TTM TECHNOLOGIES INC
Form 10-K
February 26, 2019

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	(I.R.S. Employer
Incorporation or Organization)	Identification No.)
1665 Scenic Avenue Suite 250,	92626
Costa Mesa, California	(Zip Code)
(Address of Principal Executive Offices)	

(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,” “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 it 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:

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.

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 owned approximately 5.9% of the total outstanding shares of our 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 approximately 27,000 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 to service 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 other events 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 significant 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 Republic of 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 &	100.00	107.94	101.94	123.34	157.20	137.91

Equipment

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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.

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	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		