. There is currently no definitive information regarding the future utilization of LIBOR or of any particular replacement rate. As such, the potential effect of any such event on our cost of capital and net investment income cannot yet be determined.

Debt Instruments

The table below presents the fiscal calendar maturities of long-term debt through 2023 and thereafter of our debt instruments as of December 31, 2018 and January 1, 2018.

	As of December 31, 2018								
	2019	2020	2021	2022	2023	Thereafter (1)	Total	Fair Market Value	Weighted Average Interest Rate
	(In thousands)								
US$ Variable Rate	$ 30,000	$ 70,000	$ —	$ —	$ —	$ 805,879	$ 905,879	$ 852,592	4.92%
US$ Fixed Rate	—	249,985	—	—	—	375,000	624,985	641,738	4.08%
Total	$ 30,000	$ 319,985	$ —	$ —	$ —	$ 1,180,879	$ 1,530,864	$ 1,494,330	

	As of January 1, 2018								
	2018	2019	2020	2021	2022	Thereafter	Total	Fair Market Value	Weighted Average Interest Rate
	(In thousands)								
US$ Variable Rate	$ 3,500	$ 2,625	$ 50,500	$ 4,375	$ 3,500	$ 331,625	$ 396,125	$ 393,943	3.94%
US$ Fixed Rate	1,078	407	250,419	—	—	375,000	626,904	815,887	4.08%
Total	$ 4,578	$ 3,032	$ 300,919	$ 4,375	$ 3,500	$ 706,625	$ 1,023,029	$ 1,209,830	

(1) Interest rate swap effectively fixed $400,000 of variable rate debt.

Interest Rate Swap Contracts

The table below presents information regarding our interest rate swaps (in thousands) as of December 31, 2018.

	2018	Fair Market Value
Average interest payout rate	2.84 %	
Interest payout amount	$ (6,750)	
Average interest received rate	2.17 %	
Interest received amount	5,152	
Fair value loss as of December 31, 2018		$ (4,735)

ITEM 8. *FINANCIAL STATEMENTS AND SUPPLEMENTARY DATA*

Reference is made to our consolidated financial statements, the notes thereto, and the report thereon, commencing on page 56 of this report, which consolidated financial statements, notes and report are incorporated herein by reference.

We operate on a 52 or 53 week year ending on the Monday nearest December 31. Fiscal years 2018 and 2017 were 52 weeks and ended December 31, 2018 and January 1, 2018, respectively, and each quarter of both fiscal years 2018 and 2017 contained 91 days.

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter
	(In thousands, except per share data)			
Year Ended December 31, 2018:				
Net sales	$ 663,582	$ 716,887	$ 755,837	$ 710,955
Gross profit	88,678	116,140	129,584	122,632
Income before income taxes	15,147	17,459	34,538	22,624
Net income	10,097	84,004	27,001	52,482
Net income attributable to TTM Technologies, Inc. stockholders	10,097	84,004	27,001	52,482
Earnings per share attributable to TTM Technologies, Inc. stockholders:				
Basic	$ 0.10	$ 0.81	$ 0.26	$ 0.51
Diluted	$ 0.09	$ 0.65	$ 0.22	$ 0.42
Year Ended January 1, 2018:				
Net sales	$ 625,247	$ 627,182	$ 666,814	$ 739,349
Gross profit	105,019	95,867	96,834	131,861
Income before income taxes	37,264	26,309	22,740	53,645
Net income	33,125	20,751	21,535	49,316
Net income attributable to TTM Technologies, Inc. stockholders	32,959	20,591	21,453	49,211
Earnings per share attributable to TTM Technologies, Inc. stockholders:				
Basic	$ 0.33	$ 0.20	$ 0.21	$ 0.48
Diluted	$ 0.28	$ 0.18	$ 0.19	$ 0.40

ITEM 9. *CHANGES IN AND DISAGREEMENTS WITH ACCOUNTANTS ON ACCOUNTING AND FINANCIAL DISCLOSURE*

Not applicable.

ITEM 9A. *CONTROLS AND PROCEDURES*

Evaluation of Disclosure Controls and Procedures

Our management, under the supervision and with the participation of our Chief Executive Officer (CEO) and Chief Financial Officer (CFO), has evaluated the effectiveness of the design and operation of our disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)) as of the end of the period covered by this Report. Based on this evaluation, our CEO and CFO have concluded that, as of December 31, 2018, such disclosure controls and procedures were effective to provide reasonable assurance that information we are required to disclose in reports that we file or submit under the Exchange Act is (i) recorded, processed, summarized and reported within the time periods specified in the SEC's rules and forms and (ii) accumulated and communicated to our management, including our CEO and CFO, as appropriate to allow timely decisions regarding required disclosures.

Management's Report on Internal Control over Financial Reporting

Our management is responsible for establishing and maintaining adequate internal control over financial reporting, (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) to provide reasonable assurance regarding the reliability of our financial reporting and the preparation of financial statements for external purposes in accordance with accounting principles generally accepted in the United States of America (U.S. GAAP). Under the supervision of and with the participation of our CEO and CFO, management conducted an assessment of the effectiveness of our internal control over financial reporting as of December 31, 2018 based on the criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission (COSO). Based on this assessment, management concluded that our internal control over financial reporting was effective as of December 31, 2018.

We acquired Anaren, Inc. on April 18, 2018. Management excluded from its evaluation of the effectiveness of our internal control over financial reporting as of December 31, 2018 the acquired entity's internal control over financial reporting associated with 2.4% of total assets and 6.7% of total net sales included in our consolidated financial statements as of and for the year ended December 31, 2018.

The effectiveness of our internal control over financial reporting as of December 31, 2018 has been audited by KPMG LLP, an independent registered public accounting firm, as stated in their report, which appears under the heading "Report of Independent Registered Public Accounting Firm" on page 57 of this Report.

Inherent Limitations on Effectiveness of Controls

A control system, no matter how well designed and operated, can provide only reasonable, not absolute, assurance that the control system's objectives will be met. The design of a control system must reflect the fact that there are resource constraints, and the benefits of controls must be considered relative to their costs. Further, because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that misstatements due to error or fraud will not occur or that all control issues and instances of fraud, if any, have been detected. In addition, the design of any system of controls is based in part on certain assumptions about the likelihood of future events.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting (as defined in Rules 13a-15(f) and 15d-15(f) under the Exchange Act) during the quarter ended December 31, 2018 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

ITEM 9B. *OTHER INFORMATION*

Not applicable.

PART III

ITEM 10. ***DIRECTORS, EXECUTIVE OFFICERS AND CORPORATE GOVERNANCE***

The information required by this Item is incorporated herein by reference to the definitive Proxy Statement to be filed pursuant to Regulation 14A of the Exchange Act for our 2019 Annual Meeting of Stockholders.

ITEM 11. ***EXECUTIVE COMPENSATION.***

The information required by this Item is incorporated herein by reference to the definitive Proxy Statement to be filed pursuant to Regulation 14A of the Exchange Act for our 2019 Annual Meeting of Stockholders.

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

The information required by this Item is incorporated herein by reference to the definitive Proxy Statement to be filed pursuant to Regulation 14A of the Exchange Act for our 2019 Annual Meeting of Stockholders.

ITEM 13. ***CERTAIN RELATIONSHIPS AND RELATED TRANSACTIONS, AND DIRECTOR INDEPENDENCE.***

The information required by this Item is incorporated herein by reference to the definitive Proxy Statement to be filed pursuant to Regulation 14A of the Exchange Act for our 2019 Annual Meeting of Stockholders.

ITEM 14. ***PRINCIPAL ACCOUNTING FEES AND SERVICES.***

The information required by this Item is incorporated herein by reference to the definitive Proxy Statement to be filed pursuant to Regulation 14A of the Exchange Act for our 2019 Annual Meeting of Stockholders.

PART IV

ITEM 15. ***EXHIBITS, FINANCIAL STATEMENT SCHEDULES***

(a) *Financial Statements*

Financial Statements are listed in the Index to Consolidated Financial Statements on page56 of this Report.

(b) *Exhibits*

Exhibit Number	Exhibits
2.1	Stock Purchase Agreement between TTM Technologies, Inc. and Anaren Holdings, LLC dated December 1, 2017(20)
3.1	Registrant's Certificate of Incorporation, as amended May 12,2016(1)
3.2	Registrant's Fourth Amended and Restated Bylaws, as amended March 2, 2016(2)
4.1	Indenture, dated as of May 14, 2008, between the Registrant and American Stock Transfer & Trust Company(3)
4.3	Form of Registrant's common stock certificate(4)
4.4	Sell-Down Registration Rights Agreement, dated December 23, 2009, by and among Meadville Holdings Limited, MTG Investment (BVI) Limited, and the Registrant(5)
4.8	Indenture, dated as of December 20, 2013, between the Registrant and American Stock Transfer & Trust Company, LLC(6)
4.9	Senior Notes Indenture among TTM Technologies, Inc. and Wilmington National Association dated September 28, 2017(19)
10.13‡	TTM Technologies, Inc. 2014 Incentive Compensation Plan(7)
10.15	Form of Director and Officer Indemnification Agreement, dated December 10, 2014(8)
10.16	Stock Purchase Agreement, dated November 16, 2009, by and among Meadville Holdings Limited, MTG Investment (BVI) Limited, the Registrant, TTM Technologies International, Inc., and TTM Hong Kong Limited (now known as TTM Technologies (Asia Pacific) Limited)(9)
10.20	Special Security Agreement by and among Tang Hsiang Chien, Su Sih (BVI) Limited, the Registrant and the United States Department of Defense, dated October 19, 2010(10)
10.22‡	Executive and Director Deferred Compensation Plan(11)
10.24	Call Option Transaction Confirmation, dated as of December 16, 2013, between the Registrant and JPMorgan Chase Bank, National Association, London Branch(6)
10.25	Warrant Transaction Confirmation, dated as of December 16, 2013, between the Registrant and JPMorgan Chase Bank, National Association, London Branch(6)
10.26	Call Option Transaction Confirmation, dated as of December 16, 2013, between the Registrant and RBC Capital Markets, LLC(6)
10.27	Warrant Transaction Confirmation, dated as of December 16, 2013, between the Registrant and RBC Capital Markets, LLC(6)
10.28	Call Option Transaction Confirmation, dated as of December 16, 2013, between the Registrant and Deutsche Bank AG, London Branch(6)
10.29	Warrant Transaction Confirmation, dated as of December 16, 2013, between the Registrant and Deutsche Bank AG, London Branch(6)
10.30	Call Option Transaction Confirmation, dated as of January 9, 2014, between the Registrant and JPMorgan Chase Bank, National Association, London Branch(12)
10.31	Warrant Transaction Confirmation, dated as of January 9, 2014, between the Registrant and JPMorgan Chase Bank, National Association, London Branch(12)

10.32	Call Option Transaction Confirmation, dated as of January 9, 2014, between the Registrant and RBC Capital Markets, LLC(12)
10.33	Warrant Transaction Confirmation, dated as of January 9, 2014, between the Registrant and RBC Capital Markets, LLC(12)
10.34	Call Option Transaction Confirmation, dated as of January 9, 2014, between the Registrant and Deutsche Bank AG, London Branch(12)
10.35	Warrant Transaction Confirmation, dated as of January 9, 2014, between the Registrant and Deutsche Bank AG, London Branch(12)
10.40	TTM Technologies, Inc. Form of Restricted Stock Unit Award Grant Notice (for U.S. taxpayers) pursuant to TTM Technologies, Inc. 2014 Incentive Compensation Plan(17)
10.41	TTM Technologies, Inc. Form of Restricted Stock Unit Award Grant Notice (for non-U.S. taxpayers) pursuant to TTM Technologies, Inc. 2014 Incentive Compensation Plan(13)
10.42	TTM Technologies, Inc. Form of Performance-Based RSU Grant Notice and Award Agreement pursuant to TTM Technologies, Inc. 2014 Incentive Compensation Plan(17)
10.43	Form of Executive Change in Control Severance Agreement and schedule of agreements(13)
10.44	Facility Agreement, dated May 22, 2015, by and among TTM Technologies Enterprises (HK) Limited, The Hongkong and Shanghai Banking Corporation Limited, and the other parties named therein(14)
10.45	First Amendment to amend and restate the Term Loan Credit Agreement, by and among TTM Technologies, Inc., as Borrower, the several Lenders from time to time parties thereto, JPMorgan Chase Bank, N.A., as Administrative Agent, Barclays Bank PLC, as Syndication Agent, and The Royal Bank of Scotland plc and HCBS Securities (USA) Inc., as Documentation Agents, dated as of May 31,2015, as amended September 27, 2016(18)
10.46	First Amendment to amend and restate the ABL Credit Agreement, by and among TTM Technologies, Inc., as Borrower, the several Lenders from time to time parties thereto, JPMorgan Chase Bank, N.A., as Administrative Agent, Barclays Bank PLC, as Syndication Agent, and The Royal Bank of Scotland plc and HCBS Securities (USA) Inc., as Documentation Agents, dated as of May 31, 2015, as amended September 27, 2016(18)
10.47	TTM Technologies, Inc. Form of Restricted Stock Unit Award Grant Notice (for non-employee directors) pursuant to TTM Technologies, Inc. 2014 Incentive Compensation Plan(15)
10.48	Amendment to TTM Technologies, Inc. 2014 Incentive Compensation Plan(16)
10.49	Second Amendment to the Term Loan Credit Agreement, by and among TTM Technologies, Inc., as Borrower, the several Lenders from time to time parties thereto, JPMorgan Chase Bank, N.A., as Administrative Agent, Barclays Bank PLC, as Syndication Agent, and The Royal Bank of Scotland plc and HCBS Securities (USA) Inc., as Documentation Agents, dated as of May 31, 2015, as first amended September 27, 2016, and as further amended September 28, 2017(19)
10.50	Commitment Letter from Barclays Bank PLC dated December 1, 2017(20)
10.51	Third Amendment to the Term Loan Credit Agreement, by and among TTM Technologies, Inc., as Borrower, the several Lenders from time to time parties thereto, JPMorgan Chase Bank, N.A., as Administrative Agent, Barclays Bank PLC, as Syndication Agent, and The Royal Bank of Scotland plc and HCBS Securities (USA) Inc., as Documentation Agents, dated as of May 31, 2015, as first amended September 27, 2016, second amended September 28, 2017, and as further amended December 1, 2017(21)
10.52	Fourth Amendment to Term Loan Credit Agreement, by and among TTM Technologies, Inc., as Borrower, the several Lenders from time to time, parties thereto, JPMorgan Chase Bank, N.A., as Administrative Agent, Barclays Bank PLC, as Syndication Agent, Deutsche Bank Securities, Inc. and Sun Trust Bank, as Co-Documentation Agents, and Sun Trust Bank, as participant, dated as of April 18, 2018(22)
10.53*	TTM Technologies, Inc. Executive Compensation Recoupment Policy
21.1*	Subsidiaries of the Registrant
23.1*	Consent of KPMG LLP, independent registered public accounting firm
31.1*	Certification of Chief Executive Officer

31.2*	Certification of Chief Financial Officer
32.1*	Certification of Chief Executive Officer
32.2*	Certification of Chief Financial Officer
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 the Registrant's Form 8-K as filed with the Commission on June 6, 2011 and to the Registrant's Form 8-K as filed with the commission on May 18, 2016.

(2) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on March 8, 2016.

(3) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on May 14, 2008.

(4) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on August 30, 2005.

(5) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on December 23, 2009.

(6) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on December 20, 2013.

(7) Incorporated by reference to the Registrant's Form S-8 as filed with the Commission on August 13, 2014.

(8) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on December 15, 2014.

(9) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on November 16, 2009.

(10) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on October 22, 2010.

(11) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on September 19, 2011.

(12) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on January 14, 2014.

(13) Incorporated by reference to the Registrant's Form 10-Q as filed with the Commission on May 5, 2015.

(14) Incorporated by reference to the Registrant's Form 8-K as filed with the Commission on May 29, 2015.

(15) Incorporated by reference to the Registrant's Form 10-Q as filed with the Commission on August 10, 2015.

(16) Incorporated by reference to the Registrant's Form S-8 as filed with the Commission on June 1, 2016.

(17) Incorporated by reference to the Registrant's Form 10-Q as filed with the Commission on August 4, 2016.

(18) Incorporated by reference to the Registrant's Form 10-Q as filed with the Commission on November 3, 2016.

(19) Incorporated by reference to the Registrant's Form 8-K filed with the Commission on September 29, 2017.

(20) Incorporated by reference to the Registrant's Form 8-K filed with the Commission on December 4, 2017.

(21) Incorporated by reference to the Registrant's Form 8-K filed with the Commission onDecember 14, 2017.

(22) Incorporated by reference to the Registrant's Form 8-K filed with the Commission on April 18, 2018.

‡ Management contract or Compensation Plan

* Filed herewith

(c) *Financial Statement Schedules.*

None.

ITEM 16. ***FORM 10-K SUMMARY***

None.

SIGNATURES

Pursuant to the requirements of Section 13 or 15(d) of the Securities Exchange Act of 1934, the registrant has duly caused this Report to be signed on its behalf by the undersigned, thereunto duly authorized.

TTM TECHNOLOGIES, INC.

By: /s/ Thomas T. Edman
Thomas T. Edman
President and Chief Executive Officer

Date: February 26, 2019

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

Name	Title	Date
/s/ Thomas T. Edman Thomas T. Edman	President, Chief Executive Officer and Director (Principal Executive Officer)	February 26, 2019
/s/ Todd B. Schull Todd B. Schull	Executive Vice President and Chief Financial Officer (Principal Financial Officer and Principal Accounting Officer)	February 26, 2019
/s/ Robert E. Klatell Robert E. Klatell	Chairman of the Board	February 26, 2019
/s/ Kenton K. Alder Kenton K. Alder	Director	February 26, 2019
/s/ Julie S. England Julie S. England	Director	February 26, 2019
/s/ Philip G. Franklin Philip G. Franklin	Director	February 26, 2019
/s/ Rex D. Geveden Rex D. Geveden	Director	February 26, 2019
/s/ Chantel E. Lenard Chantel E. Lenard	Director	February 26, 2019
/s/ John G. Mayer John G. Mayer	Director	February 26, 2019
/s/ Tang Chung Yen, Tom Tang Chung Yen, Tom	Director	February 26, 2019
/s/ Dov S. Zakheim Dov S. Zakheim	Director	February 26, 2019

TTM TECHNOLOGIES, INC.

Index to Consolidated Financial Statements

Report of Independent Registered Public Accounting Firm

To the Stockholders and Board of Directors
TTM Technologies, Inc.:

Opinions on the Consolidated Financial Statements and Internal Control Over Financial Reporting

We have audited the accompanying consolidated balance sheets of TTM Technologies, Inc. and subsidiaries (the "Company") as of December 31, 2018 and January 1, 2018, the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes (collectively, the "consolidated financial statements"). We also have audited the Company's internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

In our opinion, the consolidated financial statements referred to above present fairly, in all material respects, the financial position of the Company as of December 31, 2018 and January 1, 2018, and the results of its operations and its cash flows for each of the years in the three-year period ended December 31, 2018, in conformity with U.S. generally accepted accounting principles. Also in our opinion, the Company maintained, in all material respects, effective internal control over financial reporting as of December 31, 2018, based on criteria established in *Internal Control — Integrated Framework (2013)* issued by the Committee of Sponsoring Organizations of the Treadway Commission.

The Company acquired Anaren, Inc. during 2018, and management excluded from its assessment of the effectiveness of the Company's internal control over financial reporting as of December 31, 2018, Anaren, Inc.'s internal control over financial reporting associated with 2.4% of total assets and 6.7% of total net sales included in the consolidated financial statements of the Company as of and for the year ended December 31, 2018. Our audit of internal control over financial reporting of the Company also excluded an evaluation of the internal control over financial reporting of Anaren, Inc.

Change in Accounting Principle

As discussed in Note 1 to the consolidated financial statements, the Company changed its method of accounting for revenue in fiscal 2018 due to the adoption of the Financial Accounting Standards Board's Accounting Standards Codification (ASC) Topic 606, *Revenue from Contracts with Customers.*

Basis for Opinions

The Company's management is responsible for these consolidated financial statements, for maintaining effective internal control over financial reporting, and for its assessment of the effectiveness of internal control over financial reporting, included in the accompanying *Management's Report on Internal Control over Financial Reporting* appearing under Item 9A. Our responsibility is to express an opinion on the Company's consolidated financial statements and an opinion on the Company's internal control over financial reporting based on our audits. We are a public accounting firm registered with the Public Company Accounting Oversight Board (United States) (PCAOB) and are required to be independent with respect to the Company in accordance with the U.S. federal securities laws and the applicable rules and regulations of the Securities and Exchange Commission and the PCAOB.

We conducted our audits in accordance with the standards of the PCAOB. Those standards require that we plan and perform the audits to obtain reasonable assurance about whether the consolidated financial statements are free of material misstatement, whether due to error or fraud, and whether effective internal control over financial reporting was maintained in all material respects.

Our audits of the consolidated financial statements included performing procedures to assess the risks of material misstatement of the consolidated financial statements, whether due to error or fraud, and performing procedures that respond to those risks. Such procedures included examining, on a test basis, evidence regarding the amounts and disclosures in the consolidated financial statements. Our audits also included evaluating the accounting principles used and significant estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements. Our audit of internal control over financial reporting included obtaining an understanding of internal control over financial reporting, assessing the risk that a material weakness exists, and testing and evaluating the design and operating effectiveness of internal control based on the assessed risk. Our audits also included performing such other procedures as we considered necessary in the circumstances. We believe that our audits provide a reasonable basis for our opinions.

Definition and Limitations of Internal Control Over Financial Reporting

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

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

/s/ KPMG LLP

We have served as the Company's auditor since 2014.

Irvine, California
February 26, 2019

TTM TECHNOLOGIES, INC.

Consolidated Balance Sheets

	As of			
	December 31, 2018		January 1, 2018	
	(In thousands, except par value)			
ASSETS				
Current assets:				
Cash and cash equivalents	$	256,360	$	409,326
Accounts receivable, net		523,165		483,903
Contract assets		287,741		—
Inventories		109,377		294,588
Prepaid expenses and other current assets		30,271		33,490
Total current assets		1,206,914		1,221,307
Property, plant and equipment, net		1,052,024		1,056,845
Goodwill		767,045		372,571
Definite-lived intangibles, net		375,923		102,950
Deposits and other non-current assets		55,597		28,209
	$	3,457,503	$	2,781,882
LIABILITIES AND EQUITY				
Current liabilities:				
Short-term debt, including current portion of long-term debt	$	30,000	$	4,578
Accounts payable		431,288		497,455
Contract liabilities		3,220		—
Accrued salaries, wages and benefits		94,950		103,638
Other accrued expenses		113,756		114,685
Total current liabilities		673,214		720,356
Long-term debt, net of discount and issuance costs		1,462,425		975,479
Other long-term liabilities		94,777		74,667
Total long-term liabilities		1,557,202		1,050,146
Commitments and contingencies (Note 14)				
Equity:				
Common stock, $0.001 par value; 300,000 shares authorized, 103,687 and 101,820 shares issued and outstanding in 2018 and 2017, respectively		104		102
Additional paid-in capital		797,895		777,025
Retained earnings		433,008		230,850
Accumulated other comprehensive (loss) income		(3,920)		3,403
Total stockholders' equity		1,227,087		1,011,380
	$	3,457,503	$	2,781,882

See accompanying notes to consolidated financial statements.

TTM TECHNOLOGIES, INC.
Consolidated Statements of Operations

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands, except per share data)		
Net sales	$ 2,847,261	$ 2,658,592	$ 2,533,359
Cost of goods sold	2,390,227	2,229,011	2,109,744
Gross profit	457,034	429,581	423,615
Operating expenses:			
Selling and marketing	73,313	65,856	66,366
General and administrative	159,437	126,141	147,247
Amortization of definite-lived intangibles	59,681	23,634	24,252
Restructuring charges	5,518	1,190	8,951
Impairment of long-lived assets	—	—	3,346
Total operating expenses	297,949	216,821	250,162
Operating income	159,085	212,760	173,453
Other income (expense):			
Interest expense	(78,958)	(53,898)	(76,008)
Loss on extinguishment of debt	—	(768)	(47,767)
Other, net	9,641	(18,136)	17,324
Total other expense, net	(69,317)	(72,802)	(106,451)
Income before income taxes	89,768	139,958	67,002
Income tax benefit (provision)	83,816	(15,231)	(31,427)
Net income	173,584	124,727	35,575
Less: Net income attributable to the noncontrolling interest	—	(513)	(714)
Net income attributable to TTM Technologies, Inc. stockholders	$ 173,584	$ 124,214	$ 34,861
Earnings per share attributable to TTM Technologies, Inc. stockholders:			
Basic earnings per share	$ 1.68	$ 1.22	$ 0.35
Diluted earnings per share	$ 1.38	$ 1.04	$ 0.34

See accompanying notes to consolidated financial statements.

TTM TECHNOLOGIES, INC.

Consolidated Statements of Comprehensive Income (Loss)

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Net income	$ 173,584	$ 124,727	$ 35,575
Other comprehensive income (loss), net of tax:			
Foreign currency translation adjustments, net	(2,567)	47,294	(46,044)
Pension obligation adjustments, net	(1,284)	—	—
Net unrealized gains (losses) on cash flow hedges:			
Unrealized (loss) gain on effective cash flow hedges during the year, net	(4,846)	276	(83)
Loss realized in the statement of operations	1,374	162	175
Net	(3,472)	438	92
Other comprehensive (loss) gain, net of tax	(7,323)	47,732	(45,952)
Comprehensive income (loss), net of tax	166,261	172,459	(10,377)
Less: Comprehensive income attributable to the noncontrolling interest	—	(513)	(714)
Comprehensive income (loss) attributable to TTM Technologies, Inc. stockholders	$ 166,261	$ 171,946	$ (11,091)

See accompanying notes to consolidated financial statements.

TTM TECHNOLOGIES, INC.

Consolidated Statements of Stockholders' Equity

	Common Stock		Additional Paid-In	Retained	Accumulated Other Comprehensive	Total TTM Technologies, Inc. Stockholders'	Noncontrolling	Total
	Shares	Amount	Capital	Earnings	(Loss) Income	Equity	Interest	Equity
				(In thousands)				
Balance, December 28, 2015	99,137	$ 99	$ 745,608	$ 71,775	$ 1,623	$ 819,105	$ 7,564	$ 826,669
Net income	—	—	—	34,861	—	34,861	714	35,575
Other comprehensive loss	—	—	—	—	(45,952)	(45,952)	—	(45,952)
Exercise of stock options	159	—	1,743	—	—	1,743	—	1,743
Issuance of common stock for performance-based restricted stock units	271	—	—	—	—	—	—	—
Issuance of common stock for restricted stock units	829	1	(1)	—	—	—	—	—
Stock-based compensation	—	—	11,090	—	—	11,090	—	11,090
Balance, January 2, 2017	100,396	100	758,440	106,636	(44,329)	820,847	8,278	829,125
Net income	—	—	—	124,214	—	124,214	513	124,727
Other comprehensive income	—	—	—	—	47,732	47,732	—	47,732
Purchase of noncontrolling equity interest	—	—	223	—	—	223	(8,791)	(8,568)
Exercise of stock options	7	—	74	—	—	74	—	74
Issuance of common stock for performance-based restricted stock units	291	1	(1)	—	—	—	—	—
Issuance of common stock for restricted stock units	1,126	1	(1)	—	—	—	—	—
Stock-based compensation	—	—	18,290	—	—	18,290	—	18,290
Balance, January 1, 2018	101,820	102	777,025	230,850	3,403	1,011,380	—	1,011,380
New revenue standard adjustment	—	—	—	28,574	—	28,574	—	28,574
Net income	—	—	—	173,584	—	173,584	—	173,584
Other comprehensive loss	—	—	—	—	(7,323)	(7,323)	—	(7,323)
Exercise of stock options	20	—	191	—	—	191	—	191
Issuance of common stock for performance-based restricted stock units	521	1	(1)	—	—	—	—	—
Issuance of common stock for restricted stock units	1,326	1	(1)	—	—	—	—	—
Stock-based compensation	—	—	20,681	—	—	20,681	—	20,681
Balance, December 31, 2018	103,687	$ 104	$ 797,895	$ 433,008	$ (3,920)	$ 1,227,087	$ —	$ 1,227,087

See accompanying notes to consolidated financial statements.

TTM TECHNOLOGIES, INC.
Consolidated Statements of Cash Flows

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Cash flows from operating activities:			
Net income	$ 173,584	$ 124,727	$ 35,575
Adjustments to reconcile net income to net cash provided by operating activities:			
Depreciation of property, plant and equipment	162,708	150,809	156,229
Amortization of definite-lived intangible assets	63,026	23,634	24,252
Amortization of debt discount and debt issuance costs	14,687	10,970	19,066
Deferred income taxes	(98,291)	(9,190)	900
Stock-based compensation	20,681	18,290	11,090
Loss on extinguishment of debt	—	768	47,767
Impairment of long-lived assets	—	—	3,346
Other	(3,789)	9,982	(4,645)
Changes in operating assets and liabilities, net of acquisition:			
Accounts receivable, net	1,366	(51,115)	23,212
Contract assets	(3,502)	—	—
Inventories	18,254	(25,376)	(289)
Prepaid expenses and other current assets	5,199	(2,005)	3,606
Accounts payable	(45,739)	54,602	(7,796)
Contract liabilities	(4,558)	—	—
Accrued salaries, wages and benefits and other accrued expenses	(30,488)	26,659	(13,977)
Net cash provided by operating activities	273,138	332,755	298,336
Cash flows from investing activities:			
Acquisition, net of cash acquired	(596,396)	—	—
Purchase of property, plant and equipment and equipment deposits	(150,127)	(151,345)	(85,139)
Proceeds from sale of property, plant and equipment and assets held for sale	331	27,255	3,641
Release of restricted cash and cash equivalents	—	—	3,530
Net cash used in investing activities	(746,192)	(124,090)	(77,968)
Cash flows from financing activities:			
Proceeds from long-term borrowings	600,000	725,000	775,000
Repayment of long-term debt	(114,378)	(700,875)	(1,022,625)
Repayment of assumed long-term debt in acquisition	(178,604)	—	—
Proceeds (repayment) from borrowings of revolving loan	23,000	(63,000)	30,000
Payment of debt issuance costs	(7,653)	(9,842)	(1,227)
Payment of original issue discount	(1,500)	(1,750)	—
Proceeds from exercise of stock options	191	74	1,743
Payment for purchase of noncontrolling interest	—	(8,568)	—
Redemption of convertible notes	—	(15)	—
Net cash provided by (used in) financing activities	321,056	(58,976)	(217,109)
Effect of foreign currency exchange rates on cash and cash equivalents	(968)	3,360	(6,082)
Net (decrease) increase in cash and cash equivalents	(152,966)	153,049	(2,823)
Cash and cash equivalents at beginning of year	409,326	256,277	259,100
Cash and cash equivalents at end of year	$ 256,360	$ 409,326	$ 256,277
Supplemental cash flow information:			
Cash paid, net for interest	$ 62,967	$ 39,062	$ 72,041
Cash paid, net for income taxes	27,574	20,075	25,122
Supplemental disclosure of noncash investing activities:			
Property, plant and equipment recorded in accounts payable	$ 49,169	$ 84,805	$ 25,108

See accompanying notes to consolidated financial statements.

(1) Nature of Operations and Summary of Significant Accounting Policies

Nature of Operations

TTM Technologies, Inc. (the Company or TTM) is a leading global printed circuit board (PCB) manufacturer, focusing on quick-turn and volume production of technologically complex PCBs, backplane assemblies and electro-mechanical solutions (E-M Solutions) as well as a global designer and manufacturer of radio-frequency (RF) and microwave components and assemblies. The Company provides time-to-market and volume production of advanced technology products and offers a one-stop design, engineering and manufacturing solution to customers from engineering support to prototype development through final mass production. This one-stop design and manufacturing solution enables the Company to align technology developments with the diverse needs of the Company's customers and to enable them to reduce the time required to develop new products and bring them to market.

The Company serves a diversified customer base in various markets throughout the world, including aerospace and defense, automotive components, smartphones and touchscreen tablets, high-end computing, medical, industrial and instrumentation related products, as well as networking/communications infrastructure products. The Company's customers include both original equipment manufacturers (OEMs) and electronic manufacturing services (EMS) providers.

The Company operates on a 52 or 53 week year ending on the Monday nearest December 31. Fiscal 2018 and 2017 were 52 weeks ended on December 31, 2018 and January 1, 2018, respectively. Fiscal 2016 consisted of 53 weeks ended on January 2, 2017 with the additional week included in the fourth quarter. All references to years relate to fiscal years unless otherwise noted.

Reclassifications

Certain amounts in the prior period financial statements have been reclassified to conform to the presentation of the current period financial statements. These reclassifications had no effect on the previously reported net income. An adjustment has been made to combine the statutory surplus reserve with retained earnings on the consolidated balance sheets and the consolidated statements of stockholders' equity.

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 amount of revenues and expenses during the reporting period. Such estimates include the sales return reserve; accounts receivable; inventories; goodwill; intangible assets and other long-lived assets; product warranty liabilities; legal contingencies; income taxes; pension obligations; and fair values of financial instruments. These estimates and assumptions are based on management's best estimates and judgment. Management evaluates its estimates and assumptions on an ongoing basis using historical experience and other factors, including the economic environment, which management believes to be reasonable under the circumstances. Management adjusts such estimates and assumptions when facts and circumstances dictate. The actual results we experienced may differ materially and adversely from our estimates. To the extent there are material differences between the estimates and actual results, our future result of operations will be affected.

Principles of Consolidation

The consolidated financial statements include the accounts of TTM and its subsidiaries. All intercompany accounts and transactions have been eliminated in consolidation.

Foreign Currency Translation and Transactions

The functional currency of certain of the Company's subsidiaries is the Chinese Renminbi (RMB). Accordingly, assets and liabilities are translated into U.S. dollars using period-end exchange rates. Sales and expenses are translated at the average exchange rates in effect during the period. The resulting translation gains or losses are recorded as a component of accumulated other comprehensive (loss) income in the consolidated statement of stockholders' equity and the consolidated statement of comprehensive income (loss). Net gains and losses resulting from foreign currency remeasurements and transactions are included in income as a component of other, net in the consolidated statements of operations and totaled $3,529 gain, $22,802 loss and $13,538 gain for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively.

Cash Equivalents

The Company considers highly liquid investments with insignificant interest rate risk and original maturities to the Company of three months or less to be cash equivalents. Cash equivalents consist primarily of interest-bearing bank accounts.

The Company considers highly liquid investments with an effective maturity to the Company of more than three months and less than one year to be short-term investments

Accounts Receivable and Allowance for Doubtful Accounts

Accounts receivable are reflected at estimated net realizable value, do not bear interest and do not generally require collateral. The Company performs credit evaluations of its customers and adjusts credit limits based upon payment history and the customer's current creditworthiness. The Company maintains an allowance for doubtful accounts based upon a variety of factors. The Company reviews all open accounts and provides specific reserves for customer collection issues when it believes the loss is probable, considering such factors as the length of time receivables are past due, the financial condition of the customer, and historical experience. The Company also records a reserve for all customers, excluding those that have been specifically reserved for, based upon evaluation of historical losses.

The following summarizes the activity in the Company's allowance for doubtful accounts for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Balance at beginning of year	$ 2,468	$ 2,851	$ 1,525
Addition charged to expense	429	346	1,560
Deductions	(141)	(719)	(223)
Effect of foreign currency exchange rates	(6)	(10)	(11)
Balance at end of year	$ 2,750	$ 2,468	$ 2,851

Inventories

Inventories are stated at the lower of cost (determined on a first-in, first-out and weighted average basis) or net realizable value. Assessments to value the inventory at the lower of the actual cost to purchase and / or manufacture the inventory, or net realizable value of the inventory, are based upon assumptions about future demand and market conditions. As a result of the Company's assessments, when the net realizable value of inventory is less than the carrying value, the inventory cost is written down to the net realizable value and the write down is recorded as a charge to cost of goods sold.

Property, Plant and Equipment, Net

Property, plant and equipment are recorded at cost. Depreciation expense is computed using the straight-line method over the estimated useful lives of the assets. Assets recorded under leasehold improvements are amortized using the straight-line method over the lesser of their useful lives or the related lease term. The Company uses the following estimated useful lives:

Land use rights	50-99 years
Buildings and improvements	7-50 years
Machinery and equipment	3-12 years
Furniture and fixtures	3-7 years

Upon retirement or other disposition of property, plant and equipment, the cost and related accumulated depreciation are removed from the accounts. The resulting gain or loss is included in the determination of operating income in the period incurred. Depreciation and amortization expense on property, plant and equipment was $162,708, $150,809, and $156,229 for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively.

The Company capitalizes interest on borrowings during the active construction period of major capital projects. Capitalized interest is amortized over the average useful lives of such assets, which primarily consist of buildings and machinery and equipment. The Company capitalized interest costs of $1,438, $1,494 and $1,876 during the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively, in connection with various capital projects.

Major renewals and betterments are capitalized and depreciated over their estimated useful lives while minor expenditures for maintenance and repairs are included in operating income as incurred.

Goodwill

Goodwill represents the excess of purchase price of an acquisition over the fair value of net assets acquired. Goodwill is not amortized but instead is assessed for impairment, at a reporting unit level, annually and when events and circumstances warrant an evaluation. In making this assessment, management relies on a number of factors, including expected future operating results, business plans, economic projections, anticipated future cash flows, business trends and declines in the Company's market capitalization.

The Company has two reportable segments consisting of PCB and E-M Solutions. There is goodwill only in the Company's PCB reportable segment. Goodwill is allocated to reporting units, which are operating segments or one level below the Company's operating segments (the component level). Reporting units are determined by the discrete financial information available for the component and whether it is regularly reviewed by segment management. Components are aggregated into a single reporting unit if they share similar economic characteristics. The Company's PCB reportable segment is made up of two operating segments that consist of five reporting units. The Company evaluates its goodwill on an annual basis in the fourth quarter or more frequently if it believes indicators of impairment exist. 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 amount or performs its annual impairment test. When tested quantitatively, the Company compares the fair value of the applicable reporting unit with its carrying value. The Company estimates the fair values of its reporting units using a combination of the income and market approaches. If the carrying amount of a reporting unit exceeds the reporting unit's fair value, the amount by which the carrying value exceeds the fair value is recognized as an impairment loss. In the fourth quarter of 2018, the Company performed its annual impairment test quantitatively and concluded that goodwill was not impaired. See Note 6 for further details.

Intangible Assets

Intangible assets include customer relationships, technology, and backlog, which are being amortized over their estimated useful lives using straight-line and accelerated methods. The estimated useful lives of such intangibles range from 1 year to 13 years.

Impairment of Long-lived Assets

Long-lived tangible assets, including property, plant and equipment, assets held for sale, and definite-lived intangible assets, are reviewed for impairment whenever events or changes in circumstances indicate that the carrying value of the asset or asset groups may not be recoverable. The Company regularly evaluates whether events or circumstances have occurred that indicate possible impairment and relies on a number of factors, including expected future operating results, business plans, economic projections, and anticipated future cash flows. The Company uses an estimate of the future undiscounted net cash flows of the related asset or asset group over the remaining life in measuring whether the assets are recoverable. Measurement of the amount of impairment, if any, is based upon the difference between the asset's carrying value and estimated fair value. Fair value is determined through various valuation techniques, including cost-based, market and income approaches as considered necessary. See Note 4 for information regarding the impairment of long-lived assets during 2016.

The Company classifies assets to be sold as assets held for sale when (i) Company management has approved and commits to a plan to sell the asset; (ii) the asset is available for immediate sale in its present condition and is ready for sale; (iii) an active program to locate a buyer and other actions required to sell the asset have been initiated; (iv) the sale of the asset is probable; (v) the asset is being actively marketed for sale at a price that is reasonable in relation to its current fair value; and (vi) it is unlikely that significant changes to the plan will be made or that the plan will be withdrawn. Assets classified as held for sale are recorded at the lower of the carrying amount or fair value less the cost to sell and are included as a component of prepaid expenses and other current assets in the consolidated balance sheet.

The Company classifies assets held for use when a decision to dispose of an asset or a business is made and the held for sale criteria are not met. Assets of the business are evaluated for recoverability in the following order: (i) assets other than goodwill, property and intangibles; (ii) property and intangibles subject to amortization; and (iii) goodwill. In evaluating the recoverability of property and intangible assets subject to amortization, in a held for use business, the carrying value is first compared to the sum of the undiscounted cash flows expected to result from the use and eventual disposition. If the carrying value exceeds the undiscounted expected cash flows, then a fair value analysis is performed. An impairment charge is recognized if the carrying value exceeds the fair value.

Revenue Recognition

The Company derives revenues primarily from the sale of PCBs, custom electronic assemblies using customer-supplied engineering and design plans as well as the design and manufacture of RF and microwave components and assemblies. In the absence of a sales agreement, the Company's standard terms and conditions apply. Revenue is recognized when control of the promised goods or services is transferred to the Company's customers, in an amount that reflects the consideration to which it expects to be entitled in exchange for those goods or services. The Company applies a five-step approach as defined in the new standard in determining the amount and timing of revenue to be recognized: (1) identifying the contract with a customer; (2) identifying the performance obligations in the contract; (3) determining the transaction price; (4) allocating the transaction price to the performance obligations in the contract; and (5) recognizing revenue when the corresponding performance obligation is satisfied.

Revenue Streams

For the PCBs and custom electronic assemblies, orders for products generally correspond to the production schedules of the Company's customers and are supported with firm purchase orders. The Company's customers have continuous control of the work in progress and finished goods throughout the PCB manufacturing process, as PCBs are built to customer specificationswith no alternative use, and there is an enforceable right to payment for work performed to date. As a result, beginning in the first quarter of 2018, the Company now recognizesrevenue over time based on the extent of progress towards completion of the performance obligation. Revenue recognized under these contracts is based on the cost-to-cost method as it best depicts the transfer of control to the customer which takes place as we incur costs. Under the cost-to-cost measure of progress, the extent of progress toward completion is measured based on the ratio of costs incurred to date to the total estimated costs at completion of the performance obligation. Revenues are recorded proportionally as costs are incurred.

Additionally, the Company has certain long-term contracts related to its manufacture of components, assemblies, and subsystems which service the aerospace and defense electronics market. These long-term contracts, many of which provide for periodic payments, are recognized over time under the percentage-of completion method. Estimated manufacturing cost-at-completion for these contracts are reviewed on a periodic basis, and adjustments are made as needed to the estimated cost-at-completion, based on actual costs incurred, progress made, and estimates of costs required to complete the contractual requirements. When the estimated manufacturing cost-at-completion exceeds the contract value, the contract is written down to its net realizable value and the loss resulting from the cost overruns are immediately recognized.

Finally, the Company manufactures components, assemblies, and subsystems which service its wireless communications customers. The Company recognizes revenue at a point in time upon transfer of control of the products to the customer. Point in time recognition was determined as the customer does not simultaneously receive or consume the benefits provided by the Company’s performance and the asset being manufactured has alternative uses to the Company.

Performance Obligations

Each distinct promise to transfer products is considered to be an identified performance obligation for which revenue is recognized upon transfer of control of the products to the customer. A contract’s transaction price is allocated to each distinct performance obligation and recognized as revenue when, or as, the performance obligation is satisfied. The majority of the Company's contracts have a single performance obligation as the promise to transfer the individual good or service is not separately identifiable from other promises in the contract and is, therefore, not distinct. As of December 31, 2018, the aggregate amount of the transaction price allocated to remaining performance obligations for our long-term contracts was $19,671. The Company expects to recognize revenue on approximately 64% of the remaining performance obligations for the Company’s long-term contracts over the next year with the remaining amount recognized thereafter. The remaining performance obligations for the Company’s short-term contracts are expected to be recognized within one year or less.

Transaction Price

The Company provides customers a limited right of return for defective PCBs including components, subsystems and assemblies. Estimates of returns are treated as variable consideration for purposes of determining the transaction price. The Company accrues an estimate for sales returns and allowances progressively over time based on the extent of progress towards completion of the performance obligation using the Company’s judgment based on historical results and anticipated returns. To the extent actual experience varies from its historical experience, revisions to the sales returns and allowances accrual may be required. Sales returns and allowances are recorded as a reduction of revenue and included as a component of accrued expenses on the consolidated balance sheet. Shipping and handling fees and related freight costs and supplies associated with shipping products to customers are included as a component of cost of goods sold. Warranty-related services are not considered a separate performance obligation. Incremental warranty costs that are not related to sales returns are recorded in accrued expenses and cost of goods sold. The following summarizes the activity in the Company’s sales returns and allowances for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	**January 1, 2018**	**January 2, 2017**
	(In thousands)		
Balance at beginning of year	$ 8,171	$ 8,119	$ 7,789
Addition charged as a reduction of sales[(1)]	23,525	14,574	22,060
Deductions	(15,602)	(14,524)	(21,728)
Effect of foreign currency exchange rates	(23)	2	(2)
Balance at end of year	$ 16,071	$ 8,171	$ 8,119

(1) As discussed in Note 2 to the consolidated financial statements, on the date of adopting the new revenue standard, the Company recorded an estimated sales returns and allowance in the amount of $5,213 as of January 2, 2018.

Contract Balances

Accounts receivable represents the Company's unconditional right to receive consideration from its customer. Payments are generally due within 90 days or less of invoicing and do not include a significant financing component. To date, there have been no material impairment losses on accounts receivable.

A contract asset is recognized when the Company has recognized revenue, but not issued an invoice for payment. Contract assets are classified as current assets and transferred to receivables when the entitlement to payment becomes unconditional. The Company's contract assets are generally converted to trade account receivables within 90 days, at which time the Company is entitled to payment of the fixed price upon delivery of the finished product subject to customer payment terms. Contract assets were $287,741 as of December 31, 2018 and represent unbilled amounts for work performed to date. In 2018, there were no material impairment losses on contract assets. The contract assets increased by $23,585 due to the acquisition of Anaren, Inc. (Anaren) on April 18, 2018. There were no contract assets as of January 1, 2018.

A contract liability is recognized when the Company has received payment in advance for the future transfer of goods or services. The Company's contract liabilities are generally converted to revenue within 90 days. Contract liabilities were $3,220 as of December 31, 2018 and represent customer advances for work yet to be performed. There were no contract liabilities as of January 1, 2018.

The Company has elected to account for shipping and handling activities as a fulfillment cost as permitted by the standard. All incremental customer contract acquisition costs are expensed as they are incurred as the amortization period of the asset that the Company otherwise would have recognized is one year or less in duration.

Disaggregated Revenue

Revenue from products and services transferred to customers over time and at a point in time accounted for 98% and 2%, respectively of the Company's revenue in 2018. In 2017 and 2016, revenue from products and services transferred to customers was recognized at a point in time.

The following tables represent a disaggregation of revenue by principal end markets with the reportable segments:

	For the Year Ended December 31, 2018		
	PCB	E-M Solutions	Total
End Markets		(In thousands)	
Aerospace and Defense	$ 625,494	$ 858	$ 626,352
Automotive	414,787	86,828	501,615
Cellular Phone	384,843	—	384,843
Computing/Storage/Peripherals	392,091	1,694	393,785
Medical/Industrial/Instrumentation	362,724	39,852	402,576
Networking/Communications	389,720	96,894	486,614
Other	51,655	(179)	51,476
Total	$ 2,621,314	$ 225,947	$ 2,847,261

	For the Year Ended January 1, 2018 (1)		
	PCB	E-M Solutions	Total
End Markets		(In thousands)	
Aerospace and Defense	$ 418,238	$ 1,544	$ 419,782
Automotive	434,775	76,401	511,176
Cellular Phone	483,805	—	483,805
Computing/Storage/Peripherals	352,862	4,247	357,109
Medical/Industrial/Instrumentation	330,093	38,257	368,350
Networking/Communications	390,335	88,506	478,841
Other	38,398	1,131	39,529
Total	$ 2,448,506	$ 210,086	$ 2,658,592

(1) As discussed in Note 2 to the consolidated financial statements, the Company adopted ASC Topic 606, *Revenue from Contracts with Customers,* under the modified retrospective method on January 2, 2018. Accordingly, the consolidated financial statements for the years ended January 1, 2018 and January 2, 2017 have not been adjusted.

	For the Year Ended January 2, 2017 (1)		
	PCB	E-M Solutions	Total
End Markets	(In thousands)		
Aerospace and Defense	$ 380,816	$ 450	$ 381,266
Automotive	449,813	44,221	494,034
Cellular Phone	360,816	—	360,816
Computing/Storage/Peripherals	303,807	11,145	314,952
Medical/Industrial/Instrumentation	327,701	38,928	366,629
Networking/Communications	474,300	97,812	572,112
Other	37,623	5,927	43,550
Total	$ 2,334,876	$ 198,483	$ 2,533,359

(1) As discussed in Note 2 to the consolidated financial statements, the Company adopted ASC Topic 606, *Revenue from Contracts with Customers,* under the modified retrospective method on January 2, 2018. Accordingly, the consolidated financial statements for the years ended January 1, 2018 and January 2, 2017 have not been adjusted.

Stock-Based Compensation

The Company recognizes stock-based compensation expense in its consolidated financial statements for its incentive compensation plan awards. The incentive compensation plan awards include performance-based restricted stock units, restricted stock units, and stock options. The associated compensation expense for all awards is based on the grant date fair value of the awards, and for year 2016 include estimated forfeitures. For performance-based restricted stock units, compensation expense also includes management's periodic assessment of annual financial performance goals to be achieved. Compensation expense for the incentive compensation plan awards is recognized on a straight line basis over the vesting period of the awards. The fair value of performance-based restricted stock units is estimated on the grant date using a Monte Carlo simulation model based on the underlying common stock closing price as of the date of grant, the expected term, stock price volatility, and risk-free interest rates. The fair value of restricted stock units is measured on the grant date based on the quoted closing market price of the Company's common stock. The fair value of the stock options is estimated on the grant date using the Black-Scholes option pricing model based on the underlying common stock closing price as of the date of grant, the expected term, stock price volatility, and risk-free interest rates.

Income Taxes

Income taxes are accounted for under the asset and liability method. Deferred income tax assets or liabilities are recognized for the future tax consequences attributable to differences between the financial statement carrying amounts of assets and liabilities and their respective tax bases and operating loss and tax credit carryforwards. Deferred income tax assets and liabilities are measured using enacted tax rates expected to apply to taxable income in the years in which those temporary differences are expected to be settled or realized. The effect on deferred income tax assets and liabilities of a change in tax rates is recognized in income in the period that includes the enactment date. Deferred income tax assets are reviewed for recoverability, and the Company records a valuation allowance to reduce its deferred income tax assets when it is more likely than not that all or some portion of the deferred income tax assets will not be realized.

The Company has various foreign subsidiaries formed or acquired to conduct or support its business outside the United States. The Company expects its earnings attributable to foreign subsidiaries will be indefinitely reinvested except for our material Chinese plants and the respective holding companies where a deferred tax liability has been recorded for foreign withholding and estimated federal/state tax impact. For those other companies with earnings currently being reinvested outside of the U.S., no deferred tax liabilities on undistributed earnings are recorded.

The Company recognizes the effect of income tax positions only if those positions are more likely than not to be sustained. Recognized income tax positions are measured at the largest amount that is greater than 50 percent likely to be realized. Changes in recognition or measurement are reflected in the period in which the change in judgment occurs. Estimated interest and penalties related to underpayment of income taxes are recorded as a component of income tax provision in the consolidated statement of operations.

Effects of the Tax Cuts and Jobs Act

On December 22, 2017, the Tax Cuts and Jobs Act (Tax Act) was enacted. Accounting Standard Codification (ASC) Topic 740, *Accounting for Income Taxes*, requires companies to recognize the effect of tax law changes in the period of enactment regardless of the effective date of those tax law changes. Certain provisions of the Tax Act were effective September 27, 2017, December 31, 2017 and January 1, 2018.

For the year ended January 1, 2018, the Company revalued its ending gross deferred tax items, previously recorded at 35 percent, using the enacted 21 percent corporate tax rate. This change caused a reduction to the Company's U.S. federal deferred tax assets fully offset by a reduction of its valuation allowance.

For the year ended January 1, 2018, the Company had performed a preliminary earnings and profits analysis with consideration given to foreign loss carryforwards acquired as a result of the Company's acquisitions and determined on a provisional basis that there should be no income tax effect in the current or any future period. For the year ended December 31, 2018, the Company completed its analysis and maintains that there should be no income tax effect.

The Company determined that the following provisions that are effective January 1, 2018 and relevant to the Company will impact the year ended December 31, 2018 tax expense: limitations on certain entertainment expenses, the inclusion of commissions and performance based compensation in determining the excessive compensation limitation, limitation on the current deductibility of net interest expense in excess of 30 percent of adjusted taxable income, and a minimum tax on certain foreign earnings in excess of 10 percent of the foreign subsidiaries tangible assets (i.e., global intangible low-taxed income or GILTI). The Company has decided to make a policy election to treat the GILTI tax as a period expense and as such, no U.S. deferred taxes will be calculated on foreign earnings that are expected to generate GILTI income when they reverse in future years.

Convertible Debt

The accounting standards for convertible debt instruments that may be fully or partially settled in cash upon conversion require the debt and equity components to be separately accounted for in a manner that reflects the Company's nonconvertible borrowing rate when interest expense is recognized in subsequent periods. The amount recorded as debt is based on the fair value of the debt component as a standalone instrument, determined using an average interest rate for similar nonconvertible debt issued by entities with credit ratings comparable to the Company's at the time of issuance. The difference between the debt recorded at inception and its principal amount is accreted to principal through interest expense during the estimated life of the note.

Value Added and Sales Tax Collected from Customers

As a part of the Company's normal course of business, value added and sales taxes are collected from customers. Such taxes collected are remitted, in a timely manner, to the appropriate governmental tax authority on behalf of the customer. Value added and sales taxes are excluded from reported revenues and costs presented in the consolidated statements of operations and comprehensive income (loss).

Fair Value Measures

The Company measures at fair value certain of its financial and non-financial assets and liabilities by using a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, essentially an exit price, based on the highest and best use of the asset or liability. The levels of the fair value hierarchy are:

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

Level 2 — Significant other observable inputs (e.g., quoted prices for similar items in active markets, quoted prices for identical or similar items in markets that are not active, inputs other than quoted prices that are observable, such as interest rate and yield curves, and market-corroborated inputs); and

Level 3 — Unobservable inputs in which there is little or no market data, which require the reporting unit to develop its own assumptions.

Earnings Per Share

Basic earnings per common share excludes dilution and is computed by dividing net income attributable to TTM Technologies, Inc. stockholders by the weighted average number of common shares outstanding during the period. Diluted earnings per common share reflect the potential dilution that could occur if stock options, convertible senior notes or other common stock equivalents were exercised or converted into common stock. The dilutive effect of stock options or other common stock equivalents is calculated using the treasury stock method, while the dilutive effect of convertible senior notes is calculated using the if-converted method.

Comprehensive Income

Comprehensive income includes changes to equity accounts that were not the result of transactions with stockholders. Comprehensive income is comprised of net income (loss), changes in the cumulative foreign currency translation adjustments, pension obligation adjustments, and realized and unrealized gains or losses on hedged derivative instruments.

Noncontrolling Interest Holdings

Noncontrolling interest consisted of a 5% equity interest in a manufacturing facility in Huiyang, China which was acquired along with other assets and liabilities of Viasystems Group Inc. (Viasystems). In 2017, the Company purchased the 5% equity interest from the noncontrolling interest holder. See Note 21.

Loss Contingencies

The Company establishes an accrual for an estimated loss contingency when it is both probable that an asset has been impaired or that a liability has been incurred and the amount of the loss can be reasonably estimated. Any legal fees expected to be incurred in connection with a contingency are expensed as incurred.

Accounting for Retirement Benefit Plans

The Company accounts for its retirement benefit plans and postretirement and postemployment benefit obligations in accordance with ASC Topic 715,*Compensation—Retirement Benefits*. ASC Topic 715 requires the Company to recognize the overfunded or underfunded status of a defined benefit plan, measured as the difference between the fair value of plan assets and the plan's benefit obligation, as an asset or liability in its consolidated balance sheet and to recognize changes to that funded status in the year in which the changes occur through accumulated other comprehensive loss. ASC Topic 715 also requires measurement of the funded status of a plan as of the Company's consolidated balance sheet dates.

Recently Adopted and Issued Accounting Standards

Recently Adopted Accounting Standards

In August 2018, the Financial Accounting Standards Board (FASB) issued ASU 2018-13, *Fair Value Measurement (Topic 820): Disclosure Framework*. The updated guidance changes the disclosure requirements on fair value measurements. The updated guidance is effective for fiscal years, and interim periods within those fiscal years, beginning after December 15, 2019. Early adoption is permitted for any removed or modified disclosures. The Company early adopted the removed or modified disclosures in the fourth quarter of fiscal 2018 and is currently assessing the timing and impact of adopting the updated provisions.

In May 2017, the FASB issued ASU 2017-09, *Compensation-Stock Compensation (Topic 718): Scope of Modification Accounting*. This ASU provides guidance about which changes to the terms or conditions of a share-based payment award require an entity to apply modification accounting per Topic 718. The Company adopted ASU 2017-09 on January 2, 2018. The adoption did not have a material impact on the consolidated financial statements or related disclosures.

In March 2017, the FASB issued ASU 2017-07, *Compensation—Retirement Benefits (Topic 715): Improving the Presentation of Net Periodic Pension Cost and Net Periodic Postretirement Benefit Cost*. ASU 2017-07 requires that an employer report the service cost component in the same line item or items as other compensation costs arising from services rendered by the pertinent employees during the period. The other components of net benefit cost are required to be presented in the income statement separately from the service cost component and outside a subtotal of income from operations, if one is presented. If a separate line item or items are not used, the line item or items used in the income statement to present the other components of net benefit cost must be disclosed. The Company adopted ASU 2017-07 on January 2, 2018. The adoption did not have a material impact on the consolidated financial statements or related disclosures.

In January 2017, the FASB issued ASU 2017-01, *Business Combinations (Topic 805): Clarifying the Definition of a Business*. This ASU clarifies the definition of a business to exclude gross assets acquired (or disposed of) that have substantially all of their fair value concentrated in a single identifiable asset or group of similar identifiable assets. The ASU also updates the definition of the term “output” to be consistent with ASC Topic 606. The Company adopted ASU 2017-01 on January 2, 2018. The adoption did not have a material impact on the consolidated financial statements or related disclosures.

In October 2016, the FASB issued ASU 2016-16, *Income Taxes (Topic 740): Intra-Entity Transfers of Assets Other Than Inventory.* The objective of this update is to improve the accounting for the income tax consequences of intra-entity transfers of assets other than inventory by recognizing the income tax consequences when the transfer occurs. The Company adopted ASU 2016-16 on January 2, 2018. The adoption did not have a material impact on the consolidated financial statements or related disclosures.

In January 2016, the FASB issued ASU 2016-01, *Financial Instruments—Overall (Topic 825): Recognition and Measurement of Financial Assets and Financial Liabilitie*s. This ASU amends certain aspects of recognition, measurement, presentation and disclosure of financial instruments, and supersedes the guidance to classify equity securities with readily determinable fair values into different categories (that is, trading or available-for-sale) and requires equity securities to be measured at fair value with changes in the fair value recognized through net income. The Company adopted ASU 2016-01 on January 2, 2018. The adoption did not have a material impact on the consolidated financial statements or related disclosures.

In May 2014, the FASB issued ASU 2014-09, *Revenue from Contracts with Customers (Topic 606)*. Topic 606 supersedes the revenue recognition requirements in *Revenue Recognition (Topic 605)*, and requires entities to recognize revenues when control of the promised goods or services is transferred to customers at an amount that reflects the consideration to which the entity expects to be entitled to in exchange for those goods or services. The Company adopted Topic 606 as of January 2, 2018 using the modified retrospective transition method. See Note 2 for further details of the change in accounting principle.

Recently Issued Accounting Standards Not Yet Adopted

In June 2018, the FASB issued ASU 2018-07, *Compensation-Stock Compensation (Topic 718): Improvements to Nonemployee Share-based Payments.* This ASU expands the scope of Topic 718 to include share-based payment transactions for acquiring goods and services from nonemployees. The effective date for the standard is for interim periods in fiscal years beginning after December 15, 2018, with early adoption permitted, but no earlier than the Company's adoption date of Topic 606. The new guidance is required to be applied retrospectively with the cumulative effect recognized at the date of initial application. The Company does not anticipate the adoption will have a material impact on the consolidated financial statements and related disclosures.

In February 2018, the FASB issued ASU 2018-02, *Income Statement-Reporting Comprehensive Income (Topic 220): Reclassification of Certain Tax Effects from Accumulated Other Comprehensive Income*. ASU 2018-02 allows a reclassification from accumulated other comprehensive income to retained earnings for stranded tax effects resulting from the 2017 Act. Consequently, the amendments eliminate the stranded tax effects resulting from the 2017 Act and will improve the usefulness of information reported to financial statement users. However, because the amendments only relate to the reclassification of the income tax effects of the 2017 Act, the underlying guidance that requires that the effect of a change in tax laws or rates be included in income from continuing operations is not affected. The amendments in this update also require certain disclosures about stranded tax effects. This ASU is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted. The Company does not anticipate the adoption will have a material impact on the consolidated financial statements and related disclosures.

In August 2017, the FASB issued ASU 2017-12, *Derivatives and Hedging (Topic 815): Targeted Improvements to Accounting for Hedging Activities.* This ASU amends and simplifies existing guidance in order to allow companies to more accurately present the economic effects of risk management activities in the financial statements. ASU 2017-12 also amends the guidance surrounding the recognition of the value of hedged instruments to include the entire change in value, rather than just the effective portion, in other comprehensive income and recognized in earnings at the same time that the hedged item affects earnings for cash flow and net investment hedges. This ASU is effective for fiscal years beginning after December 15, 2018, including interim periods within those fiscal years. Early adoption is permitted. The Company is currently evaluating the new guidance to determine the impact it may have on its consolidated financial statements and related disclosures.

In February 2016, the FASB issued ASU 2016-02, *Leases (Topic 842)* which supersedes the existing lease recognition requirements in the current accounting standard for leases. The core principal of the new standard is that an entity should recognize right-of-use (ROU) assets and lease liabilities arising from a lease for both financing and operating leases, along with additional qualitative and quantitative disclosures. The new standard is to be applied using a modified retrospective transition method with the option to elect a number of practical expedients. The new standard will be effective for fiscal years beginning after December 15, 2018, including interim periods within such fiscal years.

In July 2018, the FASB issued ASU 2018-11, *Leases (Topic 842): Targeted Improvements*. ASU 2018-11 provides additional guidance to Topic 842 including providing preparers an additional optional retrospective adoption method which allows entities to initially apply the new leases standard at the adoption date and recognize a cumulative effect adjustment to the opening balance of retained earnings. ASU 2018-11 also provides lessors a practical expedient to not separate lease from non-lease components, in certain situations.

The Company will adopt the new lease standard as of January 1, 2019 and plan to utilize the retrospective cumulative effect adjustment transition method with a cumulative effect adjustment being recorded as of the adoption date. The Company expects to elect certain available practical expedients including the package of practical expedients permitted under the transition guidance within the new standard, which among other things, will allow the Company to carry forward the historical lease classification. Additionally, the Company will make an accounting policy election to not record ROU assets and lease liabilities for leases with an initial term of twelve months or less on its consolidated balance sheet.

The Company have established a cross-functional implementation team and are in the process of finalizing the scope of arrangements that will be subject to this standard as well as assessing the impact to the Company's systems, processes, and internal controls over financial reporting. While the Company is still evaluating the impact of adopting ASU 2016-02, the Company anticipate this standard will have a material impact on the consolidated balance sheet. The primary impact will be to record ROU assets and lease liabilities for existing operating leases on the consolidated balance sheets. Currently, the Company estimates the adoption of the standard will result in the recognition of additional ROU assets and lease liabilities that are not anticipated to be greater than the Company's future minimum lease payments (see Note 14), as of January 1, 2019.

The Company do not expect the adoption to have a material impact on its consolidated statements of operations or its consolidated statements of cash flows. The Company do not believe the standard will have a notable impact on its liquidity. The standard will have no impact on the Company's debt covenant compliance under its current agreements. The Company's analysis and evaluation of the new standard will continue through its effective date in the first quarter of 2019, including continuing to monitor any potential changes in the standard proposed by the FASB.

(2) Revenues

The Company assessed the new guidance provided by ASU 2014-09 and adopted the new revenue standard on January 2, 2018, which resulted in a change to the timing of revenue recognition for certain of the Company's revenue streams from point in time upon physical delivery to an over time model. Additionally, the Company elected the cumulative effect transition method with adjustment to the opening balance of retained earnings at January 2, 2018 for all open contracts as of January 1, 2018. Therefore, comparative information has not been adjusted and continues to be reported under previous U.S. GAAP guidance for the consolidated balance sheet at January 1, 2018 and the consolidated statement of operations for the years ended January 1, 2018 and January 2, 2017.

The cumulative effect of the changes made to the Company's January 2, 2018 consolidated balance sheet for the adoption of the new revenue standard was as follows:

	Balance at January 1, 2018	New Revenue Standard Adjustment	Balance at January 2, 2018
		(In thousands)	
Balance Sheet			
Assets			
Accounts receivable, net	$ 483,903	$ 8,171	$ 492,074
Contract assets	—	260,654	260,654
Inventories	294,588	(223,576)	71,012
Liabilities			
Other accrued expenses	114,685	13,384	128,069
Other long-term liabilities	74,667	3,291	77,958
Equity			
Retained earnings	230,850	28,574	259,424

The adoption of ASC Topic 606 resulted in the establishment of a contract asset balance sheet account and in the reclassification from inventories to contract assets related to certain customer contracts requiring an over time method of revenue recognition. On the date of adopting the new revenue standard, the Company recorded an estimated sales returns and allowance as well as a noncurrent deferred tax liability in the amount of $5,213 and $3,291, respectively, as of January 2, 2018. Additionally, the Company reclassified its sales returns and allowance balance of $8,171 as of January 1, 2018, from trade accounts receivable to other accrued expenses. Sales returns and allowances are recorded as a reduction of revenue and a component of accrued expenses on the consolidated balance sheet.

The disclosure below summarizes the impact of the adoption of the new revenue standard on the Company's consolidated balance sheet as ofDecember 31, 2018 and statement of operations for the year ended December 31, 2018 for which the As Reported reflects the new revenue standard and Balances without New Revenue Standard Adjustment reflects the Company's replaced revenue recognition policy of point in time and upon physical delivery, for certain revenue streams, as appropriate.

	As of December 31, 2018		
	As Reported	Effect of Change Increase (Decrease)	Balances without New Revenue Standard Adjustment
		(In thousands)	
Balance Sheet			
Assets			
Accounts receivable, net	$ 523,165	$ 10,492	$ 512,673
Contract assets	287,741	278,935	8,806
Inventories	109,377	(232,473)	341,850
Liabilities			
Other accrued expenses	113,756	18,893	94,863
Other long-term liabilities	94,777	1,619	93,158
Equity			
Retained earnings	433,008	36,442	396,566

	For the Year Ended December 31, 2018		
	As Reported	Effect of Change Increase	Balances without New Revenue Standard Adjustment
		(In thousands)	
Net sales	$ 2,847,261	$ 17,915	$ 2,829,346
Cost of goods sold	2,390,227	8,897	2,381,330
Gross profit	457,034	9,018	448,016
Net income	173,584	7,868	165,716

Included in the Effect of Change Increase column for the year ended December 31, 2018 are $14,408, $11,375 and $3,033 of net sales, cost of goods sold and gross profit, respectively, related to the opening balance sheet of Anaren which was acquired on April 18, 2018 (See Note 3), and not to the activity during the year ended December 31, 2018.

The adoption of the new accounting guidance had no impact to net cash provided by (used in) operating, financing or investing activities on the consolidated statement of cash flows for the year ended December 31, 2018.

(3) Acquisition of Anaren, Inc.

On April 18, 2018, the Company acquired all of the equity interests of Anaren for a total consideration of $787,911. Anaren was a leading provider of mission-critical RF solutions, microelectronics, and microwave components and assemblies for the wireless infrastructure and aerospace and defense electronics markets.

As of December 31, 2018, bank fees and legal, accounting, and other professional service costs associated with the acquisition of Anaren totaling $14,008have been expensed and recorded as general and administrative expense in the consolidated statements of operations.

The following summarizes the components of the purchase price:

	(In thousands)
Cash consideration	$ 596,396
Cash purchased	12,911
	609,307
Debt assumed	178,604
Total consideration	$ 787,911

Purchase Price Allocation

The purchase price of the Anaren acquisition was allocated to tangible and intangible assets acquired, and liabilities assumed based on the fair value at the date of the acquisition, April 18, 2018. The excess of the purchase price over the fair value of net assets acquired was allocated to goodwill. The fair value assigned to identifiable intangible assets acquired was based on estimates and assumptions made by management at the time of the acquisition. As of December 31, 2018, the Company has finalized the allocation of the purchase price.

The fair values assigned are based on reasonable methods applicable to the nature of the assets acquired and liabilities assumed. The following summarizes the final estimated fair values of net assets acquired:

	(In thousands)
Cash	$ 12,911
Trade and notes receivables	32,457
Contract assets	23,585
Inventories	56,619
Other current assets	1,373
Property, plant and equipment	45,115
Identifiable intangible assets	336,000
Other assets	300
Goodwill	394,474
Trade accounts payable	(14,623)
Contract liabilities	(7,778)
Other current liabilities	(7,616)
Long-term debt	(178,604)
Non-current deferred tax liabilities	(76,470)
Other liabilities	(8,436)
Total	$ 609,307

Inventories

The Company acquired $56,619 of inventories as a result of the acquisition. Finished goods were valued at estimated selling prices less costs of disposal and a reasonable profit for the selling effort. Work-in-process inventory was valued at estimated selling prices less costs to complete, costs of disposal and a reasonable profit allowance for the completion and selling effort. Raw materials were valued at estimated replacement cost.

Property, Plant and Equipment

The fair value of property, plant and equipment was determined by utilizing three approaches: the cost, sales comparison, and income capitalization approaches, each including management assumptions. Each approach assumes valuation of the property at the property's highest and best use.

Identifiable Intangible Assets

Acquired identifiable intangible assets include customer relationships, developed technology and backlog. The fair value of the identifiable intangible assets was determined using various valuation methods including relief from royalty and excess earnings to determine the present value of expected future cash flows for each identifiable intangible asset based on discount rates which incorporate a risk premium to take into account the risks inherent in those expected cash flows. The expected cash flows were estimated using available historical data adjusted based on a market participant perspective. The Company used risk adjusted discount rates between

4.5% and 17.0% to discount the expected future cash flows. The fair value assigned to each class of intangible assets and the related weighted average amortization periods are as follows:

	Estimated Fair Value	Weighted Average Amortization Period
	(In thousands)	(years)
Customer relationships	$ 267,500	12.2 years
Developed technology	39,500	9.4 years
Backlog	29,000	0.9 years
	$ 336,000	

Goodwill

Goodwill represents the excess of the purchase price over the fair value of assets acquired and liabilities assumed.

The Company has two reportable segments: PCB and E-M Solutions and has integrated Anaren into the PCB reportable segment. The excess purchase price over the fair value of assets acquired and liabilities assumed has been completely allocated to the PCB reportable segment.

The Company believes that the acquisition of Anaren will produce the following significant benefits:

- Provide the Company with differentiated RF expertise in aerospace and defense and embedded technology that the Company believes is critical to wireless infrastructure markets.
- Augment the Company’s strong aerospace and defense position and provide new opportunities for growth in the automotive and optical networking market.
- Deepen the Company’s engagement and interaction with leading customers in the aerospace and defense and wireless communication infrastructure markets.
- Strengthen the Company’s management and engineering teams with the addition of talented members having extensive experience in RF design;

The Company believes that these primary factors support the amount of goodwill recognized as a result of the purchase price paid for Anaren, in relation to other acquired tangible and intangible assets. The goodwill acquired in the acquisition is not deductible for income tax purposes.

Results of Operations

The results of operations of Anaren have been included in the Company’s consolidated statement of operations since April 18, 2018 which for 2018 resulted in additional net sales of $191,009. Pre-tax net income included in the consolidated statement of operations from the Anaren operations for the year ended December 31, 2018 have not been reported as it is impracticable to do so given the integration and other efficiency and cost saving measures that occurred during the year ended December 31, 2018.

Pro forma Financial Information (unaudited)

The unaudited pro forma financial information below gives effect to this acquisition as if it had occurred at the beginning of fiscal 2017, or January 3, 2017. The pro forma financial information presented includes the effects of adjustments related to the amortization of acquired identifiable intangible assets and acquired inventory, depreciation of acquired fixed assets, and other non-recurring transactions costs directly associated with the acquisition such as legal, accounting and banking fees.

The pro forma financial information as presented below is for informational purposes only and is not necessarily indicative of the actual results that would have been achieved had the acquisition occurred at the beginning of the earliest period presented, or the results that may be achieved in future periods.

	For the Year Ended	
	December 31, 2018	January 1, 2018
	(In thousands)	
Net sales	$ 2,915,935	$ 2,892,192
Net income attributable to TTM Technologies, Inc. stockholders	190,198	106,881
Basic earnings per share	$ 1.84	$ 1.05
Dilutive earnings per share	$ 1.51	$ 0.91

(4) Restructuring and Impairment Charges

Following the acquisition of Anaren on April 18, 2018 and following the acquisition of Viasystems on May 31, 2015, the Company incurred employee separation costs and contract termination and other costs related to the integration and other efficiency and cost saving measures. Contract termination and other costs primarily represented plant closure costs as well as costs related to building operating leases. Following the acquisition of Viasystems on May 31, 2015, the Company closed certain facilities which resulted in the layoff of related employees at these facilities. The acquisitions of Anaren and Viasystems were part of the Company's integration strategy to improve total plant utilization, operational performance and customer focus.

The below table summarizes such restructuring costs by reportable segment for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended								
	December 31, 2018			January 1, 2018			January 2, 2017		
	Employee separation/ severance	Contract termination and other costs	Total	Employee separation/ severance	Contract termination and other costs	Total	Employee separation/ severance	Contract termination and other costs	Total
	(In thousands)								
Reportable Segment:									
PCB	$ 2,008	$ —	$ 2,008	$ 178	$ 99	$ 277	$ 1,548	$ 2,141	$ 3,689
E-M Solutions	—	—	—	—	520	520	903	3,644	4,547
Corporate	3,389	121	3,510	33	360	393	(231)	946	715
	$ 5,397	$ 121	$ 5,518	$ 211	$ 979	$ 1,190	$ 2,220	$ 6,731	$ 8,951

The below table shows the utilization of the accrued restructuring costs during the years ended December 31, 2018 and January 1, 2018:

	Employee separation/ severance	Contract termination and other costs	Total
	(In thousands)		
Accrued at January 2, 2017	$ 124	$ 1,042	$ 1,166
Charged to expense	211	979	1,190
Amount paid	(335)	(1,522)	(1,857)
Accrued at January 1, 2018	$ —	$ 499	$ 499
Charged to expense	5,397	121	5,518
Amount paid	(2,239)	(227)	(2,466)
Accrued at December 31, 2018	$ 3,158	$ 393	$ 3,551

As of December 31, 2018, the Company incurred approximately $23,040 of restructuring charges since the inception of the restructuring plans.

Additionally, the Company recognized $3,346 in impairment charges during the year ended January 2, 2017. As a result of the above mentioned plant closures and other plant realignment efforts, $1,393 of impairment charges were recognized in the consolidated statement of operations related to machinery and equipment in the PCB reportable segment. In addition, $1,953 of impairment charges were recognized in the consolidated statement of operations related to capitalized software costs in Corporate.

(5) Composition of Certain Consolidated Financial Statement Captions

	As of	
	December 31, 2018	January 1, 2018
	(In thousands)	
Inventories:		
Raw materials	$ 97,600	$ 75,835
Work-in-process	10,299	120,031
Finished goods	1,478	98,722
	$ 109,377	$ 294,588
Property, plant and equipment, net:		
Land and land use rights	$ 75,431	$ 70,681
Buildings and improvements	534,122	506,394
Machinery and equipment	1,357,035	1,243,456
Construction-in-progress, furniture and fixtures and other	42,713	51,865
	2,009,301	1,872,396
Less: Accumulated depreciation	(957,277)	(815,551)
	$ 1,052,024	$ 1,056,845
Other accrued expenses:		
Interest	$ 9,260	$ 6,297
Restructuring	3,551	499
Income taxes payable	11,345	21,993
Other	89,600	85,896
	$ 113,756	$ 114,685

(6) Goodwill

As of December 31, 2018 and January 1, 2018, goodwill was as follows:

	Total
	(In thousands)
Balance as of January 2, 2017	
Goodwill	$ 544,009
Accumulated impairment losses	(171,400)
	372,609
Foreign currency translation adjustment	(38)
Balance as of January 1, 2018	
Goodwill	543,971
Accumulated impairment losses	(171,400)
	372,571
Goodwill recognized during the year	394,474
Balance as of December 31, 2018	
Goodwill	938,445
Accumulated impairment losses	(171,400)
	$ 767,045

Goodwill balances include foreign currency translation adjustments related to foreign subsidiaries with functional currencies other than the U.S. Dollar. All of the Company's goodwill is included as a component of the PCB reportable segment.

During the fourth quarter of 2018, the Company performed its annual goodwill impairment test quantitatively, which was based on a combination of the income approach utilizing discounted cash flow analysis and the market approach, and concluded that the goodwill was not impaired for the Company's reporting units. The Company will continue to evaluate its goodwill on an annual basis during its fourth fiscal quarter and whenever events or changes in circumstances — such as significant adverse changes in business climate or operating results, changes in management strategy, coupled with a decline in the market price of our stock and market capitalization — indicate that there may be a potential impairment.

(7) Definite-lived Intangibles

As of December 31, 2018 and January 1, 2018, the components of definite-lived intangibles were as follows:

	Gross Amount	Accumulated Amortization	Foreign Currency Translation Adjustment	Net Carrying Amount	Weighted Average Amortization Period
	(In thousands)				(years)
December 31, 2018					
Customer relationships	$ 203,634	$ (123,522)	$ —	$ 80,112	8.1
Technology	3,000	(3,000)	—	—	3.0
Acquired intangibles from acquisition					
Customer relationships	267,500	(15,561)	—	251,939	12.2
Developed technology	39,500	(3,345)	—	36,155	9.4
Backlog	29,000	(21,283)	—	7,717	0.9
	$ 542,634	$ (166,711)	$ —	$ 375,923	
January 1, 2018					
Customer relationships	$ 203,563	$ (101,089)	$ 72	$ 102,546	8.1
Technology	3,000	(2,596)	—	404	3.0
	$ 206,563	$ (103,685)	$ 72	$ 102,950	

The January 1, 2018 definite-lived intangible balances include foreign currency translation adjustments related to foreign subsidiaries with functional currencies other than the U.S. Dollar.

Definite-lived intangibles are generally amortized using the straight-line method of amortization over the useful life, with the exception of certain customer relationship intangibles, which are amortized using an accelerated method of amortization based on estimated cash flows. Amortization expense was $63,026, $23,634, and $24,252 for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively. For the year ended December 31, 2018, $3,345 of amortization expense is included in cost of goods sold.

Estimated aggregate amortization for definite-lived intangible assets for the next five years and thereafter is as follows:

	(In thousands)
2019	$ 53,161
2020	45,419
2021	42,108
2022	39,002
2023	36,290
Thereafter	159,943
	$ 375,923

(8) Long-term Debt and Letters of Credit

The following table summarizes the long-term debt of the Company as of December 31, 2018 and January 1, 2018:

	Interest Rate as of December 31, 2018	Principal Outstanding as of December 31, 2018	Interest Rate as of January 1, 2018	Principal Outstanding as of January 1, 2018
		(In thousands)		
Term Loan due September 2024	5.00%	$ 835,879	4.06%	$ 349,125
Senior Notes due October 2025	5.63%	375,000	5.63%	375,000
Convertible Senior Notes due December 2020	1.75%	249,985	1.75%	249,985
U.S. ABL Revolving Loan due May 2020	4.00%	40,000	3.06%	17,000
Asia ABL Revolving Loan due May 2020	3.90%	30,000	2.96%	30,000
Capital Lease	—	—	6.43%	1,919
		1,530,864		1,023,029
Less: Long-term debt unamortized discount		(22,167)		(30,513)
Long-term debt unamortized debt issuance costs		(16,272)		(12,459)
		1,492,425		980,057
Less: current maturities		(30,000)		(4,578)
Long-term debt, less current maturities		$ 1,462,425		$ 975,479

The fiscal calendar maturities of long-term debt through 2023 and thereafter are as follows:

	(In thousands)
2019	$ 30,000
2020	319,985
2021	—
2022	—
2023	—
Thereafter	1,180,879
	$ 1,530,864

Term Loan Facility

On April 18, 2018, the Company closed its $600,000 commitment of incremental loans concurrent with the completion of its acquisition of Anaren. At issuance, these incremental loans increased the Company's existing balance of its Term Loan Facility due 2024 from $348,250 to $948,250. As of December 31, 2018, the Term Loan Facility had an outstanding balance of $835,879, of which $30,000 is included in short-term debt and $805,879 is included in long-term debt. The Term Loan Facility was issued at a weighted average discount of 99.7% and bears interest, at the Company's option, at a floating rate of LIBOR, plus an applicable interest margin of 2.50%, or an alternate base rate, (defined as the greater of the JP Morgan prime, the New York Fed bank rate plus 0.5% or LIBOR plus 1.0%), subject to a 1.0% floor plus an applicable margin of 1.5%. At December 31, 2018 the interest rate on the outstanding borrowings under the Term Loan Facility was 5.00%. There is no provision, other than an event of default, for the interest margin to increase. The Term Loan Facility will mature on September 28, 2024. The Term Loan Facility is secured by a significant amount of the domestic assets of the Company and a pledge of 65% of voting stock of the Company's first tier foreign subsidiaries and is structurally senior to the Company's Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notes below.

During 2018, after the closing of its April 18, 2018 incremental loans facility, the Company made a $2,371 quarterly scheduled principal payment and $110,000 optional debt principal prepayments. Subsequent to December 31, 2018, the Company made an optional debt principal prepayment of $30,000. As a result of the principal prepayments, the Company is no longer required to make any quarterly scheduled payments. However, based on certain parameters defined in the Term Loan Facility, including a First Lien Leverage Ratio, the Company may be required to make an additional principal payment on an annual basis beginning after fiscal year 2018. For 2019, the Company is not required to make an additional principal payment as its First Lien Leverage Ratio was less than 2.0. Any remaining outstanding balance under the Term Loan Facility is due at the maturity date of September 28, 2024.

Borrowings under the Term Loan Facility are subject to certain affirmative and negative covenants, including limitations on indebtedness, corporate transactions, investments and dispositions, and share payments.

Senior Notes

The $375,000 of Senior Notes issued, which is included in long-term debt, bear interest at a rate of 5.63% per annum. Interest is payable semiannually in arrears on April 1 and October 1 of each year beginning April 1, 2018. The Senior Notes will mature on October 1, 2025.

Borrowings under the Senior Notes are subject to certain affirmative and negative covenants, including limitations on indebtedness, corporate transactions, investments and dispositions, and share payments.

Convertible Senior Notes due 2020

The Company maintains 1.75% convertible senior notes in the amount of $249,985 due December 15, 2020. The convertible senior notes bear interest at a rate of 1.75% per annum. Interest is payable semiannually in arrears on June 15 and December 15 of each year. The convertible senior notes are unsecured obligations and would rank equally to the Company’s future unsecured senior indebtedness and are senior in right of payment to any of the Company’s future subordinated indebtedness.

Conversion: At any time prior to March 15, 2020, holders may convert their convertible senior notes into cash and, if applicable, into shares of the Company’s common stock based on a conversion rate of 103.7613 shares of the Company’s common stock per $1 principal amount of convertible senior notes, subject to adjustment, under the following circumstances: (1) during any calendar quarter beginning after March 31, 2015 (and only during such calendar quarter), if the last reported sale price of our common stock for at least 20 trading days during the 30 consecutive trading days ending on the last trading day of the immediately preceding calendar quarter is greater than or equal to 130% of the applicable conversion price on each applicable trading day of such preceding calendar quarter; (2) during the five business day period after any 10 consecutive trading day period in which the trading price per note for each day of that 10 consecutive trading day period was less than 98% of the product of the last reported sale price of the Company’s common stock and the conversion rate on such day; or (3) upon the occurrence of specified corporate transactions described in the indenture governing the notes. In 2018, the conversion criteria had been met allowing holders to give notice of conversion during the year. However, as of December 31, 2018, the conversion criteria that would allow holders to give notice of conversion in the first quarter of 2019 had not been met.

On or after March 15, 2020 until the close of business on the third scheduled trading day preceding the maturity date, holders may convert their notes at any time, regardless of the foregoing circumstances. Upon conversion, for each $1 principal amount of notes, the Company will pay shares of our common stock, cash or a combination of cash and shares of our common stock at its election, if applicable, based on a daily conversion value calculated on a proportionate basis for each day of the 80 trading day observation period. All conversions occurring on the same date or on or after March 15, 2020 shall be settled using the same settlement method. Additionally, in the event of a fundamental change as defined in the indenture governing the notes, or other conversion rate adjustments such as share splits or combinations, other distributions of shares, cash or other assets to stockholders, including self-tender transactions (Other Conversion Rate Adjustments), the conversion rate may be modified to adjust the number of shares per $1 principal amount of the notes. As of December 31, 2018, none of the criteria for a fundamental change or a conversion rate adjustment had been met.

The maximum number of shares issuable upon conversion, including the effect of a fundamental change and subject to Other Conversion Rate Adjustments, would be 32,423.

Note Repurchase: The Company is not permitted to redeem the convertible senior notes at any time prior to maturity. In the event of a fundamental change or certain default events, as defined in the indenture governing the notes, holders may require the Company to repurchase for cash all or a portion of their convertible senior notes at a price equal to 100% of the principal amount, plus any accrued and unpaid interest.

Convertible Note Hedge and Warrant Transaction: In connection with the issuance of the convertible senior notes due 2020, the Company entered into a convertible note hedge and warrant transaction (Call Spread Transaction), with respect to the Company’s common stock. The convertible note hedge consists of the Company’s option to purchase up to 25,939 common stock shares at a price of $9.64 per share. The hedge expires on December 15, 2020 and can only be executed upon the conversion of the above mentioned convertible senior notes due 2020. Additionally, the Company sold warrants to purchase 25,940 shares of its common stock at a price of $14.26 per share. The warrants expire ratably from March 2021 through January 2022. The Call Spread Transaction has no effect on the terms of the convertible senior notes due 2020 and reduces potential dilution by effectively increasing the conversion price of the convertible senior notes due 2020 to $14.26 per share of the Company’s common stock.

As of December 31, 2018 and January 1, 2018, the following summarizes the equity components of the convertible senior notes included in additional paid-in capital:

	As of December 31, 2018			As of January 1, 2018		
	Embedded conversion option — Convertible Senior Notes	Embedded conversion option — Convertible Senior Notes Issuance Costs	Total	Embedded conversion option — Convertible Senior Notes	Embedded conversion option — Convertible Senior Notes Issuance Costs	Total
	(In thousands)					
Convertible Senior Notes due 2020	$ 60,216	$ (1,916)	$ 58,300	$ 60,216	$ (1,916)	$ 58,300

The components of interest expense resulting from the convertible senior notes for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 were as follows:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Contractual coupon interest	$ 4,375	$ 4,375	$ 4,375
Amortization of debt discount	$ 9,142	$ 8,570	$ 8,034
Amortization of debt issuance costs	$ 916	$ 858	$ 805

Asset-Based Lending Agreements

The Company maintains a $200,000 U.S. Asset-Based Lending Credit Agreement (U.S. ABL) and a $150,000 Asia Asset-Based Lending Credit Agreement (Asia ABL) (collectively the ABL Revolving Loans).

The U.S. ABL consists of three tranches comprised of a revolving credit facility for up to $200,000, a letter of credit facility for up to $50,000, and swingline loans for up to $30,000, provided that at no time may amounts outstanding under the tranches exceed in aggregate $200,000 or the applicable borrowing base, which is a percentage of the principal amount of Eligible Accounts, as defined in the U.S. ABL agreement. Borrowings under the U.S. ABL bear interest at either a floating rate of LIBOR plus a margin of 150 basis points or JP Morgan Chase Bank's prime rate plus a margin of 50 basis points, at the Company's option. At December 31, 2018, the interest rate on the outstanding borrowings under the U.S. ABL was 4.00%. The applicable margin can vary based on the remaining availability of the facility, from 125 to 175 basis points for LIBOR-based loans and from 25 to 75 basis points for JP Morgan Chase Bank's prime rate-based loans. Other than availability and an event of default, there are no other provisions for the interest margin to increase. The U.S. ABL will mature on May 31, 2020. Loans made under the U.S. ABL are secured first by all of the Company's domestic cash, receivables and certain inventories as well as by a second position against a significant amount of the domestic assets of the Company and a pledge of 65% of the voting stock of the Company's first tier foreign subsidiaries and are structurally senior to the Company's Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notes above. At December 31, 2018, $40,000 of the U.S. ABL was outstanding and classified as long-term debt, which is consistent with its maturity date.

The Asia ABL consists of two tranches comprised of a revolving credit facility for up to $150,000 and a letter of credit facility for up to $100,000, provided that at no time may amounts outstanding under both tranches exceed in aggregate $150,000 or the applicable borrowing base, which is a percentage of the principal amount of Eligible Accounts, as defined in the Asia ABL agreement. Borrowings under the Asia ABL bear interest at a floating rate of LIBOR plus 140 basis points. At December 31, 2018, the interest rate on the outstanding borrowings under the Asia ABL was 3.90%. There is no provision, other than an event of default, for the interest margin to increase. The Asia ABL will mature on May 22, 2020. Loans made under the Asia ABL are secured by a portion of the Company's Asia Pacific cash and receivables and are structurally senior to the Company's domestic obligations, including the Senior Notes and Convertible Senior Notes. See Senior Notes and Convertible Senior Notes above. At December 31, 2018, $30,000 of the Asia ABL was outstanding and classified as long-term debt, which is consistent with its maturity date.

The Company has up to $50,000 and $100,000 Letters of Credit Facilities under the U.S. ABL and the Asia ABL, respectively. As of December 31, 2018, letters of credit in the amount of $10,128 were outstanding under the U.S. ABL and $12,128 were outstanding under the Asia ABL with various expiration dates through May 2020. Available borrowing capacity under the U.S. ABL and the Asia ABL was $149,872 and $107,872, respectively, which considers letters of credit outstanding at December 31, 2018.

The Company is required to pay a commitment fee of 0.25% to 0.375% per annum on any unused portion of the U.S ABL and the Asia ABL. The Company incurred total commitment fees related to unused borrowing availability of $992, $783, and $709 for the years ended December 31, 2018, January 1, 2018, and January 2, 2017, respectively. Under the occurrence of certain events, the ABL Revolving Loans are subject to various financial and operational covenants, including maintaining minimum fixed charge coverage ratios.

Other Credit Facility

Additionally, the Company is party to a revolving loan credit facility (Chinese Revolver) with a lender in China. Under this arrangement, the lender has made available to the Company approximately $30,532 in unsecured borrowing with all terms of the borrowing to be negotiated at the time the Chinese Revolver is drawn upon. There are no commitment fees on the unused portion of the Chinese Revolver, and this arrangement expires in June 2019. As of December 31, 2018, the Chinese Revolver had not been drawn upon.

Debt Issuance and Debt Discount

As of December 31, 2018 and January 1, 2018, remaining unamortized debt discount and debt issuance costs for the Term Loan Facility, Senior Notes, and Convertible Senior Notes are as follows:

	As of December 31, 2018			As of January 1, 2018		
	Debt Issuance Costs	Debt Discount	Effective Interest Rate	Debt Issuance Costs	Debt Discount	Effective Interest Rate
	(In thousands)					
Term Loan due September 2024	$ 8,229	$ 2,489	4.66%	$ 2,788	$ 1,691	3.96%
Senior Notes due October 2025	6,071	—	5.92%	6,782	—	5.92%
Convertible Senior Notes	1,972	19,678	6.48%	2,889	28,822	6.48%
	$ 16,272	$ 22,167		$ 12,459	$ 30,513	

The above debt discount and debt issuance costs are recorded as a reduction of the debt and are amortized into interest expense using an effective interest rate over the duration of the debt.

Debt issuance costs for the ABL Revolving Loans of $1,420 and $2,421 as of December 31, 2018 and January 1, 2018, respectively, are included in other non-current assets and are amortized to interest expense over the duration of the ABL Revolving Loans using the straight line method of amortization.

At December 31, 2018, the remaining weighted average amortization period for all unamortized debt discount and debt issuance costs was 3.7 years.

Loss on Extinguishment of Debt

During the years ended January 1, 2018 and January 2, 2017, the Company recognized loss on extinguishment of debt of $768 and $47,767, respectively, primarily associated with the write off of the remaining unamortized debt issuance and debt discount for the 2016 Term Loan and the 2015 Term Loan Credit Agreement, respectively.

(9) Income Taxes

The components of income (loss) before income taxes for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 are:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
United States	$ 18,991	$ (4,178)	$ (85,323)
Foreign	70,777	144,136	152,325
Income before income taxes	$ 89,768	$ 139,958	$ 67,002

The Company expects its earnings attributable to foreign subsidiaries will be indefinitely reinvested, except for our material Chinese plants and the respective holding companies where a deferred tax liability of approximately $19,439 and $1,066 has been recorded for the foreign and U.S. federal/state impact, respectively. For those other companies with earnings currently being reinvested outside of the U.S., the undistributed earnings amounted to approximately $209,356 as of December 31, 2018. The determination of the unrecognized deferred tax liability related to these undistributed earnings is approximately $4,700.

The components of income tax benefit (provision) for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 are:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Current benefit (provision):			
Federal	$ 381	$ 82	$ (342)
State	(1,294)	(462)	(512)
Foreign	(12,045)	(24,006)	(29,672)
Total current	(12,958)	(24,386)	(30,526)
Deferred benefit (provision):			
Federal	97,723	11	—
State	14,351	(31)	—
Foreign	(15,300)	9,175	(901)
Total deferred	96,774	9,155	(901)
Total benefit (provision)	$ 83,816	$ (15,231)	$ (31,427)

The following is a reconciliation of the provision for income taxes at the statutory federal income tax rate compared to the Company's provision for income taxes for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Statutory federal income tax	$ (18,851)	$ (48,985)	$ (22,780)
State income taxes, net of federal benefit and state tax credits	(1,953)	(462)	906
Foreign deemed dividends	—	(457)	(4,585)
Transfer pricing	1,483	—	—
Acquisition related expenses	(1,737)	—	(591)
IRC Section 162(m) limitation	(3,702)	—	—
Stock options	1,072	—	—
Intercompany profit in inventory elimination	—	(743)	(335)
Permanently reinvested earnings assertion	(15,492)	—	—
Tax Act deferred tax revaluation	—	(59,228)	—
Foreign tax differential on foreign earnings & other permanent items	2,045	30,412	17,530
Change in valuation allowance	118,451	66,716	(19,119)
Uncertain tax positions	(954)	(3,992)	(3,464)
Federal research and development credits	2,996	1,270	1,270
Other	458	238	(259)
Total benefit (provision) for income taxes	$ 83,816	$ (15,231)	$ (31,427)

Deferred income taxes reflect the net tax effects of temporary differences between the carrying amounts of assets and liabilities for financial reporting purposes and the amounts used for income tax purposes. The significant components of the net deferred income tax assets (liabilities) as of December 31, 2018 and January 1, 2018 are as follows:

	As of	
	December 31, 2018	January 1, 2018
	(In thousands)	
Deferred income tax assets:		
Net operating loss carryforwards	$ 104,801	$ 143,095
Reserves and accruals	29,358	23,655
Interest expense limitation	1,276	—
Unrealized loss on cash flow hedge	1,128	—
Tax credit carryforwards	30,962	27,012
Stock-based compensation	4,528	5,099
Original issue discount on convertible senior notes	5,130	7,345
Property, plant and equipment	24,826	24,170
Other deferred income tax assets	228	1,282
	202,237	231,658
Less: valuation allowance	(27,426)	(167,238)
	174,811	64,420
Deferred income tax liabilities:		
Discount on convertible senior notes	(4,683)	(6,413)
Repatriation of foreign earnings	(20,282)	(8,977)
Property, plant and equipment basis differences	(50,622)	(33,661)
Goodwill and intangible amortization	(85,300)	(19,400)
Other deferred income tax liabilities	(252)	(828)
Net deferred income tax assets (liabilities)	$ 13,672	$ (4,859)
Deferred income tax assets (liabilities), net:		
Current deferred income taxes	$ —	$ —
Noncurrent deferred income taxes	13,672	(4,859)

As of December 31, 2018, the Company had the following net operating loss (NOL) carryforwards: $431,214 in the U.S. for federal, $148,774 in various U.S. states, $54,000 in China, and $13,300 in Hong Kong. The U.S. federal NOLs expire in 2023 through 2036, the various U.S. states' NOLs expire in 2019 through 2036, the China NOLs expire in 2019 through 2023, and the Hong Kong NOLs carryforward indefinitely. Further, the Company's tax credits were approximately $38,065 of which $6,496 carryforward indefinitely.

In connection with the Company's acquisition of Viasystems, there was more than a 50% change in ownership under Section 382 of the Internal Revenue Code of 1986, as amended, and regulations issued there under. As a consequence, the utilization of the acquired Viasystems U.S. NOLs is limited to approximately $9,826 per year. In addition, the Company recognized certain gains built in at the time of the ownership change, which increase the limitation by approximately $47,463 for each of the first 5 years after the acquisition. Any unused limitation in a year can be carried over to succeeding years.

A valuation allowance is provided when it is more likely than not that all or some portion of the deferred income tax assets will not be realized. During the year ended December 31, 2018 the Company released a majority of its valuation allowance recorded on its U.S. net deferred tax assets due to a combination of the Company's expectations for future U.S. taxable income improvement and to offset the net deferred tax liability acquired as a result of the Anaren acquisition. It continues to maintain a valuation allowance on certain of its U.S. net deferred tax assets represented by income tax attributes carried forward that are expected to expire unused. Certain subsidiaries within China continue to have NOL carryforwards in various tax jurisdictions that the Company has determined are not more likely than not to be utilized. As a result, a full valuation allowance has been recorded for these subsidiaries at December 31, 2018. For the remaining net deferred income tax asset, management has determined that it is more likely than not that the results of future operations will generate sufficient taxable income to realize the net deferred tax asset.

The following summarizes the activity in the Company's valuation allowance for the years endedDecember 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Balance at beginning of year	$ 167,238	$ 221,951	$ 234,192
Reduction related to acquisition	(76,040)	—	(18,234)
Additions charged to expense	—	4,515	5,993
Reduction charged to expense — Tax Act	—	(59,228)	—
Other reduction charged to expense	(63,772)	—	—
Balance at end of year	$ 27,426	$ 167,238	$ 221,951

Certain entities within China qualified for the high and new technology enterprise (HNTE) status enabling those entities to enjoy certain benefits, which were effective for the years ended December 31, 2018, January 1, 2018 and January 2, 2017. The HNTE status as well as enhanced research and development (R&D) deductions decreased Chinese taxes. HNTE and R&D benefit and effect on earnings per share are as follows:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands, except per share data)		
HNTE and R&D benefits	$ 11,970	$ 11,935	$ 7,666
Basic shares	103,355	101,580	100,099
Diluted shares	134,036	132,476	101,482
Increases earnings per share:			
Basic	$ 0.12	$ 0.12	$ 0.08
Diluted	$ 0.09	$ 0.09	$ 0.08

HNTE status expires at various dates 2018 through 2019, but the Company expects to continue to file for renewal of such HNTE status for the foreseeable future.

A reconciliation of the beginning and ending amount of unrecognized tax benefits, exclusive of accrued interest and penalties, is as follows:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Balance at beginning of year	$ 38,841	$ 39,727	$ 15,404
Additions related to acquisition	903	—	22,182
Additions based on tax positions related to the current year	856	1,965	5,389
Additions for tax positions of prior years	117	1,661	1,545
Reductions for tax positions of prior years	(2,140)	(3,846)	(2,286)
Lapse of statute of limitations	(728)	(666)	(2,507)
Balance at end of year	$ 37,849	$ 38,841	$ 39,727

As of December 31, 2018 and January 1, 2018, the Company recorded unrecognized tax benefits of $26,274 and $29,033, respectively, as well as interest and penalties of $13,280 and $12,679, respectively, to other long-term liabilities. The Company has also recorded unrecognized tax benefits of $11,576 and $9,808 against certain deferred tax assets as of December 31, 2018 and January 1, 2018, respectively. The amount of unrecognized tax benefits that would, if recognized, reduce the Company's effective income tax rate in any future periods is $39,553 including interest and penalties. The Company expects its unrecognized tax benefits to decrease by $1,083 along with related interest of $2,040 over the next 12 months due to expiring statutes.

As of December 31, 2018, the Company is subject to (i) U.S. federal income tax examination and / or NOL adjustment for tax years from 2000 to 2018, (ii) state and local income tax examination for tax years 2000 to 2018, and (iii) foreign income tax examinations generally for tax years from 2008 to 2018.

(10) Financial Instruments

Derivatives

Interest Rate Swaps

The Company's business is exposed to interest rate risk resulting from fluctuations in interest rates on certain LIBOR-based variable rate debt. Increases in interest rates would increase interest expenses relating to the outstanding variable rate borrowings and increase the cost of debt. Fluctuations in interest rates can also lead to significant fluctuations in the fair value of the debt obligations.

On May 15, 2018, the Company entered into a four-year pay-fixed, receive floating (1-month LIBOR), interest rate swap arrangement with a notional amount of $400,000 for the period beginning June 1, 2018 and ending on June 1, 2022. Under the terms of the interest rate swap, the Company pays a fixed rate of 2.84% against the first interest payments of a portion of its LIBOR-based debt and receives floating 1-month LIBOR during the swap period.

At inception, the Company designated the interest rate swap as a cash flow hedge and the fair value of the interest rate swap was zero. As of December 31, 2018, the fair value of the interest rate swap was recorded as a liability in the amount of $4,735 and included as a component of other long-term liabilities. The change in the fair value of the interest rate swap is recorded as a component of accumulated other comprehensive (loss) income, net of tax, in the Company's consolidated balance sheet. No ineffectiveness was recognized for the year ended December 31, 2018. During the year ended December 31, 2018, the interest rate swap increased interest expense by $1,598.

Foreign Exchange Contracts

The Company enters into foreign currency forward contracts to mitigate the impact of changes in foreign currency exchange rates and to reduce the volatility of purchases and other obligations generated in currencies other than its functional currencies. The Company's foreign subsidiaries may at times purchase forward exchange contracts to manage their foreign currency risks in relation to certain purchases of machinery denominated in foreign currencies other than the Company's functional currencies. The notional amount of the foreign exchange contracts at December 31, 2018 and January 1, 2018 was approximately $4,313 and $10,927, respectively. The Company has designated certain of these foreign exchange contracts as cash flow hedges.

The fair values of derivative instruments in the consolidated balance sheets are as follows:

		Asset/(Liability) Fair Value	
	Balance Sheet Location	December 31, 2018	January 1, 2018
		(In thousands)	
Cash flow derivative instruments designated as hedges:			
Interest rate swap	Other long-term liabilities	$ (4,735)	$ —
Foreign exchange contracts	Other accrued expenses	—	(6)
Cash flow derivative instruments not designated as hedges:			
Foreign exchange contracts	Prepaid expenses and other current assets	—	107
Foreign exchange contracts	Other accrued expenses	(139)	(132)
Foreign exchange contracts	Other long-term liabilities	—	(13)

The following table provides information about the amounts recorded in accumulated other comprehensive (loss) income related to derivatives designated as cash flow hedges, as well as the amounts recorded in each caption in the consolidated statements of operations when derivative amounts are reclassified out of accumulated other comprehensive income for the years ended December 31, 2018, January 1, 2018 and January 2, 2017.

		Year ended December 31, 2018			Year ended January 1, 2018			Year ended January 2, 2017		
		Effective Portion		Ineffective Portion	Effective Portion		Ineffective Portion	Effective Portion		Ineffective Portion
	Financial Statement Caption	Gain/(Loss) Recognized in Other Comprehensive Income (Loss)	Gain/(Loss) Reclassified into Income	Gain/(Loss) Reclassified into Income	Gain/(Loss) Recognized in Other Comprehensive Income (Loss)	Gain/(Loss) Reclassified into Income	Gain/(Loss) Reclassified into Income	Gain/(Loss) Recognized in Other Comprehensive Income (Loss)	Gain/(Loss) Reclassified into Income	Gain/(Loss) Reclassified into Income
		(In thousands)								
Cash flow hedge:										
Interest rate swap	Interest expense	$ (6,333)	$ (1,598)	$ —	$ —	$ —	$ —	$ —	$ —	$ —
Foreign currency forward	Depreciation expense	(21)	(157)	—	276	(162)	—	(83)	(175)	—

The following table provides a summary of the activity associated with the designated cash flow hedges reflected in accumulated other comprehensive (loss) income for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Beginning balance, net of tax	$ (742)	$ (1,180)	$ (1,272)
Changes in fair value (loss) gain, net of tax	(4,846)	276	(83)
Reclassification to earnings	1,374	162	175
Ending balance, net of tax	$ (4,214)	$ (742)	$ (1,180)

The Company expects that losses of approximately $837 of the accumulated other comprehensive income (loss) will be reclassified into the statement of operations, net of tax, in the next 12 months.

(11) Accumulated Other Comprehensive Income (Loss)

The following provides a summary of the components of accumulated other comprehensive income (loss), net of tax as of December 31, 2018, January 1, 2018 and January 2, 2017:

	Foreign Currency Translation	Pension Obligation	Gains (Losses) on Cash Flow Hedges	Total
		(In thousands)		
Ending balance at January 2, 2017	$ (43,149)	$ —	$ (1,180)	$ (44,329)
Other comprehensive income before reclassifications	47,294	—	276	47,570
Amounts reclassified from accumulated other comprehensive income	—	—	162	162
Net year to date period other comprehensive income	47,294	—	438	47,732
Ending balance at January 1, 2018	4,145	—	(742)	3,403
Other comprehensive loss before reclassifications	(2,567)	(1,284)	(4,846)	(8,697)
Amounts reclassified from accumulated other comprehensive income	—	—	1,374	1,374
Net year to date period other comprehensive loss	(2,567)	(1,284)	(3,472)	(7,323)
Ending balance at December 31, 2018	$ 1,578	$ (1,284)	$ (4,214)	$ (3,920)

(12) Significant Customers and Concentration of Credit Risk

In the normal course of business, the Company extends credit to its customers. Most customers to which the Company extends credit are located outside the United States. The Company performs ongoing credit evaluations of customers, does not require collateral, and considers the credit risk profile of the entity from which the receivable is due in further evaluating collection risk.

The Company's customers include both OEMs and EMS companies. The Company's OEM customers often direct a significant portion of their purchases through EMS companies. While the Company's customers include both OEM and EMS providers, the Company measures customer concentration based on OEM companies, as they are the ultimate end customers.

For the years ended December 31, 2018, January 1, 2018 and January 2, 2017, one customer accounted for approximately 15%, 20% and 15%, respectively, of the Company's net sales. There were no other customers that accounted for 10% or more of net sales for the years ended December 31, 2018, January 1, 2018 or January 2, 2017.

(13) Fair Value Measures

The Company measures at fair value its financial and non-financial assets by using a fair value hierarchy that prioritizes the inputs to valuation techniques used to measure fair value. Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date, essentially an exit price, based on the highest and best use of the asset or liability.

The carrying amount and estimated fair value of the Company's financial instruments as ofDecember 31, 2018 and January 1, 2018were as follows:

	December 31, 2018		January 1, 2018	
	Carrying Amount	Fair Value	Carrying Amount	Fair Value
	(In thousands)			
Derivative assets, current	$ —	$ —	$ 107	$ 107
Derivative liabilities, current	139	139	258	258
Derivative liabilities, non-current	4,735	4,735	—	—
Term Loan due September 2024	825,161	782,592	344,646	346,943
Senior Notes due October 2025	368,929	350,880	368,218	384,769
Convertible Senior Notes	228,335	290,858	218,274	429,199
ABL Revolving Loans	70,000	70,000	47,000	47,000
Capital lease	—	—	1,919	1,919

The fair value of the long-term debt was estimated based on quoted market prices or discounting the debt over its life using current market rates for similar debt as of December 31, 2018 and January 1, 2018, which are considered Level 2 inputs.

The fair value of the convertible senior notes was estimated based on quoted market prices of the securities on an active exchange, which are considered Level 2 inputs.

The fair value of plan assets in the defined benefit plan of $18,251 as of December 31, 2018 was not included in the table above and was estimated based on quoted market prices of the securities that are actively traded and price quotes that are readily available, which are considered Level 1 inputs. See Note 16 for further details of the plan assets measured at fair value in the defined benefit plan.

As of December 31, 2018 and January 1, 2018, the Company's other financial instruments also included cash and cash equivalents, accounts receivable, and accounts payable. Due to short-term maturities, the carrying amount of these instruments approximates fair value. Our cash and cash equivalents at December 31, 2018 consisted of $42,502 held in the U.S., with the remaining $213,858 held by foreign subsidiaries.

The majority of the Company's non-financial assets and liabilities, which include goodwill, intangible assets, inventories, and property, plant and equipment, are not required to be carried at fair value on a recurring basis. However, if certain triggering events occur (or are tested at least annually in the case of goodwill) such that a non-financial instrument is required to be evaluated for impairment, based upon a comparison of the non-financial instrument's fair value to its carrying value, an impairment is recorded to reduce the carrying value to the fair value, if the carrying value exceeds the fair value.

For the year ended January 2, 2017, the following assets were measured at fair value on a nonrecurring basis using the type of inputs shown:

		Fair Value Measurements Using:			
	January 2, 2017	Level 1 Inputs	Level 2 Inputs	Level 3 Inputs	Total Losses for the Year Ended January 2, 2017
			(In thousands)		
Long-lived assets held and use	$ 2,254	$ —	$ —	$ 2,254	$ 1,953
Assets held for sale	—	—	—	—	1,393
					$ 3,346

There was no impairment of long-lived assets recognized in the year ended December 31, 2018 or January 1, 2018.

The Company has capitalized software costs in accordance with U.S. GAAP. During the year ended January 2, 2017, the Company determined that certain capitalized costs no longer had benefit primarily as a result of the Viasystems acquisition. Because the primary determination of fair value was based on management's assumptions and estimates of capitalized costs to dispose, the resulting fair value is considered a Level 3 input.

(14) Commitments and Contingencies

Operating Leases

The Company leases some of its manufacturing and assembly plants, sales offices and equipment under noncancellable operating leases that expire at various dates through 2049. Certain real property leases contain renewal provisions at the Company's option. Most of the leases require the Company to pay for certain other costs such as property taxes and maintenance. Certain leases also contain rent escalation clauses (step rents) that require additional rental amounts in the later years of the term. Rent expense for leases with step rents is recognized on a straight-line basis over the minimum lease term.

The following is a schedule of future minimum lease payments as of December 31, 2018:

	Operating Leases (In thousands)
2019	$ 7,282
2020	4,701
2021	3,406
2022	2,408
2023	2,172
Thereafter	4,172
Total minimum lease payments	$ 24,141

Total rent expense for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, was approximately $20,345, $16,665 and $10,329, respectively.

Legal Matters

The Company is subject to various legal matters, which it considers normal for its business activities. While the Company currently believes that the amount of any reasonably possible loss for known matters would not be material to the Company's financial condition, the outcome of these actions is inherently difficult to predict. In the event of an adverse outcome, the ultimate potential loss could have a material adverse effect on the Company's financial condition or results of operations in a particular period. The Company has accrued amounts for its loss contingencies which are probable and estimable as of December 31, 2018 and January 1, 2018. However, these amounts are not material to the consolidated financial statements of the Company.

(15) Stock-Based Compensation

Incentive Compensation Plan

The Company maintains a 2014 Incentive Compensation Plan (the Plan), which allowed for the issuance of up to 5,288 shares. In May 2016, the Plan was amended to increase the amount allowed for issuance by 5,000 shares, revising the maximum allowed for issuance to 10,288 through its expiration date of February 2024.

The Plan provides for the grant of incentive stock options and nonqualified stock options to the Company's key employees, non-employee directors and consultants. Other types of awards such as performance-based restricted stock units (PRUs), restricted stock units (RSUs), and stock appreciation rights are also permitted. The exercise price for options and awards is determined by the compensation committee of the board of directors and, for options intended to qualify as incentive stock options, may not be less than the fair market value as determined by the closing stock price at the date of the grant. Each option and award shall vest and expire as determined by the compensation committee of the board of directors, with options, PRUs and RSUs generally vesting over three years for employees and one year for non-employee directors. Options, PRUs and RSUs do not have voting rights. Options expire no later than ten years from the grant date. All grants provide for accelerated vesting if there is a change in control, as defined in the Plan. Upon the exercise of outstanding stock options or vesting of RSUs and PRUs, the Company's practice is to issue new registered shares that are reserved for issuance under the Plan.

As of December 31, 2018, 949 PRUs, 2,546 RSUs and 100 stock options were outstanding under the Plan. Included in the 949 PRUs outstanding as of December 31, 2018 are 694 vested but not yet released. Included in the 2,546 RSUs outstanding as of December 31, 2018 are 422 vested but not yet released RSUs associated with non-employee directors. These RSUs vest over one year with release of the underlying shares of common stock deferred until retirement from the board of directors, (or until one year after retirement in the case of certain prior grants).

Performance-based Restricted Stock Units

The Company maintains a long-term incentive program for executives that provides for the issuance of PRUs, representing hypothetical shares of the Company's common stock that may be issued. Under the PRU program, a target number of PRUs is awarded at the beginning of each three-year performance period. The number of shares of common stock released at the end of the performance period may range from zero to 2.4 times the target number depending on performance during the period. The performance metrics of the PRU program are based on (a) annual financial targets, which are based on revenue and EBITDA (earnings before interest, tax, depreciation, and amortization expense), each equally weighted, and (b) an overall modifier based on the Company's total stockholder return (TSR) relative to a group of peer companies selected by the Company's compensation committee, over the three-year performance period.

Under the PRU program, financial goals are set at the beginning of each fiscal year and performance is reviewed at the end of that year. The percentage to be applied to each participant's target award ranges from zero to 160% based upon the extent to which the annual financial performance goals are achieved. If specific performance threshold levels for the annual financial goals are met, the amount earned for that element will be applied to one-third of the participants' PRU award to determine the number of units earned.

At the end of the three-year performance period, the total units earned, if any, are adjusted by applying a modifier, ranging from zero to 150% based on the Company's TSR based on stock price changes relative to a group of peer companies selected by the Company's compensation committee for the same three-year period.

The TSR modifier is intended to ensure that there are limited or no payouts under the PRU program if the Company's stock performance is significantly below the median TSR of a group of peer companies selected by the Company's compensation committee over the three-year performance period. Where the annual financial goals have been met and where there has been strong relative TSR performance over the three-year performance period, the PRU program may provide substantial rewards to participants with a maximum payout of 2.4 times the initial PRU award. However, even if all of the annual financial metric goals are achieved in each of the three years, there will be no payouts if the Company's stock performance is below that of the 10th percentile for PRUs granted in 2018, 2017 and 2016 of the group of peer companies selected by the Company's compensation committee, as appropriate.

Recipients of PRU awards generally must remain employed by the Company on a continuous basis through the end of the three-year performance period in order to receive any amount of the PRUs covered by that award. In events such as death, disability or retirement, the recipient may be entitled to pro-rata amounts of PRUs as defined in the Plan. Target shares subject to PRU awards do not have voting rights of common stock until earned and issued following the end of the three-year performance period.

The Company records stock-based compensation expense for PRU awards granted based on management's periodic assessment of the annual financial performance goals to be achieved. As of December 31, 2018, management determined that vesting of the PRU awards was probable. PRU activity for the year ended December 31, 2018 was as follows:

	Shares	Weighted Average Fair Value
	(In thousands)	
Outstanding shares at January 1, 2018	409	$ 16.39
Granted	335	19.59
Vested	(694)	17.22
Change in units due to annual performance achievement	205	16.92
Outstanding shares at December 31, 2018	255	$ 18.75

The fair value of PRUs granted is calculated using a Monte Carlo simulation model, as the TSR modifier contains a market condition. For the years ended December 31, 2018, January 1, 2018 and January 2, 2017, the following assumptions were used in determining the fair value:

	For the Year Ended		
	December 31, 2018 (1)	January 1, 2018 (2)	January 2, 2017 (3)
Weighted-average fair value	$ 19.59	$ 22.90	$ 6.46
Risk-free interest rate	2.14 %	1.20 %	0.84 %
Dividend yield	—	—	—
Expected volatility	40 %	43 %	40 %
Expected term in years	1.5	1.8	2.1

(1) Reflects the weighted-averages for the third year of the three-year performance period applicable to PRUs granted in 2016, the second year of the three-year performance period applicable to PRUs granted in 2017 and the first year of the three-year performance period applicable to PRUs granted in 2018.
(2) Reflects the weighted-averages for the third year of the three-year performance period applicable to PRUs granted in 2015, the second year of the three-year performance period applicable to PRUs granted in 2016 and the first year of the three-year performance period applicable to PRUs granted in 2017.
(3) Reflects the weighted-averages for the third year of the three-year performance period applicable to PRUs granted in 2014, the second year of the three-year performance period applicable to PRUs granted in 2015 and the first year of the three-year performance period applicable to PRUs granted in 2016.

The expected term of the PRUs reflects the performance period for the PRUs granted. Expected volatility is calculated using the Company's historical stock price. The risk-free interest rate for the expected term of PRUs is based on the U.S. Treasury yield curve in effect at the time of grant.

Restricted Stock Units

RSU activity for the year ended December 31, 2018 was as follows:

	Shares	Weighted Average Grant-Date Fair Value
	(In thousands)	
Non-vested RSUs outstanding at January 1, 2018	2,413	$ 10.88
Granted	1,057	15.35
Vested	(1,243)	10.14
Forfeited	(102)	12.17
Non-vested RSUs outstanding at December 31, 2018	2,125	$ 13.47
Vested and expected to vest at December 31, 2018	2,546	$ 12.90

The fair value of the Company's RSUs is determined based upon the closing common stock price on the grant date. The weighted average fair value per unit of RSUs granted was $15.35, $15.85 and $6.78 for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively. The total fair value of RSUs vested for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 was $12,599, $9,446 and $7,834, respectively.

Stock Options

During the years ended December 31, 2018 and January 2, 2017, the Company granted 40 and 20 stock options, respectively, to newly appointed members of the board which were estimated to have a weighted fair value per share of $8.37 and $6.78, respectively. The fair value calculation is based on stock options granted during the period using the Black-Scholes option-pricing model on the date of grant. For the year ended December 31, 2018, the weighted fair value was determined using 3.1% as the risk-free interest rate, 43% as the expected volatility, 8.5 years as the expected term and no dividend yield. For the year ended January 2, 2017 the fair value was determined using 1.7% as the risk-free interest rate, 51% as the expected volatility, 8.5 years as the expected term and no dividend yield. No stock options were granted by the Company for the year ended January 1, 2018.

The Company determines the expected term of its stock option awards by periodic review of its historical stock option exercise experience. This calculation uses assumed future exercise patterns to account for option holders' expected exercise and post-vesting termination behavior for outstanding stock options over their remaining contractual terms. Expected volatility is calculated by weighting the Company's historical stock price to calculate expected volatility over the expected term of each grant. The risk-free interest rate for the expected term of each option granted is based on the U.S. Treasury yield curve in effect at the time of grant with a period that approximates the expected term of the options.

Option activity under the Plan for the year ended December 31, 2018 was as follows:

	Options	Weighted Average Exercise Price	Weighted Average Remaining Contractual Term	Aggregate Intrinsic Value
	(In thousands)		(In years)	(In thousands)
Outstanding at January 1, 2018	80	$ 10.98	4.2	$ 375
Granted	40	15.57		
Exercised	(20)	9.54		
Outstanding at December 31, 2018	100	$ 13.10	6.1	$ 4
Vested and expected to vest at December 31, 2018	100	$ 13.10	6.1	$ 4
Exercisable at December 31, 2018	50	$ 11.39	2.9	$ 4

The aggregate intrinsic values in the table above represent the total pretax intrinsic value (the difference between Company's closing stock price on the last trading day of the 2018 fiscal year and the exercise price, multiplied by the number of in-the-money options) that would have been received by the option holders had all option holders exercised their options on December 31, 2018. This amount changes based on the fair market value of the Company's stock. The total intrinsic value of options exercised for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 was $128, $27 and $127, respectively. The total fair value of the options vested for both years ended December 31, 2018 and January 1, 2018 was $34. There were no options vested for the year ended January 2, 2017.

Stock-based Compensation Expense and Unrecognized Compensation Costs

For the years ended December 31, 2018, January 1, 2018 and January 2, 2017, the amounts recognized in the consolidated financial statements with respect to the stock-based compensation plan are as follows:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
		(In thousands)	
Cost of goods sold	$ 2,898	$ 2,252	$ 1,630
Selling and marketing	1,964	1,458	1,054
General and administrative	15,819	14,580	8,406
Stock-based compensation expense recognized	$ 20,681	$ 18,290	$ 11,090

The Company may become entitled to a deduction in its tax returns upon the future exercise of incentive stock options under certain circumstances. For the year ended December 31, 2018, the Company has recorded an income tax benefit. For the years ended January 1, 2018 and January 2, 2017, the Company did not record an income tax benefit as a result of a full valuation allowance on its deferred tax assets.

The following is a summary of total unrecognized compensation costs as of December 31, 2018:

	Unrecognized Stock-Based Compensation Cost	Remaining Weighted Average Recognition Period
	(In thousands)	(In years)
RSU awards	$ 17,715	1.3
PRU awards	2,508	1.4
Stock options	359	2.1
	$ 20,582	

(16) Employee Benefit Plans, Deferred Compensation Plan and Retirement Benefit Plan

As of December 31, 2018, the Company has several defined contribution plans. In North America, the Company has savings plans (the Savings Plans) in which eligible full-time employees can participate and contribute a percentage of compensation subject to the maximum allowed by the tax agencies. The Savings Plans provides for a partial match by the Company. In China, the Company contributes to either separate trust-administered funds or various government-sponsored pension plans on a mandatory basis. For all defined contribution plans, the Company has no further payment obligation once the required contributions have been made. The Company recorded contributions to defined contribution plans of $58,445, $42,461 and $36,172 during the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively.

The Company also maintains a deferred compensation plan (the Compensation Plan). The Compensation Plan is an unfunded, nonqualified deferred compensation plan and is limited to selected employees, including our named executive officers and our directors. The Compensation Plan allows participants to defer up to 100% of their annual bonus and between 5% and 100% of their annual director fees. Amounts deferred under the Compensation Plan will be credited to accounts maintained by the Company for each participant and will be credited or debited with the participant's proportionate share of any gains or losses attributable to the performance of investment options selected by the participant.

During the year ended December 31, 2018 and following the acquisition of Anaren on April 18, 2018, the Company has a noncontributory defined benefit pension plan covering eligible employees. Effective August 15, 2000, the plan was closed for new participants. Benefits under this plan generally are based on the employee's years of service and compensation. While the Company intends to continue this plan, it reserves the right to terminate or amend the plan at any time.

As of December 31, 2018, the funded status of the accumulated benefit obligation was 70%. The Company expects to fund a minimum required contribution of approximately $772 during fiscal year 2019.

The following tables set forth the changes in benefit obligation and the plan assets in the defined benefit plan described above for the year ended December 31, 2018:

Change in Benefit Obligations	For the Year Ended December 31, 2018 (In thousands)
Benefit obligation at beginning of year	$ (27,525)
Service cost	(292)
Interest cost	(758)
Actuarial gain	264
Benefits paid	650
Benefit obligation at end of year	$ (27,661)
Accumulated benefit obligation at end of year	$ 26,191

Change in in Plan Assets	For the Year Ended December 31, 2018 (In thousands)
Fair value of plan assets at beginning of year	$ 19,643
Actual return on plan assets	(1,021)
Employer contributions	280
Benefits paid	(651)
Fair value of plan assets at end of year	$ 18,251
Unfunded status	$ (9,410)
Net amount recognized	$ (9,410)

Amounts before income tax effect recognized in the consolidated balance sheets consist of the following:

	December 31, 2018 (In thousands)
Other long-term liabilities	$ (9,410)
Net amount recognized	$ (9,410)

Amounts before income tax effect recognized in accumulated other comprehensive loss consist of the following:

	December 31, 2018 (In thousands)
Net actuarial loss	$ (1,677)
Accumulated other comprehensive loss	$ (1,677)

During 2019, no accumulated other comprehensive loss is expected to be recognized as a component of net periodic benefit cost.

The components included in the net periodic benefit cost and the increase in minimum liability included in other comprehensive loss for the year ended December 31, 2018 are as follows:

	December 31, 2018 (In thousands)
Service cost	$ 292
Interest cost	758
Expected return on plan assets	(920)
Net periodic benefit cost	$ 130

The weighted-average assumptions used to determine benefit obligations for this plan at fiscal year-end were as follows:

	December 31, 2018
Discount rate	4.09 %
Rate of compensation increase	3.20
Expected return on plan assets	6.75

The Company determines the discount rate assumption based on the internal rate of return for a portfolio of high quality bonds, with a minimum rating of Moody's AA Corporate and with maturities that are consistent with the projected future cash flow obligations.

The weighted-average assumptions used to determine net periodic benefit cost for the fiscal year were as follows:

	Fiscal Year 2018
Discount rate	3.96 %
Rate of compensation increase	3.20
Expected return on plan assets	6.75

The Company determines the expected long-term rate of return on plan assets based upon recommendations from its pension plan's investment advisors and using an allocation approach that considers diversification and rebalancing for a portfolio of assets invested over a long-term time horizon. The approach relies on the historical returns of the plan's portfolio and relationships between equities and fixed income investments, consistent with the widely accepted capital market principle that a diversified portfolio with a larger allocation to equity investments can generate a greater return over the long run. Additionally, the Company monitors the mix of investments in its portfolio to ensure alignment with its expected long-term pension obligations. The Company reviews the expected long-term rate of return annually and revises it as appropriate.

Investments shall be made pursuant to the following objectives: 1) preserve purchasing power of plan’s assets based adjusted for inflation; 2) provide long term growth; 3) avoid significant volatility. Asset allocation shall be determined based on a long-term target allocation having 29% of assets invested in large-cap stocks, 11% in mid-cap stocks, 11% in small-cap stocks, 11% in international stocks, 34% in the broad bond market, and 3% in the real estate market, with little or none invested in cash. Both investment allocation and performance are reviewed periodically.

The target allocation in 2019 and plan asset allocation at the end of 2018, in percentages, by asset category are as follows:

	Target Allocation 2019	December 31, 2018
Equity securities (1)	65 %	61 %
Debt securities (2)	35	38
Cash and cash equivalents (3)	—	1
Total	100 %	100 %

The following table summarizes plan assets measured at fair value on December 31, 2018:

	Total	Quoted Prices in Active Markets for Identical Assets (Level 1)	Significant Observable Inputs (Level 2)	Significant Unobservable Inputs (Level 3)
	(In thousands)			
Equity securities (1)	$ 11,184	$ 11,184	$ —	$ —
Debt securities (2)	6,929	6,929	—	—
Cash and cash equivalents (3)	138	138	—	—
Total	$ 18,251	$ 18,251	$ —	$ —

(1) Equity securities include U.S. and foreign exchange traded common and preferred stocks and mutual funds. Common and preferred shares issued by U.S. and non-U.S. corporations are traded actively on exchanges and price quotes for these shares are readily available. Holdings of corporate stock are categorized as Level 1 investments.

(2) Debt securities include the debt of the U.S. Treasury and U.S. and foreign corporate issuers. U.S. Treasury notes and bonds are actively traded and price quotes for these securities are readily available. Holdings of U.S. Treasury notes and bonds are categorized as Level 1 investments.

(3) Cash and cash equivalents include short-term U.S. government investment notes, short-term money market mutual funds, accrued income and cash held on account. Cash held on account and short- term U.S. government investment notes (including accrued income thereon) for which there is an active market and daily pricing for the security are categorized as Level 1 investments.

The Company seeks to maximize medium- to long-term returns of overall pension plan assets with reasonable levels of investment risk. One element of controlling overall investment risk is through diversification of asset allocation, among domestic and international equity and debt instruments. The plan's equity investments include foreign and domestic exchange traded equities across a range of industries and countries, but primarily in the domestic markets. The plan's debt securities are primarily invested in government and corporate issuers primarily in the domestic market.

The following benefit payments, which reflect expected future service, as appropriate, are expected to be paid:

	(In thousands)
2019	$ 1,116
2020	1,180
2021	1,262
2022	1,328
2023	1,423
Years 2024 through 2028	8,483

(17) Preferred Stock

The board of directors has the authority, without action by stockholders, to designate and issue preferred stock in one or more series. The board of directors may also designate the rights, preferences and privileges of each series of preferred stock, any or all of which may be superior to the rights of the common stock. As of December 31, 2018, no shares of preferred stock were outstanding.

(18) Segment Information

The reportable segments reported below are the Company’s segments for which separate financial information is available and upon which operating results are evaluated by the chief operating decision maker to assess performance and to allocate resources. The Company has two reportable segments: PCB and E-M Solutions. The PCB reportable segment is comprised of multiple operating segments. Factors considered to determine whether operating segments can be aggregated into reportable segments included similarity regarding economic characteristics, products, production processes, type or classes of customers, distribution methods, and regulatory environments.

The Company, including the chief operating decision maker, evaluates segment performance based on reportable segment income, which is operating income before amortization of intangibles. Interest expense and interest income are not presented by segment since they are not included in the measure of segment profitability reviewed by the chief operating decision maker. All inter-segment transactions have been eliminated.

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
		(In thousands)	
Net Sales:			
PCB [1]	$ 2,621,314	$ 2,448,506	$ 2,334,876
E-M Solutions	225,947	210,086	198,483
Total net sales	$ 2,847,261	$ 2,658,592	$ 2,533,359
Operating Segment Income (Loss):			
PCB [1]	$ 329,668	$ 322,486	$ 285,046
E-M Solutions	8,105	6,716	4,684
Corporate	(115,662)	(92,808)	(92,025)
Total operating segment income	222,111	236,394	197,705
Amortization of definite-lived intangibles [2]	(63,026)	(23,634)	(24,252)
Total operating income	159,085	212,760	173,453
Total other expense	(69,317)	(72,802)	(106,451)
Income before income taxes	$ 89,768	$ 139,958	$ 67,002

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
		(In thousands)	
Depreciation Expense:			
PCB [1]	$ 153,637	$ 144,256	$ 149,466
E-M Solutions	2,850	2,471	2,540
Corporate	6,221	4,082	4,223
Total depreciation expense	$ 162,708	$ 150,809	$ 156,229
Capital Expenditures:			
PCB [1]	$ 103,318	$ 161,152	$ 74,318
E-M Solutions	3,918	5,438	3,206
Corporate	7,758	44,001	5,873
Total capital expenditures	$ 114,994	$ 210,591	$ 83,397

	As of		
	December 31, 2018	January 1, 2018	January 2, 2017
		(In thousands)	
Segment Assets:			
PCB [1]	$ 2,039,088	$ 1,991,049	$ 1,791,829
E-M Solutions	146,693	143,344	127,826
Corporate	1,271,722	647,489	580,421
Total assets	$ 3,457,503	$ 2,781,882	$ 2,500,076

(1) Figures for the years ended January 1, 2018 and January 2, 2017 do not include Anaren, as the acquisition occurred on April 18, 2018.

(2) Amortization of definite-lived intangibles primarily relates to the PCB reportable segment. For the year ended December 31, 2018, $3,345 of amortization expense is included in cost of goods sold.

The Corporate category includes operating expenses that are not included in the segment operating performance measures. Corporate consists primarily of corporate governance functions such as finance, accounting, information technology, facilities and human resources personnel, as well as global sales and marketing personnel and acquisition and integration costs associated with the acquisitions. Bank fees and legal, accounting, and other professional service costs associated with acquisitions of $13,279, $2,266 and $1,688 for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively, are included in Corporate.

During the year ended January 2, 2017, the Company recorded impairment charges of $1,393 and $1,953 for the impairment of long-lived assets related to its PCB reportable segment and Corporate, respectively. There were no impairment charges for the years ended December 31, 2018 and January 1, 2018.

The Company markets and sells its products in approximately 65 countries. Other than in the United States and China, the Company does not conduct business in any country in which its net sales in that country exceed 10% of the Company's total net sales. Net sales and long-lived assets are as follows:

	2018		2017		2016	
	Net Sales	Long-Lived Assets	Net Sales	Long-Lived Assets	Net Sales	Long-Lived Assets
	(In thousands)					
United States	$ 1,260,739	$ 1,315,174	$ 850,511	$ 642,256	$ 1,119,086	$ 661,058
China	548,853	851,789	957,296	866,126	646,844	781,678
Other	1,037,669	28,029	850,785	23,984	767,429	23,124
Total	$ 2,847,261	$ 2,194,992	$ 2,658,592	$ 1,532,366	$ 2,533,359	$ 1,465,860

Net sales are attributed to countries by country invoiced.

(19) Earnings Per Share

The following is a reconciliation of the numerator and denominator used to calculate basic earnings per share and diluted earnings per share for the years ended December 31, 2018, January 1, 2018 and January 2, 2017:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands, except per share data)		
Basic earnings:			
Basic earnings	$ 173,584	$ 124,214	$ 34,861
Diluted earnings:			
Net income attributable to TTM Technologies, Inc. stockholders	$ 173,584	$ 124,214	$ 34,861
Interest expense from convertible senior notes, net of tax	11,906	13,803	—
Diluted earnings	$ 185,490	$ 138,017	$ 34,861
Basic weighted average shares	103,355	101,580	100,099
Dilutive effect of performance-based restricted stock units, restricted stock units and stock options	1,677	2,157	1,383
Dilutive effect of outstanding warrants	3,065	2,799	—
Dilutive effect of assumed conversion of convertible senior notes outstanding	25,939	25,940	—
Diluted shares	134,036	132,476	101,482
Earnings per share attributable to TTM Technologies, Inc. stockholders:			
Basic	$ 1.68	$ 1.22	$ 0.35
Diluted	$ 1.38	$ 1.04	$ 0.34

For the years ended December 31, 2018, January 1, 2018 and January 2, 2017, PRUs, RSUs and stock options to purchase 528, 255 and 892 shares of common stock, respectively, were not considered in calculating diluted earnings per share because the options' exercise prices or the total expected proceeds under the treasury stock method for performance-based stock units, restricted stock units or stock options was greater than the average market price of common shares during the applicable year and, therefore, the effect would be anti-dilutive.

The below is a summary of amounts convertible to common stock related to convertible senior notes and related warrants:

	For the Year Ended		
	December 31, 2018	January 1, 2018	January 2, 2017
	(In thousands)		
Common stock related to convertible senior notes	25,939	25,939	25,940
Warrants to purchase common stock	25,940	25,940	25,940

For the year ended January 2, 2017, the effect of shares of common stock related to the Company's convertible senior notes were not included in the computation of dilutive earnings per share as the impact would be anti-dilutive.

Outstanding warrants for the year ended January 2, 2017, to purchase common stock were not included in the computation of dilutive earnings per share because the strike price of the warrants to purchase the Company's common stock were greater than the average market price of common shares during the applicable year, and therefore, the effect would be anti-dilutive.

(20) Related Party Transactions

In the normal course of business, the Company's foreign subsidiaries purchase laminate and prepreg from related parties in which a member of the Board of Directors of the Company holds an equity interest. The Company's foreign subsidiaries purchased laminate and prepreg from these related parties in the amount of $44,992, $51,985 and $55,649 for the years ended December 31, 2018, January 1, 2018 and January 2, 2017, respectively.

The Company also sells PCBs to a related party which is a wholly owned subsidiary of an entity in which a member of the Board of Directors of the Company holds an equity interest. Sales to this related party for the years ended December 31, 2018, January 1, 2018 and January 2, 2017 were $8, $78 and $991, respectively.

As of December 31, 2018 and January 1, 2018, the Company's consolidated balance sheets included $10,630 and $14,452, respectively, in accounts payable due to related parties for purchases of laminate and prepreg and such balances are included as a component of accounts payable on the consolidated balance sheets. Additionally, the Company's consolidated balance sheets as of December 31, 2018 and January 1, 2018, included $13 and $33, respectively, in accounts receivable due from a related party for sales of PCBs, as mentioned above, and such balances are included as a component of accounts receivable, net on the consolidated balance sheets.

(21) Noncontrolling Interest Holdings

During the fourth quarter of 2017, the Company acquired Desay Industrial's 5% noncontrolling equity interest in the manufacturing facility in Huiyang, China otherwise owned by the Company for 56,400 Chinese RMB or $8,568. The Company recorded an increase to additional paid-in capital for the difference between the purchase price and the carrying value of the noncontrolling interest of $223.

Exhibit 10.53

TTM Technologies, Inc. ("the Company")

Executive Compensation Recoupment Policy

Definitions:

For purposes of this policy, a "Covered Executive" is defined as the Company's Chief Executive Officer, any individual that directly reports to the Chief Executive Officer (except for his /her administrative assistant) or any Officer of the Company that has been designated as such by the Committee pursuant to Section 16 of the Securities Exchange Act of 1934, as amended.

For purposes of this policy, "Covered Compensation" shall include (i) annual cash incentive compensation paid to a Covered Executive under the TTM Incentive Plan adopted by the Committee (or any successor annual cash incentive plan adopted by the Committee), and (ii) Restricted Stock Units

("RSUs") and Performance Stock Units ("PSUs") , and/or the resulting shares vested to Covered Executives pursuant to such grant of RSUs or PRUs, minus any taxes paid by the Covered Executive on any such compensation as described above. For the avoidance of doubt, Covered Compensation shall not include base salary granted to Covered Executives.

In the event that the Company is required to prepare an accounting restatement due to material non- compliance by the Company with any financial reporting requirement under the U.S. Federal Securities laws that it is determined to be the result of an error or fraud committed by a member of management of the Company (a "Material Restatement Event"), or in the event of a material violation of the Company's Code of Conduct by a Covered Executive, the Committee may, as and to the extent it deems appropriate at the sole and absolute discretion of the Committee, recoup any and all Covered Compensation issued to the Covered Executive.

The period for which the Committee may seek the recoupment of Covered Compensation under this policy shall be up to three years preceding the Material Restatement Event or a material violation of the Company's Code of Conduct by a Covered Executive, but not prior to the enactment of this policy.

Further, the Company may take such other disciplinary action, including but not limited to actions under other Company policies, against any Covered Executive as it deems necessary and appropriate, including termination of employment.

This policy shall apply in addition to any right of recoupment against the Chief Executive Officer and Chief Financial Officer pursuant to Section 304 of the Sarbanes-Oxley Act of 2002.

Exhibit 21.1

LIST OF SUBSIDIARIES OF
TTM TECHNOLOGIES, INC.

Name of Subsidiary	State/Country of Incorporation	Parent
TTM Technologies International (Switzerland) GmbH	Switzerland	TTM Technologies North America, LLC
TTM Iota Limited	Bermuda	TTM Technologies International (Switzerland) GmbH
TTM Technologies (Shanghai) Co. Ltd.	China	TTM Iota Limited
TTM Technologies (Asia Pacific) Limited	Hong Kong	TTM Technologies North America, LLC
MTG Flex (BVI) Limited	British Virgin Islands	TTM Technologies (Asia Pacific) Limited
OPC Flex (HK) Limited	Hong Kong	MTG Flex (BVI) Limited
MTG (PCB) No. 2 (BVI) Limited	British Virgin Islands	TTM Technologies (Asia Pacific) Limited
Meadville Aspocomp (BVI) Holdings Limited	British Virgin Islands	MTG (PCB) No. 2 (BVI) Limited
Meadville Aspocomp Limited	Hong Kong	Meadville Aspocomp (BVI) Holdings Limited
Meadville Aspocomp International Limited	Hong Kong	Meadville Aspocomp (BVI) Holdings Limited
Asia Rich Enterprises Limited	British Virgin Islands	Meadville Aspocomp (BVI) Holdings Limited
Aspocomp Electronics India Private Limited	India	Asia Rich Enterprises Limited
MA Investment Holding Limited	Hong Kong	Meadville Aspocomp (BVI) Holdings Limited
MTG Management (BVI) Limited	British Virgin Islands	TTM Technologies (Asia Pacific) Limited
Oriental Printed Circuits (USA), Inc.	Delaware	MTG Management (BVI) Limited
Oriental Printed Circuits Limited	Hong Kong	MTG Management (BVI) Limited
Oriental Printed Circuits, Inc.	California	Oriental Printed Circuits Limited
Meadville International Trading (Shanghai) Co., Ltd.	China	Oriental Printed Circuits Limited
TTM Technologies Enterprises (HK) Limited	Hong Kong	MTG Management (BVI) Limited
State Link Trading Limited	British Virgin Islands	MTG Management (BVI) Limited
MTG PCB (BVI) Limited	British Virgin Islands	TTM Technologies (Asia Pacific) Limited
TTM Technologies China Limited	Hong Kong	MTG PCB (BVI) Limited
OPC Manufacturing Limited	Hong Kong	TTM Technologies China Limited
Circuit Net Technology Limited	British Virgin Islands	TTM Technologies China Limited
Guangzhou Meadville Electronics Co., Ltd.	China	TTM Technologies China Limited
Shanghai Meadville Science & Technology Co., Ltd.	China	TTM Technologies China Limited
Shanghai Meadville Electronics Co., Ltd.	China	TTM Technologies China Limited
Shanghai Kaiser Electronics Co., Ltd.	China	TTM Technologies China Limited
TTM Technologies Trading (Guangzhou) Co., Ltd.	China	TTM Technologies China Limited
Dongguan Meadville Circuits Limited	China	TTM Technologies China Limited
TTM Technologies North America, LLC	Delaware	TTM Technologies, Inc.
Coretec Building Inc.	Colorado	TTM Technologies North America, LLC
DDi Cleveland Holdings Corp.	Delaware	TTM Technologies North America, LLC
DDi Electronics Services (Shenzhen) Co. Ltd.	China	TTM Technologies North America, LLC
Wirekraft Industries, LLC	Delaware	TTM Technologies North America, LLC
Viasystems Europe Limited	United Kingdom	TTM Technologies North America, LLC
Merix Caymans Trading Company Limited	Cayman Islands	TTM Technologies North America, LLC
TTM Technologies Toronto, Inc.	Ontario	TTM Technologies North America, LLC
Trumauga Properties, Ltd.	Ohio	DDi Cleveland Holdings Corp.
TTM Technologies Trading (Asia) Company Limited	Hong Kong	Merix Caymans Trading Company Limited
Viasystems Canada Holdings, ULC	Nova Scotia	Merix Caymans Trading Company Limited
Viasystems Services (Singapore) PTE Ltd.	Singapore	Merix Caymans Trading Company Limited
Merix Printed Circuits Technology Limited	China	Viasystems Services (Singapore) PTE Ltd.
Viasystems (BVI) Limited	British Virgin Islands	Merix Caymans Trading Company Limited
Kalex Circuit Board (Guangzhou) Limited	Hong Kong	Viasystems (BVI) Limited

Name of Subsidiary	State/Country of Incorporation	Parent
Guangzhou Termbray Circuit Board Limited	China	Kalex Circuit Board (Guangzhou) Limited
Viasystems Kalex Printed Circuit Board Limited	Hong Kong	Viasystems (BVI) Limited
Termbray Laminate Company Limited	Hong Kong	Viasystems (BVI) Limited
Viasystems Asia Pacific Property (B.V.I.) Limited	British Virgin Islands	Viasystems (BVI) Limited
Viasystems Asia Pacific Company Limited	Hong Kong	Viasystems (BVI) Limited
Kalex Circuit Board (China) Limited	Hong Kong	Viasystems (BVI) Limited
Guangzhou Kalex Laminate Company Limited	China	Termbray Laminate Company Limited
Guangzhou Viasystems Commercial Technology Co. Limited	China	Viasystems Asia Pacific Property (B.V.I.) Limited
Viasystems EMS (Shenzhen) Co. Ltd.	China	Viasystems Asia Pacific Company Limited
Shanghai Viasystems EMS Co. Ltd.	China	Viasystems Asia Pacific Company Limited
Guangzhou Termbray Electronics Technologies Company Limited	China	Kalex Circuit Board (China) Limited
Kalex Multilayer Circuit Board (Zhongshan) Ltd.	China	Kalex Circuit Board (China) Limited
Metropole A Limited	Hong Kong	Merix Caymans Trading Company Limited
Metropole B Limited	Hong Kong	Merix Caymans Trading Company Limited
Viasystems BV	Netherlands	TTM Technologies North America, LLC
Print Service Holding NV	Netherlands	Viasystems BV
Viasystems Mommers BV	Netherlands	Print Service Holding NV
Viasystems Services BV	Netherlands	Viasystems BV
Anaren Holding Corp.	Delaware	TTM Technologies, Inc.
Anaren, Inc.	Delaware	Anaren Holding Corp.
Anaren, Inc.	New York	Anaren Holding Corp.
Anaren Ceramics, Inc.	New Hampshire	Anaren, Inc. (NY)
Anaren Communication (Suzhou) Co. Ltd.	China	Anaren, Inc. (NY)
Anaren GP, Inc.	New York	Anaren, Inc. (NY)
Anaren Microwave, Inc.	New York	Anaren, Inc. (NY)
Unicircuit, Inc.	Colorado	Anaren, Inc. (NY)
TTM Technologies International Limited	Cayman Islands	TTM Technologies North America, LLC
TTM Technologies Japan Kabushiki Kaisha	Japan	TTM Technologies North America, LLC
TTM Printed Circuit Group, LLC	Delaware	TTM Technologies, Inc.

Exhibit 23.1

Consent of Independent Registered Public Accounting Firm

The Board of Directors
TTM Technologies, Inc.:

We consent to the incorporation by reference in the registration statements (Nos. 333-46454, 333-138219, 333-198117, and 333-211744) on Form S-8, and (No. 333-214592) on Form S-3 of TTM Technologies, Inc. of our report dated February 26, 2019, with respect to the consolidated balance sheets of TTM Technologies, Inc. and subsidiaries as of December 31, 2018 and January 1, 2018, and the related consolidated statements of operations, comprehensive income (loss), stockholders' equity, and cash flows for each of the years in the three-year period ended December 31, 2018, and the related notes (collectively, the "consolidated financial statements"), and the effectiveness of internal control over financial reporting as of December 31, 2018, which report appears in the December 31, 2018 annual report on Form 10-K of TTM Technologies, Inc.

Our report dated February 26, 2019 refers to a change in the Company's method of accounting for revenue in fiscal 2018 due to the adoption of the Financial Accounting Standards Board's Accounting Standards Codification (ASC) Topic 606, Revenue from Contracts with Customers.

/s/ KPMG LLP

Irvine, California
February 26, 2019

Exhibit 31.1

CERTIFICATION

I, Thomas T. Edman, certify that:

1. I have reviewed this annual report on Form 10-K of TTM Technologies, Inc.;

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 report;

4. The registrant's other certifying officer(s) 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 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 fiscal 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(s) 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.

/s/ Thomas T. Edman

Thomas T. Edman
President and Chief Executive Officer
(Principal Executive Officer)

Date: February 26, 2019

Exhibit 31.2

CERTIFICATION

I, Todd B. Schull, certify that:

1. I have reviewed this annual report on Form 10-K of TTM Technologies, Inc.;

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 report;

4. The registrant's other certifying officer(s) 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 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 fiscal 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(s) 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.

/s/ Todd B. Schull

Todd B. Schull
Executive Vice President and Chief Financial Officer
(Principal Financial Officer and Principal Accounting Officer)

Date: February 26, 2019

Exhibit 32.1

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of TTM Technologies, Inc. (the "Company") for the year ended December 31, 2018, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Thomas T. Edman, Chief Executive Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934(15 U.S.C. 78m(a) or 78o(d)); and

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

By: /s/ Thomas T. Edman
Thomas T. Edman
President and Chief Executive Officer
(Principal Executive Officer)

February 26, 2019

Exhibit 32.2

CERTIFICATION PURSUANT TO
18 U.S.C. SECTION 1350,
AS ADOPTED PURSUANT TO
SECTION 906 OF THE SARBANES-OXLEY ACT OF 2002

In connection with the Annual Report on Form 10-K of TTM Technologies, Inc. (the "Company") for the year ended December 31, 2018, as filed with the Securities and Exchange Commission on the date hereof (the "Report"), I, Todd B. Schull, Chief Financial Officer of the Company, certify, pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002, that:

(1) The Report fully complies with the requirements of Section 13(a) or 15(d) of the Securities Exchange Act of 1934(15 U.S.C. 78m(a) or 78o(d)); and

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

By: /s/ Todd B. Schull

Todd B. Schull
Executive Vice President and Chief Financial Officer
(Principal Financial Officer and Principal Accounting Officer)

February 26, 2019