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On the cover – September 2019

New old stock: not necessarily what it seems
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Buyers' Guide

All the facts and figures to help you buy



Take caution with NOS

Having spent plenty of years refurbishing classic vehicles I'm well versed with the acronym NOS which stands for 'new old stock'. In essence it's a process where unused obsolete stock finds its way back into the market, having been hidden on a shelf for years, if not decades. NOS parts are hard to find and priced accordingly but they remain the gold standard for refurbishment projects.

This process is replicated in the electronics industry. However, buyers need to remain cautious. Aside from counterfeiting, which is a major risk, I consider invisible degradation the biggest potential problem.

For example, I recently decided to test my spare wireless car key which has remained unused in a draw for seven years. Unsurprisingly it didn't work. I changed the battery and it burst into life, but intermittently. I stressed the battery contacts and tried again. No luck. Then I checked the contacts under a microscope to ensure the surface was intact. They passed visual inspection.

Finally, I turned to the nuclear option and dug out my DeoxIT pen. A quick wipe across the contacts and the key was as good as new. Oxidation was clearly the problem.

So, just because a component is genuine NOS and passes a detailed visual inspection doesn't mean it will work reliably, if at all, without some form of restoration to combat the wear and tear of thermal degradation and corrosion.

NOS parts can dig an electronics manufacturer out of trouble but they need to be treated with care. Pay particular attention to contact surfaces and rubber/elastomer elements.

Jon Barrett

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Proximity sensors in stock

Future Electronics is offering purchasing professionals access to Vishay's VCNL36687 proximity sensor with vertical cavity surface emitting laser. This fully integrated proximity sensor combines a high power VCSEL and photodiode for proximity measurement and a signal processing IC in a single package with a 12-bit analog to digital converter.

www.futureelectronics.com



QPL listing expands mission-critical capacity

AirBorn has been approved by the Defense Logistics Agency to produce MIL-DTL-83513 product at its Lake City, PA, location. Qualified Product List status means AirBorn's Lake City site is now a recognized manufacturer of products meeting military specifications, while AirBorn and its authorized distributors are approved sources for government procurement. Micro D connectors manufactured in AirBorn's Georgetown, Texas, location were already QPL listed.

AirBorn's rugged MIL-DTL-83513 Micro D connectors are used in a variety of military applications ranging from critical onboard fighter jet computer systems to advanced communications devices for troops on the ground.

Chief compliance officer at AirBorn, Chris Wegmann, explained: "Expanding AirBorn's M83513 QPL to include our Lake City facility, in addition to Georgetown, provides additional capacity for this mil spec qualified product and other AirBorn products where customers require M83153 qualification."

AirBorn holds additional QPL status for MIL-DTL-32139 Nano connectors and MIL-DTL-55302 rectangular connectors. Customers can find a full military part number cross reference on the AirBorn website.

www.airborn.com



Enhancing access to power portfolio

Mouser Electronics has announced a global distribution agreement with XP Power to stock a variety of XP Power's AC/DC power supplies, DC/DC converters, high-voltage power supplies, and EMI filters.

Products now available from Mouser include XP's AC/DC power solutions, available in a wide power range of three to 3,000W and in a variety of mechanical formats including open-frame, chassis mount, DIN rail mount, and wall plug. Potential uses include industrial and process control, semiconductor fabrication equipment, medical devices, test and measurement equipment, scientific instruments, consumer devices, and defense applications.

Global marketing and distribution director at XP Power, Steve Head, said: "With Mouser's distribution expertise, we can expand our reach while also providing exceptional support and value. Leveraging Mouser's excellent logistics support, we can continue to drive new growth opportunities around the world."

www.mouser.com

Canadian source for rugged interconnect

Diverse Electronics has been named as the Canadian stocking franchise distributor for Wago connectors. Describing itself as the creator and original patent holder of spring pressure connection technology, Wago offers connectors for use in a variety of applications including in the automotive industry, railway systems, power engineering, marine and offshore applications.

President of Diverse Electronics, Rick Masciotra, commented: "The quality and reputation of the Wago brand is unsurpassed in the industry, and the range of its products' applications are as diverse as our customer base."

"From lighting systems and control panels, to HVAC and transportation manufacturing, our customers require quality products that are reliable and meet the unique challenges each industry presents. Wago's German-engineered products, along with the company's local engineering support, will provide the quality and reassurance that customers have the right solution no matter how unique the requirement."

www.diverseelectronics.com



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In Brief

Easy IoT lighting

Future Electronics has signed a global partnership agreement with Silvair, a provider of qualified Bluetooth mesh solutions for lighting control. The agreement adds to Future's IoT strategy, allowing purchasers to easily implement wireless control features in lighting applications. Silvair solutions are Bluetooth SIG qualified for faster time-to-market and cross-vendor interoperability. www.futureelectronics.com

More protection products

Bourns has enhanced its circuit protection portfolio with the acquisition of KEKO-Varicon, a manufacturer of overvoltage protection products including varistor and EMI suppression solutions. As well as adding breadth and depth to Bourns' overvoltage and overcurrent protection portfolio, KEKO-Varicon brings expertise addressing the strict requirements of the automotive industry. www.bourns.com

Shifting supply chains

The DHL Global Trade Barometer indicates a slight contraction of worldwide trade for the next three months. Thanks to the US-China trade war, both the US and China reveal sharply lower trade volumes. Given their large contribution to the global index, their diminishing trade growth rates contribute greatly to the projected global decline. Other regions remain positive with supply chains shifting into other countries as result of trade conflict. dphl.com/gtb

Mil/aero info hub

TTI has introduced a new central hub for market updates and product information on mil/aero technology. The resource center provides up-to-date content from mil/aero suppliers including links to white papers, MarketEYE articles, line cards and solution guides. Visit to gain in-depth information about components for aircraft, weapons and weapons systems, ground vehicles, radar, communication systems and satellites. www.ttiinc.com



Configurable power supplies available fast

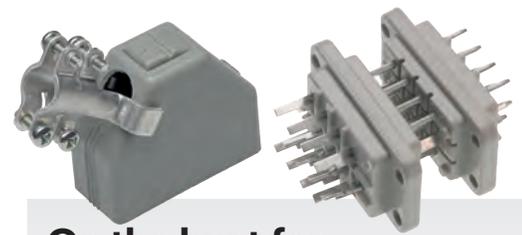
Digi-Key Electronics has signed a distribution agreement with Vox Power providing purchasers with worldwide, 24-hour availability of configurable power supply solutions.

Chief executive officer of Vox Power, Marco Prinsloo, commented: "Our modular products offer the flexibility to configure a custom power solution for virtually any single or multiple output application, now with Digi-Key's global reach for fast and easy access to all these solutions."

Products include the VCCM600 series, which boasts reliability and low audible noise from a 600W fan-less architecture, to the Nevo+ high density modular range, providing 600 to 1,200W of configurable power in a small lightweight package. Solutions are typically used in medical equipment, lasers, robotics, automation, and other pioneering applications, says the manufacturer.

Vice president, global supplier management at Digi-Key, David Stein, added: "With rapid advancements in the electronics industry there is increasing demand for power supplies that can be customized to the specific application. The flexibility and compact size of the Vox Power product allows customers to design a power system tailored to their needs."

www.digikey.com



On the hunt for industrial connectors?

Cinch Connectivity Solutions has announced availability of its Jones J Series connectors through distribution partners Digi-Key, Mouser and Newark, providing extensive availability for this connector series.

Jones J Series connectors are a standard J-type connector used throughout Europe, mainly in industrial applications where heavy impact forces are expected. The J Series female connectors incorporate a resilient 12-finger contact within a glass reinforced heavy-duty molded insulator. This, along with other special features, helps provide a reliable and robust connector that is further enhanced by the MK. 2 back shell molded in a high impact thermoplastic for durability.

belfuse.com/cinch

Lead-free research will simplify military supply chain

The IPC trade association is pleased to record that the US House of Representatives has approved a measure to promote research and development into the performance of lead-free electronics in high-reliability sectors such as aerospace, defense, automotive, and medical equipment. The amendment will help to ensure that the defense industry can integrate cutting-edge civilian technology to meet military requirements.

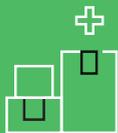
IPC is leading the advocacy effort to secure these funds because the aerospace, defense, and high performance electronics sectors remain reliant on lead-based solders and components even as the commercial sector has largely phased out the use of lead due to human health and environmental concerns.

Representative Brad Schneider commented: "Without research and investment, our defense industrial base will continue to face challenges incorporating newly developed technologies, which ultimately will adversely affect our military readiness."

IPC president and CEO, John Mitchell, added: "Leaded electronics are vital to the reliability of aerospace, defense, and other high-performance sectors. However, the migration of the commercial industry to lead-free electronics has introduced technical and supply-chain concerns that can only be addressed through new R&D. The R&D that the House backed this week will ensure that DoD strengthens its access to cutting-edge electronics."

www.ipc.org

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Single source for embedded solutions

Newark has expanded its offering in the embedded systems field with the addition of Renesas Electronics to its portfolio. Newark will stock over 1,500 products from Renesas for same day shipping, providing enhanced access to Renesas' advanced microcontroller, analog, mixed-signal, power, and system-on-chip solutions for markets such as automotive, industrial, cloud computing and IoT.

Complementing the new lineup, Newark will offer a range of support devices including precision analog, power management and mixed-signal interface products from Renesas, as well as RF, high performance timing, memory interface, real-time interconnect, optical interconnect, wireless power, and sensor solutions from IDT, a wholly owned subsidiary of Renesas Electronics. This combination of brands aims to provide a comprehensive range addressing next generation industrial IoT, infrastructure and automotive applications.

President of Farnell global businesses, Chris Breslin, explained: "By increasing the breadth of our portfolio with products from Renesas, we believe that customers no longer need to go anywhere else for their embedded solutions."

www.newark.com

One cable for power and comms

TTI is now offering Bourns' SM13126PEL local area network 10/100 Base-Tx Voice over IP, Power over Ethernet transformer. Perfect for applications that require voice and power delivered to an endpoint such as industrial paging systems, surveillance systems with speaker capability and VoIP phones, the transformers have the ability to power and communicate using one cable. According to the manufacturer, this

greatly reduces installation cost and improves reliability for the life of the system.

These single-port, potted construction LAN 10/100 Base-Tx VoIP and IEEE 802.3 compliant transformers boast an operating temperature range of -40 to 85°C and 1.5kVrms isolation voltage.

www.ttiinc.com

AVX MALAYSIA MLCC EXPANSION COMPLETED

Factory expansion supports MLCC sales

AVX has expanded its multilayer ceramic capacitor manufacturing facility in Penang, Malaysia. The facility, which now encompasses 450,000ft², includes Class 1K and Class 10K cleanrooms, as well as manufacturing equipment, test technology, and warehousing to support the safe storage and global export of its passive components.

Expansion of the site will facilitate sales of the company's high-reliability passive components, designed to meet the exacting demands of next-generation automotive systems and other challenging applications in the military, aerospace, defense, renewable energy, and industrial industries.



Managing director, AVX Manufacturing Malaysia, Kumar Krishnamani, said: "The new site expansion represents an investment of approximately \$150 million and demonstrates an ongoing commitment to developing competitive, cutting-edge component solutions with a special focus on advanced automotive applications. As a result of our latest expansion, the Penang site will now operate as a dedicated export facility to support the seamless global distribution of our products."

www.avx.com

Rugged rechargeable batteries ready to ship

Sager Electronics is now stocking Power Sonic's PS-640F1 rechargeable sealed lead acid battery designed for general purpose and standby applications. The 6V 4.50Ah battery features absorbent glass mat technology and a maintenance-free, spill-proof construction. Products also boast a rugged, vibration- and impact-resistant ABS case and cover and five-year design life. All Power Sonic batteries are subject to stringent quality controls throughout the manufacturing process, ensuring consistency and reliability.

Applications include security and fire systems, medical devices, emergency lighting and UPS systems.

www.sager.com

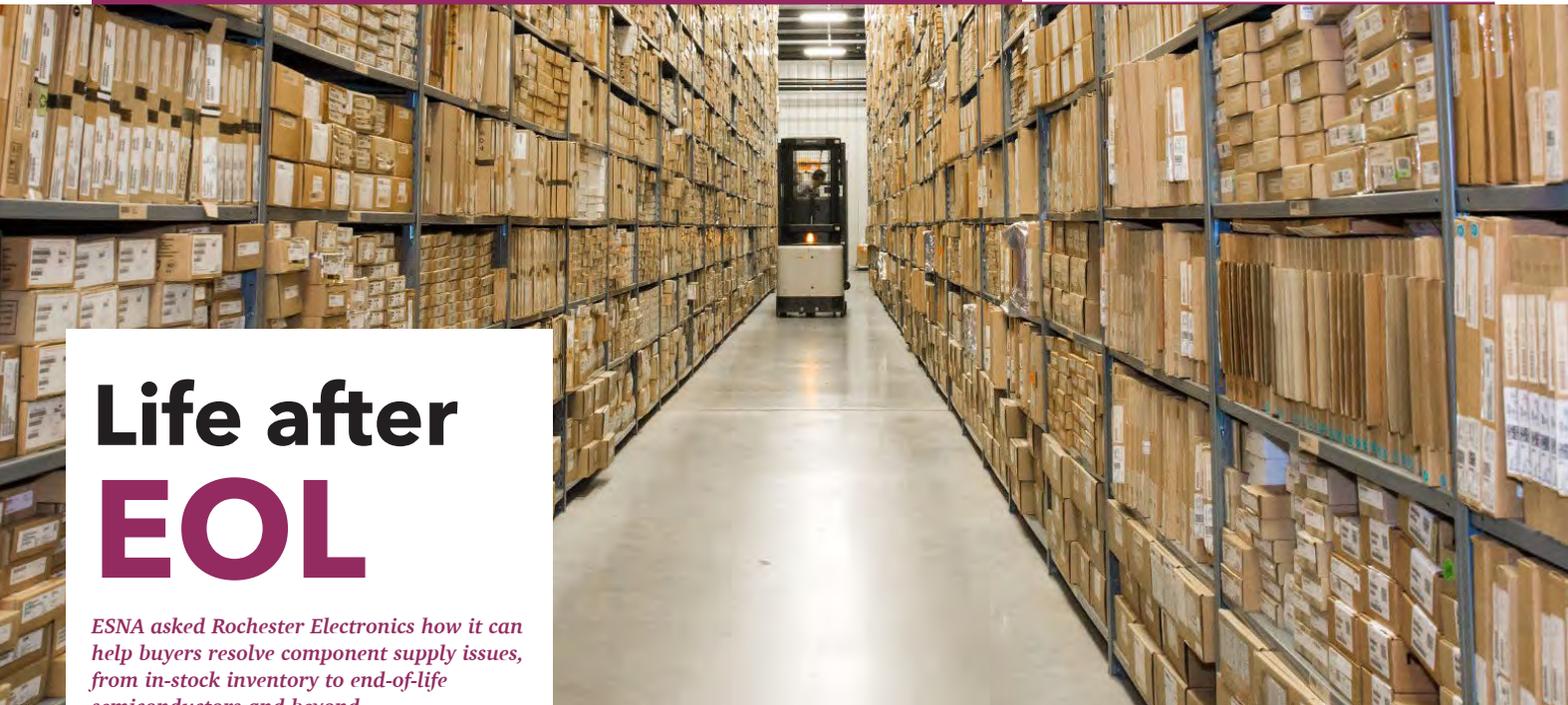


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Life after EOL

ESNA asked Rochester Electronics how it can help buyers resolve component supply issues, from in-stock inventory to end-of-life semiconductors and beyond

Q How do your semiconductor solutions help purchasers manage shortages in the supply chain?

Through our authorized distribution and licensed manufacturing, we provide a continuous source of supply of both active components, to solve supply chain disruption, and end-of-life semiconductors, to meet long term customer needs. Focusing on our active components, we have over five billion devices in stock, ready for immediate dispatch. With sales and support staff located in all major markets, complimented by a network of regional and global authorized channel partners, we aim to meet purchasers' needs face to face, over the phone or via e-commerce platforms anytime, anywhere.

Q How can purchasers access active stock?

Available in-stock inventory is listed on our website. During component shortages and long lead-times, when product is maybe harder to find in the channels and customers may be faced with line down

situations, it is so important that they are able to quickly identify and obtain product risk-free, rather than being tempted to procure outside authorized channels.

Q How does Rochester support ongoing product needs after EOL?

Rochester's growing supplier authorizations allow us to make a large supply of finished semiconductor devices available, all of which are 100 per cent authorized, traceable and guaranteed. Over 10 billion of our in-stock devices are classed as EOL by the original manufacturer from which the product was supplied. Rochester is therefore well positioned to offer a continuous source of supply for applications where the product lifecycle exceeds the active availability of a device. Our factory direct offering negates the need for expensive re-design, re-qualification and re-certification and avoids the risk of sourcing hard to find products on the open market where product traceability, authenticity and storage conditions are questionable, unknown or compromised.

Q When Rochester's factory direct EOL finished goods supply is exhausted, what can Rochester offer?

As a licensed semiconductor manufacturer, Rochester has over 12 billion die in stock. We have manufactured over 20,000 device types with the capability to manufacture over 70,000 more. By carefully analyzing ongoing customer requests, we manufacture a range of semiconductors, which are kept in stock, ready for immediate dispatch. This is in addition to our build-to-order devices, for which we provide price and leadtime quotations upon request. If a device is not showing on our website, purchasers should contact us with their critical requirements, and we will endeavor to provide a solution wherever possible.

Q What do Rochester's licensed manufacturing solutions involve?

Our licensed manufacturing solution uses information and technology transferred directly to Rochester from the original component

manufacturer. We utilize the original manufacturer's die or fab processes, matching the original design, assembly solution and test protocols to provide a range of ongoing stocked and built to order product. All of the resulting product is 100 per cent certified, authorized, licensed, guaranteed and sold with full approval under the original manufacturer's part number, with no need for lengthy customer re-design or re-qualification. For reference, Rochester's process flows include commercial, industrial, mil temp, Rochester R and B, MIL-STD 883, SMD/QML and space level s/v, in addition to a range of industry standard packaging with a variety of lead finishes including Sn, SnPb and RoHS.

www.rocelec.com

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Component integration: the purchaser's dream

ESNA spoke to Smith's vice president of business development, Todd Burke, to find out how semiconductor sourcing is evolving. Could increasing integration mean less parts to source?

Q What should be on a purchasing professional's shopping list to ensure they buy the correct semiconductor products?

Before sourcing components, purchasers need to ensure that their supplier base is qualified and has been rated via a documented, internal rating system. Suppliers should go through a formal selection process based on specific quality requirements and have the appropriate ISO certifications. Once they've been onboarded, key performance indicators such as on-time delivery rates and other quality performance metrics should be top of the list when choosing suppliers.

Regardless of whether a supplier has already been vetted or not, be sure that it can provide detailed pictures, if needed, and traceable lot codes as required. Standard details like manufacturer and manufacturer part number, date code restrictions, and any approved alternates

are a starting point when sourcing semiconductor products. Other factors, such as country of origin, may also come into play. Certified quality assurance should be a priority for every purchasing professional to ensure that the correct product is sourced and to safeguard product authenticity.

Q What semiconductor-related products are available in the electronics supply chain?

Semiconductors encompass all types of board-level components. Smith distributes virtually every type of semiconductor and integrated circuit, from commodity items like processors and memory to the smallest components, such as multi-level ceramic capacitors. Right now, CPUs are in especially high demand in the personal computing and server markets. MLCCs are utilized across an array of industries and in every connected product.

Q What are lead times like for semiconductor products in the Americas?

Most single-die semiconductor products take four to eight weeks, but American OEMs and contract manufacturers can expect a variety of lead times depending on the products they are sourcing, which will vary from one manufacturer to another. The brand and volume needed could move the lead-time up or down. Market conditions also influence standard lead times and shortages can add weeks or months to the delivery time of any item. For instance, average lead times for some MLCCs are at 36 to 46-weeks plus, and some power MOSFETs are in the 29-weeks plus range. When sourcing from an independent distributor like Smith, lead times can be greatly reduced, and, in some cases, cut entirely, due to the variety of sourcing channels available throughout the open market. If you're working within a certain timeframe,



Smith's vice president of business development, **Todd Burke**

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Q How have semiconductor products advanced over the last few years?

Most semiconductors are adapting and advancing at the same rates as the products they support. Over the past few years, we've seen more multichip packages and application-specific integrated circuits being developed to cater to new or niche end products. Specifically, more DRAM, CPU, and microprocessor manufacturers are integrating different ICs into a single-chip format. Ultimately, this saves room on the board so consumer products like cellphones can be made thinner and smaller.

Q Why is there so much packaging when semiconductors are delivered?

The number one reason there is a lot of packaging for semiconductors is to ensure the safety and quality of the product during every step of shipping, handling, and storage. Whether semiconductors are shipped locally or across the globe, parts must be packaged so that they're protected from electrostatic discharge and moisture. Regarding the buildup of empty reels, manufacturers do not want to reuse them because of their potential to sustain damage after multiple uses. The various labels on the reels are also unique to the product, so removing or replacing them would be inefficient and could cause unclear traceability.

Instead of reusing the reels to hold other products, many manufacturers have simply opted to recycle them for the plastic.

Q What can we expect from semiconductor technology in the future, and what benefits will this provide purchasing professionals?

Multichip packages will continue to rise in component design and manufacturer popularity. As more and more legacy parts go obsolete, causing PCBs to get redesigned, fewer chips will need to be sourced. Fewer components will be required for boards since the products they support are trending smaller. Instead, many ICs will be packaged with central processing units and microprocessors. While

the product and component specifications might become more detailed and stringent, purchasing professionals will benefit by having a shorter sourcing list.

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Standard logic will post modest growth through 2023

Not all standard logic functions can be integrated on other chips, so demand for logic gates, buffers, encoders and other logic parts will grow albeit at a slow rate



James Carbone

While standard logic chips are mature products, they will post steady, but slow growth over the next several years as the prosaic parts continue to be used in equipment ranging from inexpensive electronic toys to high-end servers.

Semiconductor buyers can expect standard logic tags to be mostly steady as supply will remain ample. There could be short-term price increases if demand temporarily rises due to inventory building by distributors, OEMs and EMS providers, but that is unlikely to occur for the rest of 2019. Standard logic chips include logic gates, buffers, bus transceivers, inverters, flip-flop ICs, encoders among other chips.

The global market for standard logic was \$1.45 billion in 2018 when about 20.3 billion units shipped, according to Semico Research. Guy Rahamim, product line manager for ON Semiconductor, said standard logic demand was strong across

the board in 2018, "in line with the overall semiconductor market. We experienced higher demand across all industries, but did see higher demand growth" in automotive, networking, cloud computing and industrial segments including factory automation, said Rahamim. He added there was an increase of components per system based on added functionality.

Standard logic is needed in many systems because it is the "glue that allows compatibility between components and circuits that weren't designed to work together," said Rahamim.

In 2019, about 19 billion units will ship and revenue should decline slightly to \$1.4 billion because of overall weaker demand for all semiconductors including standard logic according to Semico. However, demand for standard logic will increase next year and for several years thereafter. By 2023, standard logic, sales will reach

\$1.9 billion and 24 billion units will ship, the researcher said.

Up and down market

The standard logic market has been up and down over the past five years. In 2014 it was a \$1.5 billion market as 18.4 billion standard logic chips were sold. Then in 2015, demand declined as 17.3 billion units shipped. In 2016 manufacturers sold 17.9 billion standard logic chips.

"Interesting in 2015 there was a shortage, and we saw prices jump quite a bit," said Jim Feldhan, Semico president. "We saw prices went from 8.2 cents to 11.3 cents. In 2016 we saw prices fall to 8.4 cents."

In 2017, there were some shortages of wafers and that was followed by some inventory building by distributors, OEMs and EMS providers, resulting in 20.2 billion units being shipped, the researcher said. However, average selling prices declined and revenue totaled \$1.66 billion,

according to Semico.

In 2018, standard logic sales declined to \$1.45 billion although unit shipments increased slightly to 20.3 billion. Revenue fell because of price erosion as the average price for a standard logic chip was 7.1 cents. "It was the first time since 2013 when the ASP got into the 7-cent range," said Feldhan.

Ironically, the standard logic market in 2018 grew in terms of dollars and units from January through September. But after September, "we saw a continued degradation of dollars and units through December 2018," said Feldhan.

The slowdown continued into 2019. About 1.3 billion units shipped in January and shipments declined to 1.1 billion in February. Prices have also declined to 6.8 cents in June.

"I think the last time we saw prices in the 6-cent range was

By the Numbers



19 billion

The number of standard logic chips that will ship in 2019.



\$1.9 billion

The forecasted size of the standard logic market 2023.



\$1.45 billion

The size of the global standard logic market in 2018.



7.1 cents

The average selling price for a standard logic chip in 2018.



24.3 billion

The number of standard logic chips that are forecasted to ship in 2023.

Source Semico Research



2011,” said Feldhan. However, the average for the year has been about 7.2 cents.

More integration

Growth in the standard logic market will remain slow because standard logic functionality is being designed into system-on-chip (SoC) solutions. However, not all standard logic functions will be integrated onto SoCs.

“There is always some little fix that needs to be applied to a circuit board because an engineer doesn’t want to redesign an SoC,” said Feldhan. Often, a standard logic part can be used rather than an SoC being redesigned.

“In a perfect world, a chip designer would never make a mistake and an engineer would think of all the features” an SoC would need. So, a separate standard logic chips would not be needed, Feldhan said. However, often a standard logic chip will be used to “fix a bug” or add some feature after the “chip is designed and taped,” said Feldhan. It’s often cheaper just to add a standard logic part than redesign the SoC.

However, standard logic is being integrated into more chips as products become more standard and feature sets get more stable. “But there are always new

applications, new edge devices coming on that need standard logic.

As a result, there will continue to be modest growth for standard logic. “I think the overall market is growing and we’re still bullish that IoT and smart cities, and edge devices” will help drive the need for standard logic, said Feldhan.

Widely used parts

He noted that “around every system-on-a-chip or MCU, there are always a few standard logic parts” and standard logic is used in most electronics equipment. “Even in high-end servers you will see some standard logic,” said Feldhan. Standard logic is also used in computers, cell phones, networks and lower cost products such as remote controls, game controllers, garage door remote controls, toys, appliances, smart switches for lighting systems among many other products.

Rahamim said 5G handsets will create a temporary increase in demand for standard logic. However, 5G networks will have a more significant and longer lasting effect on the standard logic market, he said.

“Whether it is more sophisticated antenna systems, more back plane

Standard logic revenue growth will grow slowly through 2023. Source: Semico Research

Standard logic market will dip, then rise



equipment to manage the flow of data, or cloud computing to store and analyze the vast amounts of data collected, it will lead to a boost in standard logic for a sustained period of time,” said Rahamim.

Feldhan noted that more base stations will be needed for 5G networks than were needed for 4G networks. Base stations use standard logic, but “we’re talking about tens of millions and not billions of base stations,” according to Feldhan.

Fifth generation cell phone technology will enable more IoT and edge devices and those products could help drive standard logic over the next several years.

Consumer IoT products such as health monitors and smart watches use highly integrated SoCs and “aren’t heavily reliant on standard logic,” said Rahamim. “For home automation and industrial IoT there is higher consumption and growth” of standard logic, he said.

EVs will help drive demand

Automotive is adding to standard logic demand as more vehicles being built are hybrid or electric vehicles. “Electric and hybrid engine systems have an increase in standard logic components

primarily in the communication portion of the system,” said Rahamim.

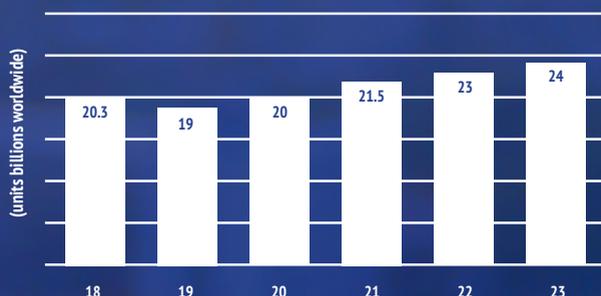
EVs will use more standard logic in the instrumentation panels and for power management systems than internal combustion engines. In addition, Advanced Driver Assistance Systems (ADAS) also require standard logic.

Autonomous driving will directly lead to an increase in usage of standard logic because self-driving cars will be enabled by ADAS and such systems are “heavy users of standard logic,” said Rahamim. ADAS systems require multiple sub-systems such as cameras and sensors which increase the overall usage of electronics, including standard logic, according to Rahamim.

Because standard logic is used in mature systems such as computers, and networking equipment as well as in new automotive and IoT applications, standard logic will remain a viable product category that will grow at a modest pace.

Standard logic chips may be “jellybean parts but they are used everywhere,” said Feldhan. “Standard logic is going to be here for the foreseeable future. I just don’t see a time when standard logic would go away,” he said.

Unit demand will rise



Standard logic unit demand will decline this year, but then increase again in 2020 for several years after. Source: Semico Research

Bringing new ideas stateside

ESNA checked in with RS Pro president, Kurt Colehower, to find out more about the decision to launch RS Components in the States. What can buyers expect and how will they benefit?

Q RS Components is a household name in Europe while Allied Electronics is familiar stateside, so why launch the RS brand in the States?

RS is proud of its history supporting design engineers in Europe and Asia. We believe that our design tools, our breadth of products, and our partnerships with technology leaders continue to enable designers to create amazing products around the world. Our suppliers and global customers have repeatedly asked us to bring our solutions to the Americas and now we are here. Our products, technologies and software, enabled by our DesignSpark platform, will put them at the forefront of product design and creation.

Q How will RS Components differ from Allied Electronics?

Allied Electronics and Automation remains committed to all things automation and control in the Americas; while RS Components is delivering a world class experience for electronics customers, suppliers and design engineers worldwide. We are also excited to feature the DesignSpark toolset, enabling designers to improve time to market for new products.

Q Do you plan to offer RS Components' own branded components?

A strong own brand brings value to engineers and purchasing professionals looking to improve costs, but

not sacrifice quality. Over time, we will introduce our private label to complement our outstanding line card with world-class technology leaders.

Q Will components ship from Europe or from the Allied warehouse?

A) We currently stock over 500k SKUs in Europe from a long list of partners, so we plan to initially ship from Europe, but will continuously evaluate how we better service the Americas. Reliable delivery of product is often the most important part of procurement, so we are committed to being a trusted partner here.

Q Who will be RS Components' biggest competitor in the US?

Launching into the Americas is no small task. There are a few strong competitors in the market, and they do a good job, but we believe in enablement. Our DesignSpark platform with its CAD software, product data library, product obsolescence tool, and community immediately provides designers with the ability to take their idea to reality. As we back that up with a large range of tried and true products plus the newest technologies from suppliers such as TE Connectivity, On Semiconductor, and Vishay, we believe we can be one source for designers to bring their vision to life.

Q How many subscribers to DesignSpark do you have in North America?

DesignSpark has been around for almost a decade and in that time 850k people have become members. Over 110k of these are based in North America and this was a contributing factor to our decision to strengthen our presence in the Americas.

Q Will the RS Components line card be identical globally?

RS is focused on supporting electronics design in the Americas and the availability of technology reflects this. We are expanding our offering for the Americas market to ensure the highest level of support for new designs.

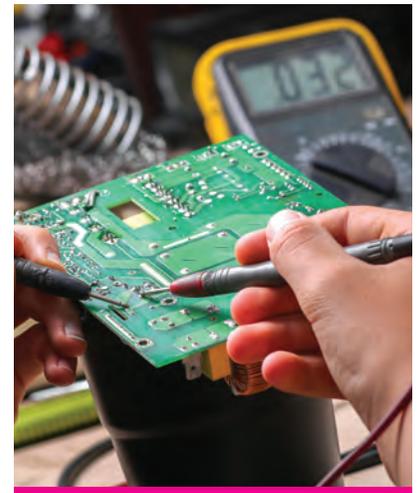
Q Are you also targeting purchasing professionals in the States?

Yes, designers are heart of RS, but in the past 12 months, we have added over 50k full reel, tray, and tube items to our shelves, ensuring that purchasing professionals receive support for their bill of materials.

americas.rsdelivers.com



President, RS Pro, Kurt Colehower



Backed by the DesignSpark platform RS Components will offer a one-stop resource for designers bringing new ideas to life

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Pick poke-home connectors that measure up

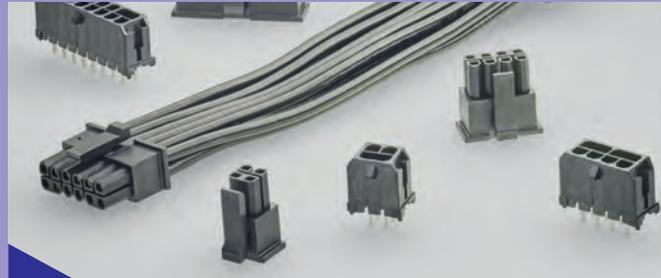
AVX has expanded its wire-to-wire connector portfolio with the new 9286-300 series poke-home connectors for 12 to 18 AWG wire.

Designed to simplify the connection process in industrial applications that require high current or large gauge wires, the new 9286-300 series WTW connectors enable simple strip-and-poke-home wire insertion and twist-and-pull wire extraction. The connectors employ a one-piece phosphor bronze contact with high-force contact beams that provide both mechanical stability and reliable wire retention and an integral wire-stop that prevents over insertion. Both solid and stranded wires can be accommodated.

Connector product manager, AVX, Tom Anderson, said: "The new 9286-300 series connectors offer several critical benefits over competing solutions, including space savings of up to 80 per cent, the absence of clunky levers, and reusability."

Available immediately from Arrow, Digi-Key Electronics, Future Electronics, Mouser Electronics, and TTI, connectors are offered in eight wire-matched insulator colors and are packaged in bulk in quantities of 500 pieces per bag.

www.avx.com



Delivering high currents in small spaces

TE Connectivity has launched an expanded portfolio of Elcon Micro wire-to-board products, designed to provide up to 12.5A per pin in an industry standard 3.0mm footprint. The 12.5A per pin current density is ideal in data communications, telecommunications, consumer devices, white goods, industrial and instrumentation, medical devices and 5G applications.

Connectors in the range are designed to perform reliably in harsh environments thanks to their maximum operating temperature of 105°C and halogen-free material. Unlike comparable products, TE states the Elcon Micro connector housing is also designed to prevent mating the plug in the wrong direction, making assembly virtually fool-proof.

The use of a common industry footprint allows customers to easily upgrade existing designs and the 3.0mm PCB footprint is compatible with Molex's Micro-Fit products, and inter-matable and interchangeable with BellWether's Micro-Hi products.

www.te.com



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Your top ten connector queries

Tricky part numbering, environmental ratings, and complex material considerations prompt detailed purchasing questions when sourcing specialist connectors. ECCO president, Bernard J Gizzi, lists the FAQs

Who is the manufacturer?

Sounds simple, but connectors share similar part numbers across competitors. Certain customers dictate that the connector can only be sourced from the manufacturer referenced on the print, so defining this early is important.

What is price and availability?

Economics are key and while some connectors can be easy to make and source, it is important to understand buyer requirements early in the sourcing process. Availability may also be a deciding factor.

ROHS Y or N?

Now more than ever, buyers have to check this box, given government and international requirements for the reduction of hazardous materials.

Where is this made and where is it shipping from?

Tariffs play a role here, but also risk. Supply chain challenges brought on by geo-political issues such as trade wars and unstable governments can wreak havoc on keeping the pipeline of material on time/in full quantities/and cost effective.

Ratings IP67 or EXP proof?

Mil aero, industrial and harsh environment connectors are often subject to additional requirements such as fluid ingress, temperature, and current/power ratings. Verifying ratings during quotations is essential to meet the application's needs.

What does this prefix or suffix mean?

Part number complexity can be an issue. For example, a MIL-DTL-5015 series

connector is a stalwart in many industrial and mil aero applications. It can go by its mil-spec callout or by its commercial callout, which is used to identify a specific manufacturer. Suffixes are used in commercial part numbers to help identify key changes in material, contact style, or any customization.

Can you cross this?

Too often price or availability become problematic and buyers need to seek alternatives. An ability to provide a commercial callout against a mil spec callout helps distributors support buyers in times of need.

MOQ's and price breaks?

Often connectors are used in maintenance, repair, and operations applications where only a minimum quantity is needed. Online retailers such as Newark or Allied offer online pricing with no minimum order quantity and

sometimes free shipping. Price breaks are also important — the higher the quantity ordered, the lower the end column pricing.

Can we waive the NCNR?

Non-cancellable, non-returnable order conditions exist for special parts not easily resold to other customers. To get around this a buyer can ask for the closest standard part number and specs and verify engineering cannot use a standard in that application.

Price history of the SKU?

The best way to determine longer term sourcing trends for a given connector is to understand whether it is made by multiple suppliers and used in higher volume applications. This will dictate how a given part might be priced early in its life versus mid and late in its life cycle.

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America's supply chain: hostage to tariffs



John Denslinger is a former executive VP Murata, president SyChip Wireless, and president/CEO ECTA, the industry's trade association. His career spans 40 years in electronics

John Denslinger takes a closer look tariffs, their impact on the electronics supply chain and some of the actions companies are taking

Tariffs • By John Denslinger

The on-again, off-again negotiations between the US and China are on-again according to published reports from the recent G20 meetings. That being the case, I'll bet there are a number of procurement departments shaking their heads as they assess and re-assess supply chains. Does it adjust easily to these challenging conditions? Is it still cost efficient? Will it survive the seismic shifts that seem to be the routine now rather than the exception? Bottom line, do I have a robust supply line or is it hostage to tariffs?

If you're having trouble distinguishing rhetoric from fact, welcome to the club although the key point remains: both sides have committed to resuming talks. President Xi said: "China and the US both benefit from cooperation and lose in confrontation." In his own style, President Trump concurred: "Talks with China are back on track." Whether the stalemate is resolved any time soon is debatable, but the good news, talks have restarted.

So, where do we go from here? A CATO Institute study at the end of last year, listed more than 200 US based companies adversely hurt by tariffs. For the electronic component industry, that included a broad customer segment particularly hard hit: automotive, aero, medical devices, contract assembly, white goods, marine, industrial and heavy equipment. Perhaps more bad news from Torsten Slok, chief economist for Deutsche Bank, who was quoted as saying semiconductor sales are proving to be a reliable indicator of the broader US tariff economy and unfortunately semi sales are trending down in 2019.

It's worth noting both Presidents have significant tariff policy discretion, so the future is anything but certain. Even if an agreement were inked tomorrow, tariffs would likely remain for some time as the logical compliance enforcement tactic. The hope of many for a quick settlement is gone and so too the ability to fully absorb the cost arising from this

tariff war. With short term options seemingly exhausted, it's time to consider long run countermeasures.

So what countermeasures are most commonly discussed? Again, referencing the CATO study, the composite of companies identified five distinct actions:

- Super-aggressive cost reduction including downsizing
- Accelerating the shift of supply out of China to other regions
- Postponing capital investment and R&D projects planned for 2019 and 2020
- Redesigning products purposely eliminating components made in China
- Re-writing contracts making it easier to pass tariff related costs onto customers

You might have noticed 'just raise prices' is totally absent. I would imagine that's the American dream but reality would suggest otherwise. To the surprise of no one prices are bound to rise.

And, production is not coming back. While companies may be reconfiguring supply chains, US trade balance data suggests the tariff war is not creating any meaningful shift of production to the US. Declining imports from China have been completely offset by increased imports from other countries.

Unfortunately, tariffs have become a potent economic weapon. The goal of worldwide free trade is an honorable one and worth the work-arounds. Let's hope for a USMCA-like settlement and soon. Being a hostage does have endurance limits.



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The conference program begins with a review of Industry 4.0 and the Digital Transformation of Manufacturing with **Tony Uphoff**, Thomasnet. Providing an update on both the macro economy and the components industry are **Cliff Waldman**, New World Economics and ECIA's **Dale Ford**.

Disruptive technologies provide opportunities and challenges. **Dwight Howard**, APTIV LPC will focus on Intelligent Transportation. **Francis Sideco**, IHS Markit, delivers insight on 5G.

Talent development efforts are critical as we move into 2020. **Elena Richards** explains PwC's CEO-driven business initiative. **Skip Weisman** provides specific strategies that engage team members. TTI's **Michael Knight** and industry recruiter **Carla Mahrt** lead a panel of senior leaders on succession planning; **Gordon Hunter**, Littelfuse; **Joe Nelligan**, Molex, and **David Kirk**, Murata.

Managing radical change and addressing the constant need to adapt, TEDx speaker **Shawn Rhodes** reveals how to leverage change and implement critical practices. Lectrix CEO **Graham Kilshaw** explains how to make the cultural shift from product-promoter to problem-solver. Author and mountaineer **Ed Viesturs** shares his incredible journey and how perseverance and preparation are critical to leadership.

ECIA CEO **Bill Bradford** offers his "State of the Association" with updates on board and council restructuring; increased market insights and committee deliverables.

Don't go blindly into the next decade — attend the industry's premiere conference for innovative solutions, strategies and insight to transform your business.

For complete conference details visit:
www.ecianow.org/executive-conference

Ready for the future?

The 2019 ECIA Executive Conference, 20 to 22 October, will provide electronics industry professionals with in-depth sector analysis and insight, helping buyers purchase with confidence in the 2020s

Designed specifically to offer an in-depth look at the electronic component industry, the ECIA Executive Conference is geared towards industry-focused education and fostering meaningful relationships across the supply chain network. As ever, this ensures the Electronic Components Industry Association's 2019 conference will be a must-attend event.

This year, the goal for the event is to ensure delegates are empowered with a clear and compelling vision of the future; an essential qualification for any effective leader. As we set our sights on the next decade, the 2019 ECIA Executive Conference program is therefore designed to illuminate industry challenges and enable leaders to successfully guide their organizations into the 2020s.

Described by its organizers as the industry's executive leadership event of the year, this one-and-a-half-day conference provides plenty of networking opportunities coupled with thought-provoking, informative sessions, delivered and attended by senior management teams from leading electronics companies.

Vision 2020: leading with clarity

Supporting delegates with a clear vision of the future, chief executive officer of Thomas, Tony Uphoff, will kick off the conference program with a review of Industry 4.0 and the digital transformation of manufacturing.

Day one

Sessions will focus on market insight, talent development, marketing and change leadership:

- An overview of recent economic activity in the major industrialized and developing economies will be presented by Cliff Waldman of New World Economics.
- ECIA's Dale Ford explores key forces shaping the future of the electronics component industry.
- Dwight Howard, APTIV, speaks about the rapid advances in automation and information technologies for our roadways.
- PwC's Elena Richards discusses how unconscious biases can narrow your vision and potentially influence your behaviors.
- TTT's Michael Knight and industry recruiter, Carla Mahrt, lead a panel of senior leaders including Gordon Hunter, Littelfuse, Joe Nelligan, Molex, and David Kirk, Murata, in a discussion on succession planning.
- Lectrix CEO, Graham Kilshaw, reveals the cultural challenges and sales opportunities facing component makers and marketers in 2020.
- To cap the day, columnist Shawn Rhodes shares insight from the best teams and organizations across industries

Day two

The focus for the second day is leadership — building your team and keeping them motivated.

- Ed Viesturs, author and renowned mountaineer, shares how perseverance and preparation are critical to leadership.
- IHS Markit's Francis Sideco delivers insight on how to optimize short-term and long-term 5G adoption.
- ECIA's CEO, Bill Bradford, provides an update on the 'State of the Association', increased market insights and committee deliverables.
- The conference closes with former professional baseball executive, Skip Weisman, providing strategies for creating a work environment that engages team members to bring their best every day.

Conference proceedings are informed by insight from across the electronic components industry including electronic component manufacturers, their manufacturer representatives and authorized distributors. The event is driven by a common goal to promote and improve the business environment for the authorized sale of electronic components.

Attending the conference, which provides innovative solutions, strategies and



Cliff Waldman, New World Economics, provides an overview of recent economic activity in the major industrialized and developing economies



Ed Viesturs, author and renowned mountaineer illustrates how perseverance and preparation are critical to leadership

insight could transform your business, ensuring you don't go blindly into the next decade.

What is the ECIA?

Comprised of a broad array of leaders and professionals representing all phases of the electronics components supply chain, the Electronic Components Industry Association is made up of electronic component manufacturers, their manufacturer representatives and authorized distributors. ECIA aims to combine business optimization, product

authentication and industry advocacy. Its members develop industry guidelines and technical standards, as well as generating critical business intelligence.

The ECIAauthorized.com site was created by ECIA, in collaboration with its members, to support the authorized electronic components industry by giving

users access to aggregated price and availability data for genuine parts from authorized sources. It is a free service to purchasing professionals, design engineers and anyone in need of electronic components price and availability information from franchised distributors.

www.ecianow.org



TTI's **Michael Knight** leads a panel discussion on succession planning



The conference program begins with a review of Industry 4.0 and the digital transformation of manufacturing with **Tony Uphoff**, CEO of Thomas



Former professional baseball executive, **Skip Weisman**, provides specific strategies for creating a work environment that engages team members



Columnist **Shawn Rhodes** shares insight from the best teams and organizations across industries



Detailed conference and registration information is available online at www.ecianow.org/executive-conference. Hotel accommodation at the Loews Chicago O'Hare can be booked by calling direct: 847-544-5300. Mention the ECIA 2019 meeting.

Perfect timing

The complexity of frequency control devices and the vast range available can be daunting. To assist, AEL Crystals offers a break-down of the basic product types offered and explains how distributor expertise can help optimise selection

Throughout the specification process, AEL Crystals aims to assist buyers to ensure that the correct parts are selected. As a start point, AEL's broad product range can be broken down into various groups, the most common of which are: crystals, oscillators and filters.

Simple timing

Crystal resonators are the simplest form of timing device. AEL offers a host of package and specification options to cover all requirements from simple microprocessor timing solutions through to devices for high stability wireless and radio communications applications. Package sizes include all industry standard surface mount devices and through hole parts, with SMD parts available in packages as small as 1.2 by 1.0mm and with 1.0 by 0.8mm currently in development.

In order to supply a product that will work reliably in a customer's application, AEL must identify the correct frequency, stability, temperature range, capacitive loading and package size. In many cases this information will be available from the customer's own database, but if not, AEL is happy to discuss this with the customers' engineers and technical purchasing team to find the most suitable solution.

Understanding oscillators

Oscillators are essentially a crystal element and its driving circuitry combined into a single package. Included

within this area are simple clock oscillators as well as temperature compensated oscillators (TCXO), voltage-controlled oscillators (VCXO) and voltage-controlled temperature compensated oscillators (VCTCXO). A range of output types are available, including complementary metal oxide semiconductor (CMOS), low voltage differential signalling (LVDS), low-voltage positive emitter-coupled logic (LVPECL), high speed current steering logic (HCSL) and Sine wave.

Again, these parts are used across a range of applications with clock oscillators used in many commercial and consumer applications. More complex TCXO, VCTCXO and VCXO parts are used in telecoms, wireless and RF applications demanding more functionality.

To correctly supply these products, AEL must identify the correct frequency, stability, temperature range, input voltage, required output type and package size. For VCXO and VCTCXO parts, the pulling range and control voltage are also required. In many cases there will be additional requirements, such as phase noise, that must also be reviewed.

Experience in supplying parts for radio frequency applications means AEL can offer parts with exceptional stability down to parts per billion levels for emerging telecommunications applications.

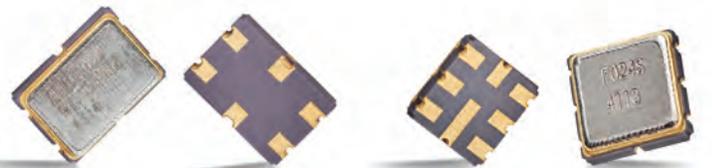
Make the most of MEMs

Within this product group, AEL can also supply micro-electro-mechanical systems (MEMs), which provide a new silicon-based oscillator



solution. Most current quartz clock oscillator applications can be replaced seamlessly with MEMs oscillators, with no changes to the PCB or effect on circuit operation.

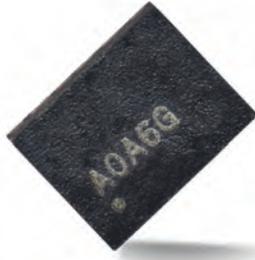
Put simply, MEMs are to quartz what integrated circuits are to transistors, bringing frequency control into the 21st century. As a drop-in



replacement for standard quartz oscillators they differ in using a silicon resonator controlled by an on-board application specific integrated

AEL can work with customers' engineers to identify the correct technical specifications

AEL Crystals boasts extensive logistics, allowing products to be shipped to customers' manufacturing sites globally and supporting local stocking facilities



circuit, rather than a quartz blank to derive the output frequency.

MEMs offer a comprehensive product range with a variety of specifications, outputs and package sizes. Outputs include high speed CMOS (HCMOS), LVDS, LVPECL and HCSL. Various industry standard packages are supplied with temperature ranges or -20 to 70°C through to -55 to 125°C. Furthermore, MEMs oscillators offer several advantages over quartz devices and can counter the main weaknesses in quartz technology. Size is a real advantage, since the resonator in a MEMs device measures only 50 by 50µm. Due to the semiconductor construction, MEMs oscillators are inherently more resistant to shock and vibration than quartz. Parts also offer improved mean time between failure and failure in time performance.

Cost advantages are in evidence, particularly in the differential output devices, where costs can be up to 50 per cent lower than quartz. MEMs oscillators are available on short lead-times of typically 24 hours for low quantities and samples, and two to three weeks for production volumes. This is applicable to all output types, including differentials, and all package sizes.

Filter the results

Filters are used within most RF and communications equipment. AEL offers a range of standard ceramic and quartz parts, ranging from simple 455kHz ceramic filters through to custom designed devices.

AEL can also offer surface acoustic wave devices, antenna for global positioning systems, global navigation satellite system, Wi-Fi,

Bluetooth, satellite digital audio radio service and radio frequency identification, plus dielectric filters for GPS and RFID and VCO.

When selecting the most appropriate components, purchasing should also consider the vendor's ability to support a customer's production model, including the design authority and local or offshore production facilities. To this end, AEL Crystals boasts an extensive logistics operation, allowing products to be shipped to customers' manufacturing sites globally and supporting local stocking facilities to aid lead-time reduction.

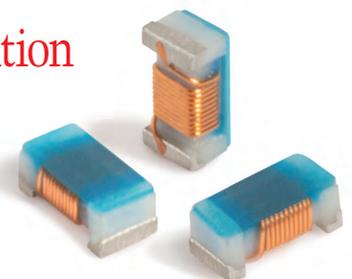
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Experience in supplying parts for radio frequency applications means AEL can offer products with exceptional stability

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Supercharging EV component choice

Component manufacturers are researching new technologies for EV charging, from thin-film capacitors and supercapacitors to connectors, relays and more. TTI's Gabe Osorio looks at what might be on the BoM

As impressive as the advances in consumer electric vehicles have been, even more exciting advances in EV charging technology will unlock new opportunities for electric shipping vehicles, transport vessels and aircraft.

Superchargers and fast-charging

Delivering some 500A per terminal into a vehicle's battery pack means overcoming many challenges. First, you have to create components that can withstand the heat generated by passing that much power through a single source. Off-the-shelf cables, connectors and PCBs can overheat easily under those conditions, spurring developments to get more power out of boards and interconnects with the same footprint.

Manufacturers are also exploring new heat

management solutions, such as liquid-cooling on the power inverter PCB that manages the flow of energy in and out of a vehicle's battery pack — trying to prevent components from being damaged or even melting under high operating temperatures.

As the amount of power needed to charge industrial-grade EVs increases, we're now seeing cables manufactured from different mixes of raw materials, some with liquid-cooling capability built around the cable itself. This allows you to pump 500A into the charging system and charge the battery pack in three to four hours instead of 10 or more.

Interconnect challenges

Engineers are struggling to find connectors that meet the power requirements they want to achieve, such as the ability to pass

800V through a connector and 500A continuously through a terminal. Existing interconnects that can do so are costly and require special tooling.

There's also no single global standard. In North America, most industrial EV installations rely on a combination of AC and DC power and a standard known as CCS Type 1. In China, however, the CHAdeMO connector is standard, utilizing a different configuration and more DC power than AC — and sometimes only DC. Yet another standard, CCS Type 2, is prevalent in Europe. It isn't clear which standard will become the norm worldwide.

Industry groups such as SAE International are developing new charging standards for short-haul delivery trucks and other working vehicles with

different power requirements and use cases than consumer EVs. These standards are still brand-new and will continue to be developed over time.

Smaller, lighter, more efficient

The common thread among components in EV charging applications is continuous improvement for more efficiency, smaller footprint and reduced weight. For example, some manufacturers are considering adding solar charging on a truck or car yet there's a need to balance this with the need to maintain existing vehicle weight or reduce it.

Engineers and scientists are working on longer-lasting electrodes designed to improve efficiency for supercapacitors, looking for new materials to improve capacitance while retaining existing packaging and power



draw. Also, capacitors, relays and contacts must all evolve to meet the high power needs of industrial and large-scale EVs.

Customers will need reliable energy storage and improved battery efficiency to increase travel distances. New component designs will be integral to this process, doing everything from improving vehicle battery management systems to in-vehicle power distribution and battery charging.

Finally, there's the additional challenge of complexity. Some specialized connectors take as much as 30 weeks to manufacture. Unlike the plastic assemblies used in conventional automotive connectors, EV charging components often require

specialized aluminum fabrication and unique assemblies.

Chicken-and-egg development

As we move forward, products will catch up in terms of availability and supply as engineers create new solutions and deliver them to component manufacturers. Customers and engineers alike are also giving valuable feedback to suppliers.

For now, we're seeing a chicken-and-egg situation: component suppliers have dedicated high-voltage engineering groups developing the technology to progress EV charging in the right direction. However, when each supplier spends money to develop a different solution to the same problem,

they compete with one another. In the meantime, vehicle engineers continue to develop new ideas.

New components and updates to existing products are continuously being released. TTI aims to offer a great source of the latest releases and innovations, as do the increasing number of EV trade shows across the country, such as HEV and Battery Show, ACT Expo, and TE Expo, all of which provide useful resources for purchasing professionals working in this highly charged sector.

www.ttiinc.com



Sales engineer, TTI, **Gabe Osorio**

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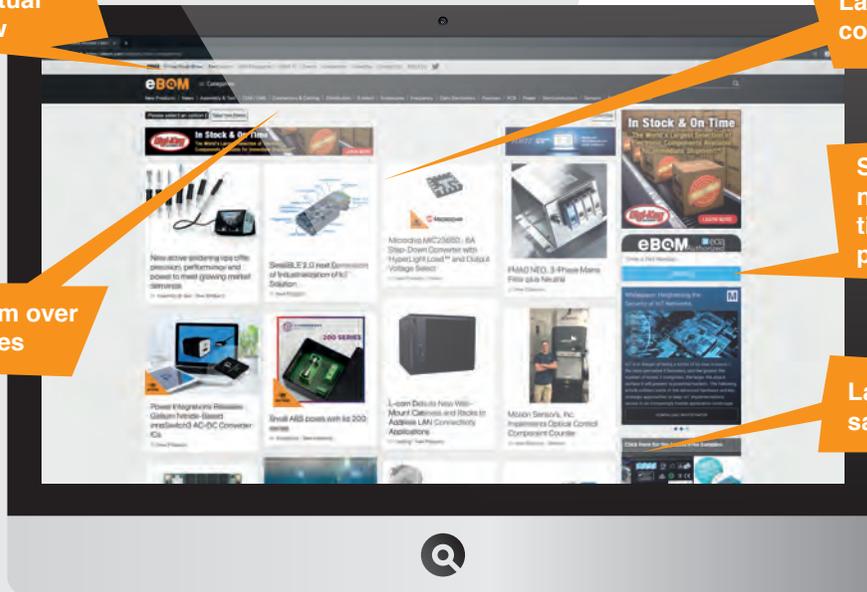
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Stay on track for on-time delivery

Director of materials and operations at Bisco Industries, Joshua Uhlich, looks at the tools available to control variables in the supply chain, ensuring on-time deliveries remain on course

Purchasing professionals today are faced with ever increasing complexity in their supply chains. Tariff uncertainty, multiple production locations, and inclement weather are just a few of the variables that can cause havoc and jeopardize on-time deliveries. Fortunately, procurement teams now have more tools than ever to control these, and other, variables.

One easy way to break down each variable into a manageable project is through

a risk-based approach. By looking at the likelihood of occurrence, the potential impact of that occurrence, and, finally, the ability to correct or hedge against the issue, supply chain teams can proactively and strategically address even the most complex problems.

Plan for force majeure

When it comes to acts of nature, war, and other unpredictable impacts to your supply chain, the best way to overcome these is

through process redundancy; the adage 'two is one and one is none' rings very true here. Larger organizations with additional infrastructure are traditionally able to reroute shipments more easily or change production schedules. However, some small organizations have the dynamic advantage on their side of being more nimble.

One final tip for disaster planning goes back to the risk-based approach. Focus on your top risks first and be sure



Director of materials and operations at Bisco Industries, Joshua Uhlich

Advertorial

Where does component excess fit in the supply chain?

Purchasing managers have a complex job of planning and forecasting to acquire the components required for current and future electronics production.

Products are designed, developed, manufactured, and sold. Sometimes they continue to be manufactured for years with no change to the bill of materials. Often, however, the design is altered and the BoM changes, meaning the components purchased are no longer required.

At that point in the supply chain, there is the option to dispose of unwanted components but

there is another possibility. Excess inventory holds significant value and can be resold rather than written off and scrapped. This creates revenue and simultaneously avoids contributing to e-waste.

Parts hold the most value when they are new; the longer they sit on the shelf, the less they are worth as the potential for other manufacturers to use them declines. When faced with the issue of unwanted components, consider working with a specialist excess inventory management company to realize that value.

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to plan and practice. A great plan without practice could prove ineffective when your organization needs it most.

Choose locations wisely

Many organizations need more than one distribution hub to allow their supply chain to operate efficiently. There are a few advantages to having multiple locations over a single hub, including: local inventory, expedited delivery times, weather hedging, and shipping cost avoidance.

That is not to say, however, that multiple locations don't have drawbacks—like the lack of economies of scale. When choosing to segment product into multiple locations the best question to ask is 'Why?' If the answer doesn't add to an organization's value proposition, bottom line, logistic positioning, or cut down on a likely risk, it might be better to consolidate product nearest the most effective means of delivery.

Opt for software integration

There are a multitude

of programs that enable suppliers to monitor on-time delivery, gather shipping and transit information, predict leadtimes, and help teams manage projects, but without integration, each of these tools fall short.

One of the biggest advantages for the current purchasing professional is that of software integration. If a buyer has to use eight different programs, Outlook, an enterprise or materials resource planning system, and track it all in an Excel Gantt chart, they will never be as successful as their counterpart who manages shipments from one central platform.

Process walks and spending time with team members while they perform their duties can also help uncover inefficiencies, process breakdowns, and lack of integration.

Use order tracking

In our tech-centric world information is our ally. The key to software is integration and order tracking is no

exception. Some of the most successful order tracking software systems are built directly into a company's MRP software and use bar codes or RFIDs to expedite the tracking process. Receiving direct feeds from your preferred carriers gives a real time view for upcoming deliveries.

Manage the process

All of the above activities are useless without a form of process management. In a disaster scenario, during software integration, and while selecting product locations, management is key. Key performance indicators provide a quick, high-level look for managers and, through the use of control charts, a manager can quickly see if a process has gotten away from them.

The final and most important item is to maintain a continuous growth mindset; always be on the lookout for the next industry best practice—your supply chain will thank you for it.

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Many organizations need more than one distribution hub to allow their supply chain to operate efficiently





High-service distributors expand operations and grow their customer count

Small-volume, catalog distributors have become more important to the supply chain as engineers and buyers rely on them for components and technical expertise



James Carbone

The role of the small-volume, high-service electronics distributor has evolved over the years and become more integral to OEM and electronics manufacturing services (EMS) providers.

Distributors such as Mouser, Digi-Key, Newark and Premier Farnell are often key go-to partners to many OEMs and EMS companies, providing components for new designs, prototype builds and small production runs. During shortages, high service distributors are often a reliable source for hard-to-find parts for many buyers.

Most high service distributors have been expanding, adding more suppliers, product lines and warehouse space in an effort to make sure they have parts on their shelves when engineers and buyers need them. Some of the expansion is driven by the need to satisfy demand from emerging technologies and growing applications involving Internet of things, artificial intelligence and autonomous driving. For instance, many small volume distributors have increased their product portfolios involving sensors and wireless solutions because of the growth of IoT.

High service, small volume distributors have extended their global reach. Some of them have been acquired by larger global broad-line distributors, while others have expanded operations in Europe, China and other Asian countries to reach new customers and existing ones that

have expanded their worldwide operations.

All have enhanced their websites in an effort to provide the necessary data for customers to make sound design decisions as well as to provide the tools to make it easier for engineers and buyers to effectively do their jobs.

High service distributors often say they are in a unique position in the electronics supply chain. When the electronics industry is thriving, small-volume, catalog distributors will often post sales growth that outpaces the overall industry. When the industry is in a downturn, high-value distributors may still post modest sales growth or suffer a small sales decline while high-volume distributors' revenue declines more sharply. While an economic downturn often means that volume production of electronics slows, OEMs are still designing new products and continue to buy components from high-service distributors.

Weathering downturns

In addition, high-service distributors weather downturns better because they don't cater to a few customer segments, but to a wide range of OEMs in different industries.

"We don't depend on a few thousand customers for our business. We had 691,000 buyers last year," said Kevin Hess, senior vice president of marketing for Mouser Electronics, "So we don't depend on one small group of customers for the opportunities

Pete Shopp, senior vice president, business operations for Mouser

"Eastern Europe is an opportunity. There's a lot of contract manufacturing in Hungary"



that we have with these new designs. That's always going to be happening," he said.

Mouser's customer base is growing especially in Europe and Asia, and the Mansfield, Texas company will continue to expand globally and has plans to grow its business in the Philippines, Vietnam, Poland and South America. "Eastern Europe is an opportunity. There's a lot of contract manufacturing in Hungary," said Pete Shopp, senior vice president, business operations for Mouser. He said Australia could also be an opportunity for growth in the future.

"Eventually we probably will need to provide local customer service

in those growing areas," he said. To grow business, it is necessary to have a robust website and local customer service, according to Shopp.

"Most engineers read and write English data sheets, but it doesn't mean they want to," said Shopp. "They would much rather talk to someone in their local language and local time zone. They would like someone who knows them culturally," he said.

As it grows its customer base worldwide, Mouser plans to expand its facility to house more products to meet rising demand. The distributor will add 200,000 square feet of warehouse and will increase the breadth and depth of products and perhaps



add different types of products that it currently does not have, said Hess.

Adding new suppliers, products

Shopp said Mouser is adding new products from its existing supplier base as well as from "small, niche suppliers. We are not one for resting on our laurels," said Shopp.

Expanding product lines and growing inventory will give us "more opportunities to find new customers," said Hess.

Hayne Shumate, senior vice president, Internet business for Mouser, said the distributor has three major sets of customers: engineers, buyers and engineers/buyers. He said Mouser was "constantly building tools for buyers who are not engineers and building content and tools for engineers," he said. Such tools include a bill of materials management tool as well as MouserMobile, which lets buyers browse and search for parts, view product pricing, availability, specifications and images and buy from a mobile device.

Of course, Mouser is not the only small-volume distributor that is growing its sales, customer base and reach.

Digi-Key, is expanding its facilities in Thief River Falls, Minn. to better service existing customers and attract new ones by offering more product lines and component manufacturers. It is building a 1 million square foot facility adjacent to its current distribution center in Thief River Falls. The new facility is scheduled to be completed by 2021.

As it expands its facilities, Digi-Key is also adding new suppliers and more products to its portfolio. "Over the last 15 months we've added 118 suppliers," Doherty said in May. Digi-Key already has most of the traditional-board level suppliers. Many of the new suppliers are component manufacturers that build sensors, or other activity components that are used in IoT applications. Some are "very niche leading-edge suppliers," said Doherty.

The new facility will help Digi-Key fulfill demand as its sales in Europe and Asia increase and as it adds new customers in North America. In addition, the facility will help Digi-Key meet new demand created by industrial IoT, the automotive supply chain and the maker movement.

Meet the makers

"The maker movement is interesting," said Dave Doherty, president and chief operating officer of Digi-Key. "When we first got into the maker space, we thought it would be great to establish our brand with the speakers as they become professional engineers" and then be recognized and remembered by them as they work on projects in the future, he said. "But it turned out to be more than that," said Doherty.

Makers often use boards such as Raspberry Pi to design a product. Raspberry Pi is a single-board computer that runs Linux, but it also provides a set of general-purpose input/output pins that can control electronic components for physical computing and for Internet of Things (IoT) applications. Raspberry Pi and other open source board such as Arduino,

Dave Doherty, president and chief operating officer for Digi-Key

"Over the last 15 months we've added 118 suppliers. Some are very niche, leading-edge suppliers"



which distributors sell, allow rapid prototyping of products. While such boards are often purchased by makers, they are not the only ones buying them, according to Doherty.

"There are a lot of traditional OEMs buying these boards," he said. Engineers at established OEMs are buying the boards, too.

"What we find is a high percentage of the folks that buy these initial maker boards, come back to us and purchase traditional components," which helps drive business, he said.

Another high service distributor that is adding suppliers and products and growing its warehouse capacity is Allied Electronics, based in Fort Worth, Texas.

More space needed

"We just expanded our warehouse," said Dan Stewart, vice president of marketing and eCommerce. "We broke ground back in the August/September timeframe last year and we are roughly doubling the footprint of our warehouse and will triple the product capacity because we are going to be adding a lot of automation," he said.

Along with the warehouse expansion, Allied will expand its product portfolio. It will carry more products from its

existing suppliers and will add new suppliers to its roster, said Stewart.

The goal of increasing its number of suppliers and products is to reach new customers. Allied is also enhancing its website to make it easier for customers to find parts, and necessary data to make design and sourcing decisions.

"One thing we have done is launch a new section of our website called Expert Advice which is focused in industrial automation," he said.

The section is design to help customers answer questions about products they are considering buying.

For instance, a customer may be looking for proximity sensor. "Well, there are a number of different proximity sensors," said Stewart. There are inductive and capacitive sensors" and others, he said.

The site helps guide the customers, provides information to help the customer make the right sensor choice for the application.

Rising demand from automotive OEMs should not crimp integrated circuit supply

However, electronics purchasers may face shortages again for discrete semiconductors because of increasing demand from the automotive OEMs

Electronics buyers in non-automotive industries may face tight supply conditions for power transistors, diodes and some passives if sales of automobiles pick up sharply over the next years

Increased vehicle sales, coupled with rising electronics content in cars and light trucks, would likely result in tight supply for a number of discrete semiconductors and integrated circuits (ICs). Of course, buyers had to deal with similar issues in 2017 and 2018, but tight supply conditions eased this year as suppliers added capacity and overall demand weakened. But the question is has enough capacity been added if demand picks up again?

Electronics content in vehicles will continue to rise even if car sales slump, according to analysts. If vehicle sales rebound, supply will likely tighten again for power transistors, diodes, and some passives such as multilayer ceramic capacitors because automotive systems require large volumes of those components.

The good news for buyers, but bad news for automakers, is U.S. automobile and light truck sales are expected to fall 1.4 per cent to \$16.8 billion in 2019, according to the National Automobile Dealers Association. In Europe, passenger car sales were expected decline 1 per cent to 15 million units, said

the European Automobile Manufacturers' Association (ACEA).

However, while car sales may decline in the short term, electronics content in vehicles will continue to increase in virtually all car models, ranging from low-end economy cars to high-end luxury vehicles.

The added electronics content has led to a rise in the number of semiconductors and other components that are being shipped to automobile systems manufacturers and that trend will continue for at least the next five years.

As a result, component demand from the automotive manufacturers will rise. "Automobile sales may be flat to down or increase 10 per cent, but there still will be growth in automotive segment semiconductors because of the growth in functions in vehicles," said Nina Turner, research manager, semiconductor applications forecaster enabling technologies: automotive and energy for IDC. Automotive systems require a range of chips from basic small signal transistors to microprocessors.

Auto chip market rises

The automotive semiconductor market is expected to rise from \$41.7 billion in 2018 to \$43.5 billion in 2019, according to IDC. The automotive chip market will continue to increase through

2023 when revenue reaches \$62.5 billion, the researcher said.

"Automotive is one of the strongest growth areas for the semiconductor market," said Turner. "Computing and mobile phones are flat to down, but demand from automotive continues to rise," because electronics content in vehicles is increasing, she said.

More semiconductors are being designed into cars because of the growth of Advanced Driver Assistance Systems (ADAS), infotainment and connective systems in vehicles as well as development of autonomous vehicles and electrification of vehicles.

Those trends mean more integrated circuits and discrete semiconductors are needed by automakers and their suppliers. The automotive segment is becoming more important to more chipmakers. For instance, semiconductors, excluding memory ICs, that were sold to automotive companies represented about 11 per cent of all semiconductor sales in 2015, according to IDC. By 2023, that percentage will increase to 15 per cent, said Turner.

Increased demand for semiconductors by automotive companies could impact supply of certain, but not all chips. Automotive systems use a lot of microcontrollers

and analog semiconductors. Microcontrollers account for about 39 per cent of the automotive IC market, while analog semiconductors represent about 24 per cent, according to researcher IC Insights.

"When you get beyond that, memory, microprocessors, and digital signal processors and standard logic are small segments of the automotive chip market," said Brian Matas, vice president of market research firm IC Insights.

Automakers have used microcontrollers in their systems for decades, but ADAS, infotainment and other sophisticated systems require more of them.

MCU demand increases

Automotive MCU sales revenue will total about \$6.4 billion this year. "Probably 75 per cent of that is expected to be 32-bit MCUs," said Matas. Sixteen-bit MCUs will account for about 19 per cent of all microcontrollers used in automotive applications, while 8-bit or less MCUs will make up the rest of the auto MCU market.

"That has that changed over the years. Ten years ago, 8-bit MCUs were primarily used in automobiles," he said. But as prices declined and automotive electronics systems became more complex and needed a lot more computational power, 32-bit



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MCUs were more widely used. Such systems include ADAS, infotainment systems and GPS maps.

MCU suppliers “made it pretty easy to step from their 8-bit families to the 32-bit family” by reducing cost, so prices became more competitive, which encouraged automotive OEMs to upgrade to 32-bit devices, said Matas.

With analog semiconductors, power management ICs are widely used in automotive systems. “It’s really critical in a car to make sure nothing is using more power than it needs to,” said Matas. “You don’t want to draw more power from the battery that is necessary. With 12-volt and even 42- and 48-volt systems, it’s necessary to maintain the minimal amount of power to make sure that proper power is distributed,” he said.

Power management IC demand from the electric vehicle market will continue to grow over the next several years “although the EV market is small and may be just 2 to 4 per cent of total car sales,” said Matas. However, there are twice as many power management ICs and other semiconductors in an EV as there is in an internal combustion powered vehicle, he said. Hybrids have a little more semiconductor content than conventional cars.

“If the EV market takes off there will be much greater demand for microcontrollers and for power management

devices,” said Matas.

Automotive growth discrete shortages

Automotive is also driving demand for discrete semiconductors and optoelectronics, including high brightness LEDs and image sensors. “Automotive is a high-growth area for discrettes and has always been an important segment especially with power transistors and diodes,” said Rob Lineback, senior market analyst for IC Insights. “Automotive was the prime culprit over the last couple years for shortages and tight supply of power transistors,” he said. Lead times for power MOSFETs exceeded 40 weeks, as more power transistors were designed into more automotive electronics systems.

He said automotive demand for power transistors, diodes and other discrettes is continuing to grow despite a weak automotive market. One reason for continuing growth is their use in electric vehicles (EV), which require more power transistors than traditional internal combustion engine vehicles, said Lineback.

EVs and hybrids will also result in greater demand for diodes, which are often “teamed up” with insulated gate bipolar transistors (IGBTs) in electric vehicles, said Lineback. In addition, other discrettes are also needed in electric vehicles including small signal and

regular transistors and rectifiers, he said.

Discrete semiconductor purchasers at automotive companies can expect to be purchasing more power transistors that are based on silicon carbide (SiC) and gallium nitride (GaN) compounds. GaN and SiC technologies are really taking off and getting a real stronghold in automotive, said Lineback. “It seems that every single supplier is announcing something every other month about those technologies, and new products or some type of partnership with automotive customers, he said. *See related story page 14.*

Because of strong demand chipmakers have added some new capacity for discrettes, “but don’t want to overbuild capacity because they don’t want a supply glut. On the other hand, they can’t afford to let business go to competitors,” said Lineback. As a result, chipmakers are taking a cautious wait-and-see approach before making large investments in new production.

Automotive demand for optoelectronic components, including high-brightness LEDs, infrared emitters, and CMOS image sensors, is also growing, said Lineback.

Wanted: more image sensors

Demand for image sensors by automakers is especially strong and will continue to rise over the next several

years. Last year, automotive accounted for a relatively small percentage of image sensor demand. However, more vehicles are being equipped with ADAS including such features as crash avoidance, and backup warning as more image sensors are needed in such systems. In 2018 only about 6 per cent of all image sensors were used in automotive applications, while 60 per cent were used in smart phones. By 2023, the percentage of image sensors used in automotive will increase to 15 per cent and smart phones will account for 45 per cent of image sensors, according to IC Insights.

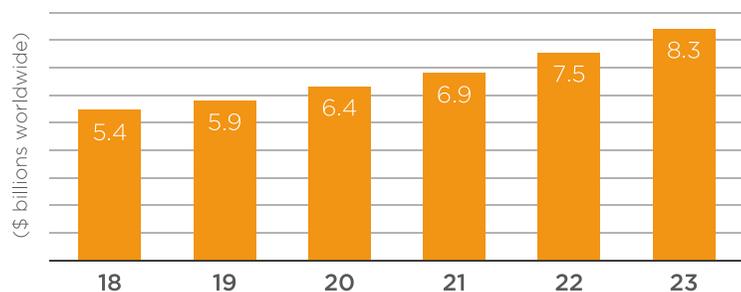
The compound annual growth rate over the next five years for image sensors used in automotive applications will be 30 per cent as revenue rises from less than \$900 million to \$3.2 billion in 2023, the researcher said.

Automotive demand will also rise for other types of sensors, including pressure, motion detection, accelerometers, magnetic field, temperature sensors and gyroscopes. In fact, while smart phones and video games are growing segments for sensors, automotive is still the biggest market for sensors, said IC Insights.

More IC supply added

While semiconductor demand from automotive companies increased and caused some supply shortages for discrettes in recent years, it did not

Revenue rises for automotive sensors



Increasing use sensors in automotive systems will drive revenue for sensors and actuators to more than \$8.3 billion by 2023.

Source: IC Insights

cause acute problems with integrated circuits supply and IC supply should not be a problem over the next several years. One reason is that IC makers that derive a large percentage of their sales to the auto industry are adding capacity or have acquired other chipmakers and fabs in an effort to meet rising semiconductor demand from their automotive customers.

Such chipmakers include IC industry heavy hitters such as Infineon, STMicroelectronics, ON Semiconductor, Texas Instruments, and NXP and SONY, among others.

Automotive can represent 20-35 per cent of such chipmakers' businesses. "All the major semiconductor suppliers have automotive as a top priority," said Lineback.

Infineon is a leading automotive supplier "and they want to maintain that level," said Matas. "SONY is the world's largest CMOS image sensor maker and they have set a target to be the number one supplier of automotive sensors by the middle of the next decade," said Lineback. TI makes a lot of analog chips used by auto companies and STMicroelectronics has a robust automotive business, too.

Such companies are making investments to make sure their automotive businesses grow as more electronics systems are designed into vehicles. For instance, Infineon announced in June it would acquire Cypress Semiconductor which makes microcontrollers among other chips. Infineon's decision to buy Cypress is largely driven by growth in the automotive segment, said Matas. "They are interested in what Cypress brings in terms of microcontrollers."

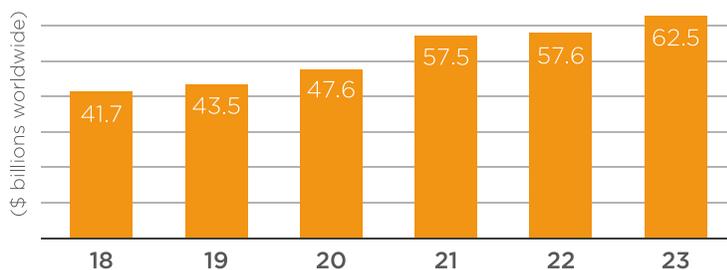
Infineon is planning to build a 300mm fab for analog and "a lot of that is driven by the automotive market," he said.

In addition, ON Semiconductor announced in April that it would purchase the East Fishkill, N.Y. fab from GlobalFoundries, which builds chips on 300mm wafers.

"One reason they bought the GlobalFoundries fab is they see the automotive segment expanding and they want to use their 300mm capability in that fab to produce cheaper power management devices," said Matas. ON wants to produce more parts for automotive over the next five or 10 years as the segment grows, he said.

"The biggest automotive IC suppliers are not standing still. They are preparing facilities for what they see will be a pretty good expansion" in automotive, said Matas.

Auto semiconductor sales take off



The global market for automotive semiconductors will post robust growth through 2023 when revenue reaches \$62.5 billion.

Source: IDC

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ELECTROMECHANICAL (Continued)											
Honeywell	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Keystone Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NKK Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	13,976	N/A	\$0	86.00%	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Panasonic	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PUI Audio	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schneider Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Sensata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne Relays	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ENCLOSURES											
Bud	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bud Industries	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	80.00%	50	1,000+	Y
Hammond Manufacturing	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,839	N/A	\$0	82%	50	1,000+	Y
New Age Enclosures	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FREQUENCY MANAGEMENT											
Abrakon Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,780	N/A	\$0	100%	50	1,000+	Y
CTS Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,889	N/A	\$0	100%	50	1,000+	Y
ECS Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,070	N/A	\$0	100%	50	1,000+	Y
Epson Toyocom	Mouser Electronics	800-346-6873	www.mouser.com	Y	178	N/A	\$0	100%	50	1,000+	Y
IQD Frequency Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kyocera	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Labs	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ICs & SEMICONDUCTORS											
Analog Devices, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,749	N/A	\$0	95%	50	1,000+	Y
Broadcom Limited	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor Corp.	Future Electronics	(800) 675-1619	www.futureelectronics.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Cree, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cypress Semiconductor Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	81.00%	50	1,000+	Y
Digi International	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Diodes Incorporated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FTDI	Mouser Electronics	800-346-6873	www.mouser.com	Y	94	N/A	\$0	100%	50	1,000+	Y
IDT (Integrated Device Technology)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Infineon	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,580	N/A	\$0	63%	50	1,000+	Y
Intel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ISSI	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lattice	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MACOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	\$0	100%	50	1,000+	Y
Microsemi	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Nexperia	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	\$0	100%	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	\$0	96%	50	1,000+	Y
Power Integrations	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Qorvo	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Renesas Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
SanDisk	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	\$0	100.00%	50	1,000+	Y
Skyworks	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	\$0	96.00%	50	1,000+	Y
Swissbit	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	\$0	94%	50	1,000+	Y

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ICs & SEMICONDUCTORS (Continued)											
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	\$0	77%	50	1,000+	Y
INTERCONNECTION											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23,235	N/A	\$0	46.00%	50	1,000+	Y
Aero Conesys	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	Mouser Electronics	800-346-6873	www.mouser.com	Y	165,853	N/A	\$0	31%	50	1,000+	Y
Anderson Power Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Aptive (Delphi)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cinch	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cinch Connectivity/Bel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ERNI Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FCI	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,394	N/A	\$0	73.00%	50	1,000+	Y
Glenair	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Harting	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,160	N/A	\$0	51.00%	50	1,000+	Y
Harwin	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Hirose Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ITT Cannon	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ITT Cannon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
JAE Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,02	N/A	\$0	100%	N/A	N/A	Y
JST	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
LEMO	LEMO	800-444-5366	www.lemo.com	M	N/A	N/A	N/A	N/A	N/A	1,500	N/A
LEMO	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mill-Max	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	\$0	89%	50	1,000+	Y
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	\$0	100%	50	1,000+	Y
NorComp	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	\$0	77.00%	50	1,000+	Y
Radiall	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	\$0	27%	50	1,000+	Y
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	\$0	55%	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	\$0	69%	50	1,000+	Y
OBSCOLESCENCE / HARD TO FIND											
	America II Electronics	800-767-2637	www.americali.com	M	1,900	\$1B	\$0	75.00%	59	550+	Y
	Lantek Corp.	973-579-8100	www.lantekcorp.com	M	186,000	\$22M	\$0	75.00%	5	62	Y
	Chip 1 Exchange USA, Inc.	949-589-5400	www.chip1.com	Y	850,000	N/A	\$0	85%	20	150	Y
	Rochester Electronics	978-462-9332	www.rocelec.com	Y		N/A	\$250		10	400+	Y
OPTO ELECTRONICS											
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	582	N/A	\$0	99.00%	50	1,000+	Y
Finisar	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,927	N/A	\$0	99%	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PASSIVES											
ABRACON	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
AVX	Mouser Electronics	800-346-6873	www.mouser.com	Y	42,454	N/A	\$0	72%	50	1,000+	Y
Bourms	Mouser Electronics	800-346-6873	www.mouser.com	Y	38	N/A	\$0	78%	50	1,000+	Y
Cornell Dubilier	Mouser Electronics	800-346-6873	www.mouser.com	Y	24,145	N/A	\$0	71%	50	1,000+	Y
Coilcraft	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	26,533	N/A	\$0	98.00%	50	1,000+	Y
Fair-Rite	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kemet	Mouser Electronics	800-346-6873	www.mouser.com	Y	77,568	N/A	\$0	66%	50	1,000+	Y
KOA Speer	Mouser Electronics	800-346-6873	www.mouser.com	Y	34,078	N/A	\$0	58%	50	1,000+	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	33,780	N/A	\$0	99%	50	1,000+	Y
Nichicon	Mouser Electronics	800-346-6873	www.mouser.com	Y	20,389	N/A	\$0	84.00%	50	1,000+	Y
Ohmite	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,293	N/A	\$0	55.00%	50	1,000+	Y
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,948	N/A	\$0	100.00%	50	1,000+	Y

Buyers' Guide

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PASSIVES (Continued)											
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	\$0	98.00%	50	1,000+	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	\$0	100.00%	50	1,000+	Y
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	\$0	64.00%	50	1,000+	Y
Würth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	\$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	\$0	100.00%	50	1,000+	Y
POWER & BATTERIES											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mornsun		+1-978-567-9610/+1-978-293-3923	www.mornsunamerica.com			N/A	\$0	100%	N/A	2000+	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phihong	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
RECOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schaffner	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK Lambda	Mouser Electronics	800-346-6873	www.mouser.com	Y	405	N/A	\$0	80.00%	N/A	N/A	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vicor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
REED SWITCHES											
HSI Sensing	HSI Sensing	405-224-4046	www.hsisensing.com	M	75	N/A	\$200	100.00%	15	275	N
SENSORS											
ams	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Analog Devices Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bosch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,059	N/A	\$0	64.00%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,379	N/A	\$0	45.00%	50	1,000+	Y
Melexis	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,915	N/A	\$0	59.00%	50	1,000+	Y
Sensirion	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
STMicroelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	914	N/A	\$0	65.00%	50	1,000+	Y
SWITCHES & KEYBOARDS											
OTTO	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TEST & MEASUREMENT											
B&K Precision	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Fluke	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,008	N/A	\$0	94.00%	50	1,000+	Y
Keysight	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lascar Electronics		814-835-0621	www.lascarelectronics.com	Y	130	\$602,000	\$0	100%	10	175	Y
Tektronix	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	\$0	96.00%	50	1,000+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Pektron	1-248-677-4838	www.pektron.com	\$66m	Michigan & UK	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y



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