

ELECTRONICS

APRIL 2021

sourcing

NORTH AMERICA

E-COMMERCE: PURCHASERS, FILL YOUR BASKETS

INCREASED
AUTOMOTIVE
OPPORTUNITIES

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PMIC: STRONG DEMAND,
LIMITED CAPACITY

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IOT, 5G AND ALTERNATE
ENERGY DRIVE MARKET

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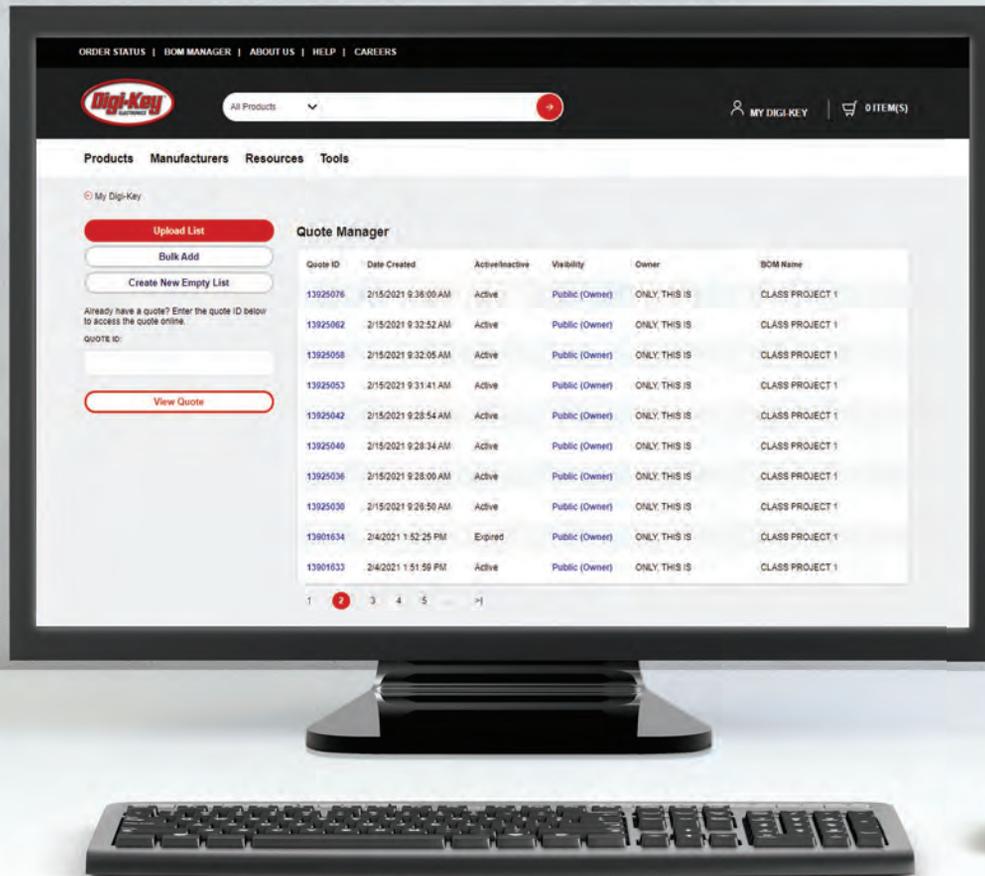
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On the cover – April 2021

E-commerce: purchasers, fill your baskets

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Buyers' Guide

All the facts and figures to help you buy



Supply chain conundrums

As a designer, I'm always on the lookout for conundrums as they are the sources of confusion from which innovations emerge. Looking at the landscape of the post pandemic electronics supply chain, I'm seeing conundrums everywhere. Allow me to shine a light on two.

One word I'm hearing more than most is 'digitisation' which can mean different things in different industries. In the supply chain, as of today, I take digitisation to mean 'real-time demand transparency'. In the most extreme example, the second an electronics retailer places a forward order, that demand cascades through the wholesaler, OEM, contract manufacturer, component distributors, device manufacturers and raw material suppliers.

This requires digital integration at every level, based on tight technological and commercial partnerships. However, at the same time, there are demands for new levels of supply chain resiliency based on more flexible, multi-sourcing agreements.

Another conundrum is forming around globalisation and sustainability. As entire countries chase the benefits of comparative advantage, the components they manufacture literally circle the earth seeking out their end application. Likewise, subassemblies may pass back and forth between countries, each of which specialises in adding value at a specific production step. Yet, at the same time, sustainability goals demand shorter, simpler supply chains which are designed to drive down a component's total carbon footprint year-after-year.

So, two sector scale conundrums, which I imagine will keep electronics supply chain professionals busy well into the middle of this century. It's too early to place bets but I am already seeing innovations starting to emerge which will be reported here.

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Reliable relay ready to ship

New Yorker Electronics has announced Picker Components' new 40A latching PCB power relay. It is available in coil voltages from three to 110VDC. It is offered in single or dual coil mode latching and is 40A at 250VAC resistive load and 30A at 277VAC general purpose load.

The device features a 1W coil to maintain contact pressure in the non-latching T90 style relay. This latching version only requires a 45msec pulse at the same power to switch. The power savings lowers operating costs and increases reliability with the significant reduction in coil heat.

Applications include energy management, metering and heater controls. The silver cadmium oxide contact material and TV-10 tungsten load assures high reliability and high surge current capabilities. Insulation material options include UL Class B and UL Class F and it is available in a sealed plastic case or with a dust cover. The PTRL relay is lead free and RoHS compliant.

www.newyorkerelectronics.com

Wireless modules available for volume production

InnoPhase has signed a global distribution agreement with Richardson RFPD covering Talaria TWO SoC wireless modules and development kits. The technology is designed to offer ultra-low-power connectivity solutions for direct-to-cloud communications in the smart home, industrial, commercial and health IoT markets. The agreement makes these modules available to customers globally for high-volume production.

InnoPhase's vice president and general manager of the IoT Business Unit, Greg Winner, said: "Signing a distribution agreement with Richardson RFPD is a significant step in our efforts to reach global electronics and IoT customers with our award-winning Talaria TWO solutions."

The products provide complete solutions with wireless connectivity, plus an integrated microcontroller for edge-of-network IoT designs. The integrated, multi-protocol single-chip platform includes Wi-Fi and BLE5 connectivity for wireless data transfer, an embedded Arm Cortex-M3 microcontroller for system control and user applications, and advanced security elements for device safeguards.

innophaseinc.com

Authorized for interconnect

Diverse Electronics has announced it is now an authorized distributor of On-Shore Technology which provides terminal blocks, sockets, headers, USBs and other interconnect products. The company states its products are fit-form-function and quality-equivalent with other manufacturers and are produced to be drop-in replacements.

Diverse Electronics' president, Rick Masciotra, said: "Diverse is very pleased to add On-Shore to our strong interconnect line up. Known for its extensive product offering and quality, On-Shore fits well with our customers' varied requirements. Coupled with safety approvals, competitive pricing and local support, we can meet nearly every connector demand."

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In Brief

Investing in product line expansion

Infinite Electronics has been acquired by Warburg Pincus. The investment will support Infinite's geographic and product line expansion, entry into new, high-growth markets and enhanced digital capabilities.
infiniteelectronics.com

Hard frequency site in Europe

Abracon has acquired AEL Crystals, a privately held frequency control supplier headquartered in Surrey, England. Abracon's president and CEO, Mike Calabria, said: "One key strategic objective for Abracon has been to position a hard site in Europe with a service center. AEL's headquarters in the UK will transform into the Abracon European service center."
www.abracon.com

Boost to sensor-enabled imaging expertise

AMS is establishing an imaging center of excellence producing consumer image sensors and product validation to support key US customers from the Riverwood Tech Campus in Rochester, New York, USA. The new research and development and design center will continue the tradition of consumer imaging innovation into the sensor-enabled era.
ams.com

ECIA welcomes Electrocomponents

ECIA has announced Electrocomponents has joined the association as a global member, along with its subsidiaries: Allied Electronics & Automation, a distributor of automation and control, electronic, electrical, mechanical and maintenance products in North America; and RS Components a global distribution partner for industrial customers and suppliers involved in designing, building or maintaining industrial equipment and facilities.
www.ecianow.org

Comprehensive suite of environmental sensors

Mouser is offering a broad selection of Sensirion's environmental sensors. Sensirion specializes in the design and manufacture of flow and environmental sensors for applications ranging from air purification to carbon dioxide detection.

The company's SGP40 indoor air quality sensor is a single chip, integrated CMOSens sensor system that provides a humidity-compensated indoor air quality signal. It offers long-term stability regarding response time and sensitivity, providing a reliable solution for applications including kitchen hoods, thermostats and demand-controlled ventilation.

The SPS30 particulate matter sensor is an optical sensor that combines laser scattering with Sensirion's contamination-resistant technology. Built for an eight year plus lifetime, the sensor enables accurate measurements for HVAC equipment, air conditioners and IoT devices.

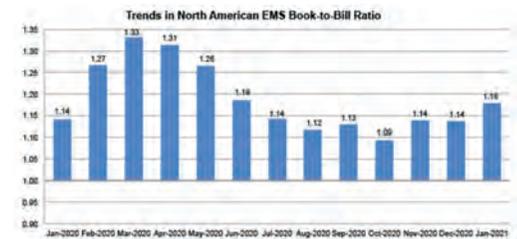
Sensirion's STC31 is a chip-sized gas concentration sensor, designed to offer



accurate, high-range CO₂ measurements for high-volume production. It is based on a thermal conductivity measurement principle, engineered for repeatability and long-term stability.

The SFA30 formaldehyde sensor module is based on Sensirion's electrochemical technology and provides formaldehyde sensing with low cross-sensitivity to other volatile organic compounds. The module is designed for simple integration into air purifiers, indoor air quality monitors and demand-controlled ventilation systems.

mouser.com



Immediate availability of ultra-wide input DC/DC converters

Sager Electronics is now stocking Murata Power Solution's 10:1 wide-input DC/DC converters. Optimized for harsh environments, these power supplies are offered in multiple power ratings in different packages.

IRQ series isolated, regulated converter modules deliver 150W from an ultra-wide 10:1 input voltage range and come in a fully encased quarter brick package for greater efficiency. The IRH series delivers a 250W single output from an ultra-wide input voltage range of 16 to 160VDC and complies with the input battery voltage transient ranges of EN50155. The IRV series is a 300W system level, stand-alone chassis mount isolated DC/DC converter, designed to accept nominal battery voltages from 24 to 110V in a single product.

Applications include industrial, railway and transportation.

www.sager.com

North American EMS up 9.7 per cent in January

IPC has announced the January 2021 findings from its North American Electronics Manufacturing Services (EMS) Statistical Program. Book-to-bill ratio stands at 1.18. Total North American EMS shipments in January 2021 were up 9.7 per cent compared to the same month last year. Compared to the preceding month, January shipments fell 6.4 per cent. EMS bookings in January fell 5.4 per cent year-over-year but increased 10.2 per cent from the previous month.

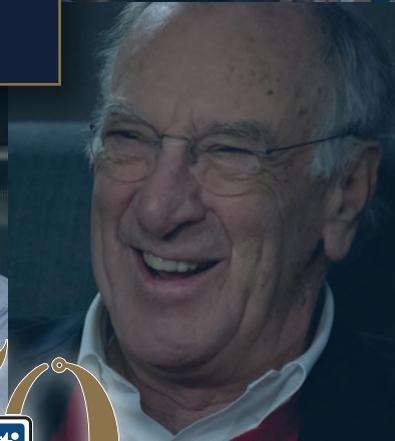
IPC's chief economist, Shawn DuBravac, said: "The EMS sector carried last year's momentum into 2021. Strong January orders should help drive shipments in the coming month."

www.IPC.org



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Importance of a strong inventory

Mouser's senior vice president of products, Jeff Newell, explains how by ordering months in advance of expected demand, the company stays ahead of lead time extensions

In the face of semiconductor shortages and other supply chain disruptions in the automotive and manufacturing sectors, Mouser's longstanding strategy to invest in and maintain strong inventory is helping meet the component needs of buyers and manufacturers around the globe.

Mouser's senior vice president of products, Jeff Newell, said: "As an essential infrastructure business and part of the global supply chain, Mouser continues to ship hundreds of thousands of components every week. Because Mouser orders months in advance of expected demand, we have done a good job trying to stay ahead of lead time extensions and product availability issues in our industry."

With over 1.1 million unique part numbers in stock or available to order, Mouser's inventory position is designed to ensure customers get what they need fast. Additionally, the distributor specializes in the rapid introduction of new products and technologies, helping customers gain the edge they need to reduce their time-to-market. The company's assortment of products from over 1,100 manufacturer brands assists customers in finding alternate products should the need arise.

Despite 2020's challenges, Mouser added over 70 semiconductor and electronic component manufacturers to its line card and introduced nearly 5,000 new products.

Newell added: "There's never been a more important

time to buy from an authorized distributor. Fully operational at all 27 of our global locations, Mouser has the professionals and procedures in place to ensure an effective and efficient supply chain, free of counterfeit or gray market products. Customers can always expect 100 per cent certified, genuine products that are fully traceable from each manufacturer."

Mouser ships everything from its distribution center in Texas, so all products are picked, packed and shipped from the same location, rather than from multiple warehouses in different countries.

mouser.com



Mouser's senior vice president of products, **Jeff Newell**





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Distributors see increased opportunities from automotive

Some distributors say their sales to the automotive supply chain are rising because of semiconductor shortages, rising electronic content in cars and the trend towards electric vehicles



James Carbone

Automotive represents a small percentage of electronics distributors' overall sales, but distributors say there has been a sharp increase in demand by automakers and their key systems suppliers and contract manufacturers fueled by severe shortages of some semiconductors.

Some distributors say demand by automotive customers may be short lived while others say there is a paradigm shift occurring and automotive OEMs will continue to use the distribution channel even after shortages abate.

Catalog distributors have a long history of servicing the auto industry. When automakers and their tier 1 suppliers design new systems, their engineers frequently turn to catalog distributors for components in the development of new systems.

Automotive customers buy a wide range of parts from distributors, including semiconductors, passives and connectors, among other components. "We sell everything from electromechanical devices to sensors to test and measurement equipment into the automotive customer," said Jeff Newell, senior vice president of products for Mouser Electronics. "It's an important customer segment from a design perspective," he said.

He said transportation, which includes automotive, represents about three per cent of Mouser's sales. However, that figure does not include sales to electronics manufacturing services (EMS) providers that manufacture systems for automotive customers.

He said Mouser does business with all areas of the automotive supply chain. The distributor sells parts to automotive suppliers such as Continental, Delphi and Daimler-Benz, among others. "They are looking to us for new products in new product engineering quantities. We believe design engineers start their designs with us," said Newell. Mouser also sells components to lower tier suppliers as well. "We are probably more important to those folks because they find it easier to find the products that they need and we get the parts to them quickly with no hassle," said Newell.

Shortages boost business

Mouser, like other distributors, has seen an increase in sales over the last six months because of semiconductor shortages. Many automakers slowed down production last year because of COVID-19. As a result, automotive customers stopped ordering semiconductors for several months.

Business started to bounce back in the second half year and car makers started placing



Jeff Newell, senior vice president of products for Mouser Electronics.

"We sell everything from electromechanical devices to sensors to test and measurement equipment into the automotive segment"

purchase orders again. However, there was also robust demand from other customer segments including computers, 5G phones and consumer electronics gear.

With all the demand, semiconductor integrated device manufacturers and foundries could not keep up with demand resulting in shortages and many OEMs and their EMS providers turning to the distribution channel for parts. Strong demand continued into 2021 and distributors reported stellar sales in the first few months of the year.

For instance, Digi-Key's sales were up 40 per cent in January and February, said Jim Ricciardelli, executive vice

president of digital business. "How much of this can we attribute to automotive business? I'm sure it has a lot to do with it," he said. "I believe the automotive business triggered this crazy acceleration of business."

He said the recovery of the auto industry and strong continuing demand for laptops, smart phones, and consumer electronics products resulted in many electronics manufacturers placing annual buys for semiconductors. "Before they would buy every month because we have such good inventory position," said Ricciardelli. "Now they're saying, 'we will take all of our product all at once because we

Widest selection of electronic components

In stock



don't know where the market is going this year," he said.

Ricciardelli predicts strong demand from automotive—and other industries—will continue. "I think our industry is going through a paradigm shift," said Ricciardelli. "The growth we are seeing in sales right now is not going to go away. We are seeing demand from many different industries because of strong demand for vehicles, smart phones, including 5G, and for smart home products," he said.

Sales to automotive will rise
Automotive is a small but growing customer segment for Digi-Key. The distributor has 700,000 customers and it is "hard to put our finger on how many of them are connected to automotive," said Ricciardelli. "It's not a huge percentage, but it is a good chunk. The tier ones for sure," he said.

Digi-Key provides parts for automotive engineers designing new systems. "But I think the bigger volume for us is contract manufacturers and subassembly houses that support automotive," he said. "Our volume business is high-mix, low-volume at the contract manufacturers."

One automotive subsegment that will further drive component demand for Digi-Key and other distributors is electric vehicles (EVs) and charging stations for EVs. "EV market sales are growing 30 per cent this year," said Ricciardelli. In addition, EVs have two times more semiconductors than internal combustion engine vehicles. Researcher IC insights says an average internal combustion engine vehicle has about \$600

of semiconductors, while an EV has about \$1,200 worth of chips. As a result as more vehicle production shifts to EVs, semiconductor demand from automotive will rise. EVs will also boost demand for passives. "There are more than 20,000 MLCCs in an electric vehicle," he said.

Latest and greatest wanted
Distributors say automakers and their systems manufacturers need the latest and greatest products when they design new systems. As a distributor, "it's all about having the newest products: battery management, diodes, sensors, microcontrollers," said Ricciardelli. "Design engineers are trying to stay ahead of the curve. That's what's most important," he said

However, because automotive has long lifecycles, obsolescence is an important issue for automakers and their systems suppliers and EMS providers. When an automotive OEM designs a product "they need to know the component is going to be around for a long time, more so than some other industries," said Ricciardelli. "That plays to our strengths. Because of our inventory solutions, auto companies like to work with Digi-Key because if anything goes obsolete, we are going to put in inventory to protect them for a long time," he said.

One distributor that expects its business to grow with automotive customers is Avnet. "Automotive has been a key strategic vertical for Avnet for many years," said Jason Skoczen, sales director-lightspeed and transportation. Currently more than seven

Jason Skoczen, sales director-lightspeed and transportation for Avnet

"We fully expect our business in the automotive supply chain will grow substantially in the coming years and we are excited about the opportunity to play our part in helping to drive the transformation of the auto sector"



per cent of Avnet's business is in the transportation market segment. The distributor expects its business throughout the automotive supply chain will grow "substantially in the coming years and we are excited about the opportunity to play our part in helping to drive the transformation of the auto sector," he said.

Skoczen added the opportunities in the automotive market "are on a steady growth trajectory as advanced electronic functions proliferate and spread from premium models to lower-priced, high-volume models."

More chips for vehicles

He said because of the adoption of infotainment and advanced driver-assistance systems and the growth of EVs, semiconductor content per vehicle is growing. He said market research shows the global automotive semiconductor market will grow in value from about \$48 billion in 2019 to nearly \$130 billion by 2025. "Industry insiders say it is not out of the realm of possibility for the semiconductor content per vehicle to quadruple in the coming years," said Skoczen.

Such growth will have a positive impact on distribution sales although "auto OEMs have

been a little slower to embrace distribution," he said. However, Avnet sees "newer players in the sector actively seeking our support around not just sourcing but supporting their design and operations with the range of platforms and services we offer," said Skoczen.

More automotive companies are beginning to see the value of using distributors to manage the supply chain. Partnering with a global component distributor "can enable automotive brands—both traditional and emerging players—to leverage our experience, infrastructure and existing relationships with critical technology suppliers so they can quickly ramp up their ability to manage the complexity of technology supply chain," said Skoczen.

Servicing automotive customers may be more challenging for distributors because automakers have different requirements than customers in other industries. Because liability risks are particularly high in the automotive industry, the automotive industry is highly regulated, and electronic components must adhere to specific quality standards, such as IATF 16949, ISO 26262, AEC-Q100 and AEC-Q200, said Skoczen.

Why does 2021 have CEOs concerned?

NewPower Worldwide's CEO, Carleton Dufoe, provides an expert view on current market problems and insights on how to mitigate risk

The pandemic has challenged every known business process in our industry and has issued a universal challenge to supply chains globally: evolve or suffer the consequences.

CEOs from almost every major distributor emphasize the importance of being agile to navigate current market obstacles. If examined closely, you'll find a more refined message revolving around resiliency and positioning to take advantage of the forecasted recovery on the horizon. On the other hand, most of the world's OEMs have already received the message and are scrambling to ensure component availability does not slow their recovery.

Two things are abundantly clear. Firstly, the market is set to rebound. Secondly, supply will not keep up with the demand. It's becoming customary for manufacturers to require an NCNR 52

weeks out, as they want to lock in concrete orders for the limited amount of inventory they will have.

Let's start with the good news. Demand is increasing way ahead of expectations, suggesting life will be returning to some kind of normalcy relatively soon. Unfortunately, this demand is creating mayhem on businesses looking to produce products as component supply cannot keep up with the demand. The result is historically high shortages across almost all categories, which is likely to spread well into 2022. Part shortages are now the new normal and represent a supply chain catastrophe for the unsavvy.

In an effort to mitigate this risk, most customers start with what they know and turn to their franchised distribution partners. These trusted partners are essential and play a critical

role in securing pre-existing schedules. However, when franchised distribution openly discusses working to manage customer forecasts or worse yet, extend-order horizons, you know you have a big problem.

Fortunately, navigating these uncertain times is NewPower's specialty. As the world's fastest-growing independent distributor, we pride ourselves on being global sourcing experts. Our market expertise and proprietary trading platform, Empower™, allows our global sourcing team to find fully traceable product, fast. While supply chain risk continues to be top of mind for most buyers, NewPower's \$150M committed credit facility and \$10M in E&O insurance means NewPower not only removes the risk but is also setting the new financial standard for other distributors to follow.

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**NewPower Worldwide's CEO,
Carleton Dufoe**



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Plan now to avoid production losses in 2021

In this article Rutronik's vice president North America, Sean Sisson explores the market forces shaping supply and demand through 2021 and beyond

For 2021, three industry sectors which will become growth drivers are 5G, automotive (especially in e-mobility) and servers. Requirements for performance, capacity and service life are increasing at the same rate as IIoT, cloud computing, edge and artificial intelligence.

To successfully overcome the global economic crisis, companies need to focus on and plan for the long term. Rutronik recommends ordering resources required for the entire 2021 production year as soon as possible. Long delivery times of 20-plus weeks (possibly longer for large orders) can make or break a company's survival.

Due to the partial shortage of resources and components, prices are expected to rise. This introduces the risk of accepting supposed bargains from dubious suppliers, especially if they also promise shorter delivery times. Constructive cooperation creates a way out of this tense market situation, with Rutronik offering customers economic and technical support.

Positive development, triggered by expected growth, is creating challenges, especially in Europe.

China is working on new infrastructure across the country, including 5G,

e-mobility, EV charging (with high power charging stations), high-speed trains and server farms for artificial and edge intelligence. Accordingly, components produced in China are being used for its own market. In addition, the US ban on SMIC is the reason other foundries are seeing so much demand.

Growth markets are accessing similar, if not the same,



components and resources. For example, 10 μ F, 1206, MLCCs overlap in the automotive and 5G sectors. High-performance servers require 22 μ F capacitors which are also relevant for automotive electronics.

Delivery bottlenecks are already occurring at the beginning of the production chain. The problem relates to the worldwide lockdowns that severely restricted production in 2020. In addition, the raw materials for the production of these components have a limited shelf life before they degrade.

Manufacturers have been facing discontinuations resulting from mergers and acquisitions: not just since the 2020 crisis. Rutronik is working to establish constructive cooperation with global manufacturers to ensure customers are supplied without interruption. Thus, if a discontinuation occurs, production can be guaranteed with equivalent alternatives.

In summary: demand for high, ultrahigh and AEC-Q MLCCs is rising; there are long delivery times for new technologies and materials such as SiC, GaN, polymers, nanocrystalline ferrites and carbon components; prevent line stops with forward-looking resource planning.

www.rutronik.com



Rutronik's vice president North America, **Sean Sisson**



Components produced in China are being used for its own market. In addition, the US ban on SMIC is the reason other foundries are seeing so much demand

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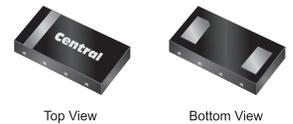
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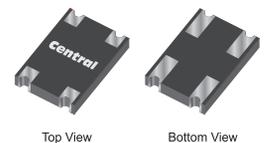
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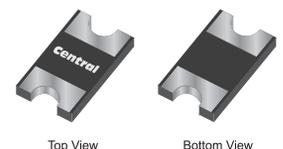
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John Denslinger is a former executive VP Murata, president SyChip Wireless, and president/CEO ECIA, the industry's trade association. His career spans 40 years in electronics

Small but big impact

John Denslinger investigates why supply constraints of the tiniest components can have significant consequences for even the biggest industries

Demand and supply

A WSJ article published in mid-February spoke to the impact of electronic components on the automotive supply chain. What prompted me to read the piece was the title: 'How car makers collided with a global chip shortage'. Curiosity set in. Could a massive market segment like automotive really miss the warning signals?

The warning signs were there and chief among them was scale. Automotive is a 100M vehicles per year market with EV accounting for less than three per cent of output. Despite the rapid digitalization of performance, safety and entertainment functions, automotive semiconductor consumption still pales in comparison to smartphone output which is already at a billion devices per year. 5G is just launching and likely driving mobile phone demand even higher. For chip and wafer manufacturers the reality is pecking order and priority when supplies are constrained.

Evidence suggests profit margins on high volume consumer electronics supersede that of automotive. Perhaps that is why the largest wafer fab company, TSMC's 2020 financials indicate only three per cent of capacity is assigned to automotive. Obviously, the procurement task of securing adequate automotive capacity now shifts to wafer fab, traditionally viewed as upstream in the supply chain.

The other big factor was insufficient investment in wafer capacity, specifically 200mm. Let's be honest, the pandemic didn't help. Governments everywhere shutdown businesses, shuttered most services, restricted movement of goods and personnel, and flip-flopped along the way. Economic uncertainty isn't a recipe for deep-pocket investment. Now that all market segments have bounced back strongly, demand understandably exceeds supply.

• By John Denslinger

For more details and commentary on the chip shortage dilemma, I recommend the Executive Analysis prepared by ECIA's chief analyst, Dale Ford. His February summary covers a number of additional constraints on the semiconductor shortage worth reviewing.

Small, but big impact. Semiconductors are that and more, but let's not forget to include passive components as well. The purchasing community knows every bill-of-material has lots of resistors and capacitors. It's the lowest purchase value but largest part count on the bill. These are often called the 'after-thought' components: totally necessary but not fun to source.

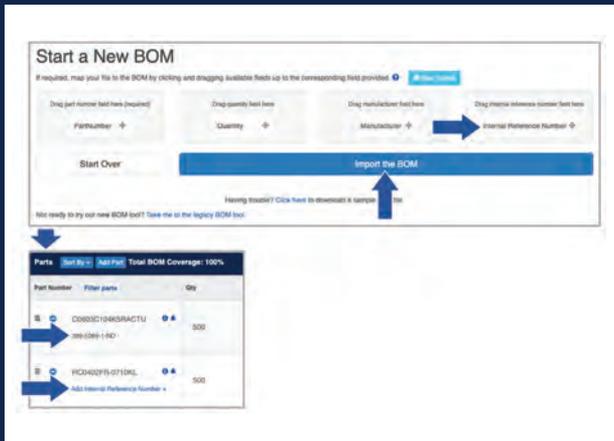
In the case of resistors and capacitors, the constraint is a little different than chips. Since early 2020 when Covid first hit, lead times have pushed out an additional three weeks in resistors and five to six weeks more in capacitors. While that is manageable, a prolonged demand surge is just awakening. Fortunately for customers, major passive companies in Asia planned and built new capacity with most coming on-board during 2021, but this expanded capacity was intended to serve new demand from 5G, automotive and battery electronics, IoT, cloud enterprise, and global infrastructure buildouts. If these segments take-off and demand soars as predicted, capacity will remain constrained and lead times will stay extended through much of the year.

The electronics industry is about to benefit big time from several, concurrent technology deployments in 2021. More capacity across every component area is sorely needed. Maybe the car makers' collision with the chip shortage is the canary in the coal mine. On a macro-economic level, shortages in chip supply and persistent long lead times in passives will curtail industrial growth. That impact will ripple badly in our industry. That's big for such a small component.

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Most compact power entry module

Schurter's DD11 series power entry module is designed to provide functional integration in minimal package dimensions. It suits equipment with low profile panels.

Consisting of a C14 IEC appliance inlet and compatible with cord retention, 1 or 2-pole fuseholder and power on/off switch, the DD11 is now available with side mounting flanges which minimises height when vertically mounted.

Especially suited for medical applications, the series complies with IEC 60601-2. The fuse drawer is offered as 1 or 2-pole and accepts 5 by 20mm fuses. An extra-safe feature prevents users removing the fuse drawer while the power cord is plugged into the equipment. The cord retention feature protects against inadvertent disconnection. Other applications include IT, telecom, office and household equipment.

The DD11 is rated 10A at 250VAC according to IEC and UL/CSA and is ENEC and cURus approved. Versions with EMC filters are also available.

www.schurterinc.com

Off-the-shelf, direct from stock, no lead times



Harwin has strengthened its connector cable assembly offering, with additional variations for its 2mm pitch Datamate high-reliability connector assemblies enabling greater customer convenience.

Immediately available from stock via Harwin's supply chain partners, there are 61 new variants covering male and female connections, with numerous contact count and cable length options available. Single and double-ended configurations can measure 150, 300 and 450mm long. Contact options include the high-performance T-Contact for up to 8.5A. For assemblies with extended rear wall housings, epoxy potting is included for added strain relief. All connectors have stainless steel jackscrews for secure mating and vibration resistance.

As well as supporting 500 mating cycle lifespans, they exhibit superior resilience to shock (100G for 6ms) and vibration (10G for 2 hours on each axis). Working temperature range is -55 to 125°C.

Harwin's new product manager, Ryan Smart, said: "By offering a broad array of different cable assemblies as part of our Datamate product line, we can help customers avoid all the complications of taking on such work themselves."

www.harwin.com

Ready for USB-C



Suntsu's is now offering USB-C connectors. With the right configuration, USB-C connectors are the fastest for transporting data. Their smaller size, reversible shape and interoperability are three additional features.

Most people are familiar with USB A. However, they can be difficult to plug in first time and as devices become smaller and thinner, the ports are too large to be accommodated. USB-C is designed to be compact and adaptable, offering a one-size-fits-all solution for charging and data transfer.

The reversible shape helps orientation when making a connection, as the pins are the same on both sides.

This form factor is being adopted in many new devices and reduces the number of cables users need.

Over 700 technology companies have come together to design and adopt this next-generation cable including Apple, Google, Dell, Microsoft, Intel, HP and Samsung.

USB-C connectors support standards like USB 3.1 which allows data transfers up to 10Gbps and USB PD, enabling power delivery. Multiple series are available in through-hole or surface-mount packaging.

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Shrink your way to EMI/RFI solutions

In this article, ECCO introduces shielded conductive heat-shrink tubing as a quick, cost effective solution to electromagnetic interference or radio frequency interference problems

The proliferation of electronic circuits can be witnessed virtually everywhere from our homes to the industrialized Internet of Things found in factories, transportation, food processing equipment and medical devices. Conductive surfaces, like the wires or metallic enclosures housing these circuits generate unexpected current and electrical energy when exposed to electromagnetic waves coming from a variety of natural and artificial sources. When electromagnetic energy disrupts the expected electrical performance of a device or material it's called electromagnetic interference (EMI) or radio frequency interference (RFI). In today's world of sophisticated electronic systems, this susceptibility can affect performance in one of two ways: conducted EMI/RFI which causes the system to malfunction from within, or radiated EMI/RFI, which causes nearby equipment to malfunction.

Cables often need shielding to mitigate EMI or RFI problems. Common solutions include a metal or metallized plastic connector and soldering the cable shield to the connector or, alternatively, wrapping the junction with copper tape and soldering it to the cable shield. More robust solutions involve metal braided sleeving and tubular expandable braided cable shielding which is used primarily in the electrical wire interconnect industry to protect cables from electrostatic and electromagnetic interference. Even though these types of solutions may work, they can be costly and labor-intensive.

A cost-effective solution to this problem is shielded conductive heat-shrink tubing with a metallic conductive ink coating on the inside of the tube. The inner coating provides electrical continuity and EMI, RFI and ESD shielding around the joints being connected. This tubing can solve a number of EMI/RFI problems easily and inexpensively.

In use, the appropriate diameter of tubing is placed over the components or assemblies to be shielded, and heat from a heat gun, oven or other conventional heating device is applied to the tubing. After the tubing shrinks, the inner metallic layer provides an electrical connection between the outside surface of the objects that are joined by the tubing, thereby creating an almost 100 per cent effective, 360 deg circumferential shield.

The versatility of heat-shrink tubing and its shielding effectiveness have been demonstrated in diverse applications. One military application is in a soldier's high-tech helmet. The manufacturer had developed a new design incorporating advanced systems such as night vision, heat sensing and two-way communications. However, when the helmet was manufactured the various electronic systems were in proximity and were interfering with each other. Resulting crosstalk was so bad it was virtually impossible to use more than one system component at a time.

Using heat-shrink tubing to cover the cables running inside the helmet easily solved the crosstalk problem. That simple solution avoided the design

and fabrication of custom cable shields or metal enclosures, thus reducing the helmet's complexity and weight. The heat-shrink tubing also withstood the rapid thermal changes experienced where warfighters need to work and perform their duties in support of freedom.

In conclusion, shielded heat-shrink tubing offers a cost-effective and easily implemented solution to EMC challenges.

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Trends in mil circular connectors

TTI's director mil/aero connectors, Kenny Vigil and business development manager, Steve Brahosky, explore trends impacting military-grade circular connector design and selection

Military-spec D38999 circular connectors are used in defense and aerospace applications for reliable, standards-grade performance to military specifications. These rugged connectors deliver high grade protection from the elements, maintain mission-critical signal integrity and protect sensitive electronics from environmental hazards. These characteristics lend themselves to heavy-duty/harsh-environment industrial applications, medical instrumentation, marine electronics, ground vehicles and

applications where reliability and dependability are required.

Most mil-circular connector manufacturers are accommodating higher performance and higher speeds. Suppliers now offer high-speed variations, incorporating quadrax contacts, differential twinax contacts and even fiber for increasing demands for video, audio, Gigabit Ethernet and other high-speed communication protocols.

While often associated with

aerospace applications, D38999 connectors with high power/high voltage contacts are also finding use in ground vehicle applications thanks to their ruggedness and ability to transmit the amount of energy required.

Electrification in military and heavy industrial vehicles currently lags the commercial space. However, economic pressures and government mandates likely will speed the transition and we will see high-power/high-voltage, mil-spec circular connectors finding their way into products and applications for military and civilian vehicles alike.

Micro 38999 connectors provide many of the same benefits while being smaller and lighter. Originally designed for wearable military applications, allowing soldiers to connect communications and other devices, these connectors also suit ground vehicles, UAVs and other systems.

Finally, as more companies deploy satellite constellations and small-size cubesats, we're seeing increasing demand for hermetically sealed connectors chosen for their performance in low Earth orbit (LEO) along with deep space. The sealing requirements of emerging marine applications, such as offshore wind power generation, make 38999 circular connectors an ideal choice for these wildly different types of applications, protecting sensitive electronics from moisture and outgassing in a vacuum.

The proliferation of both marine and space/LEO



TTI's director mil/aero connectors, Kenny Vigil



TTI business development manager, Steve Brahosky

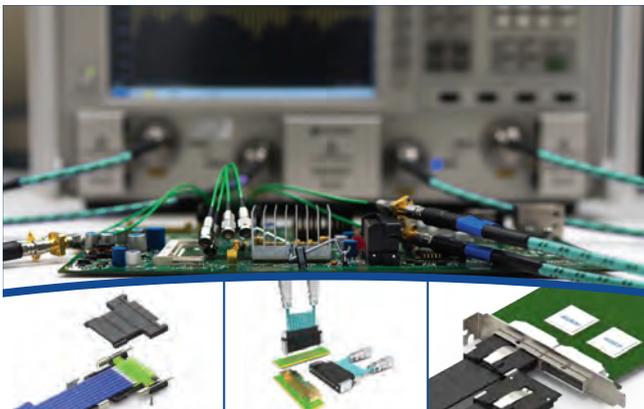
applications means almost every connector manufacturer has a hermetic line on offer.

Authorized distribution helps ensure access to these connectors and also helps reduce lead-times and mitigate supply chain risk by holding inventory. We work closely with suppliers to make sure connector customers' needs are readily available, even when those orders require custom pin configurations.

In addition to stocking available-to-sell completed connectors, TTI is approved for value-add connector assembly for a range of mil-spec and commercial connector product families. This capability provides maximum flexibility and customer support.

To combat market uncertainty, a distributor partner with industry knowledge and design skills can make sure customers get these specifically engineered mil-spec connectors quickly. With so many options to choose from, a distributor partner can help navigate the breadth of available inventory and find the right product to add durability and reliability to your next design.

tti.com



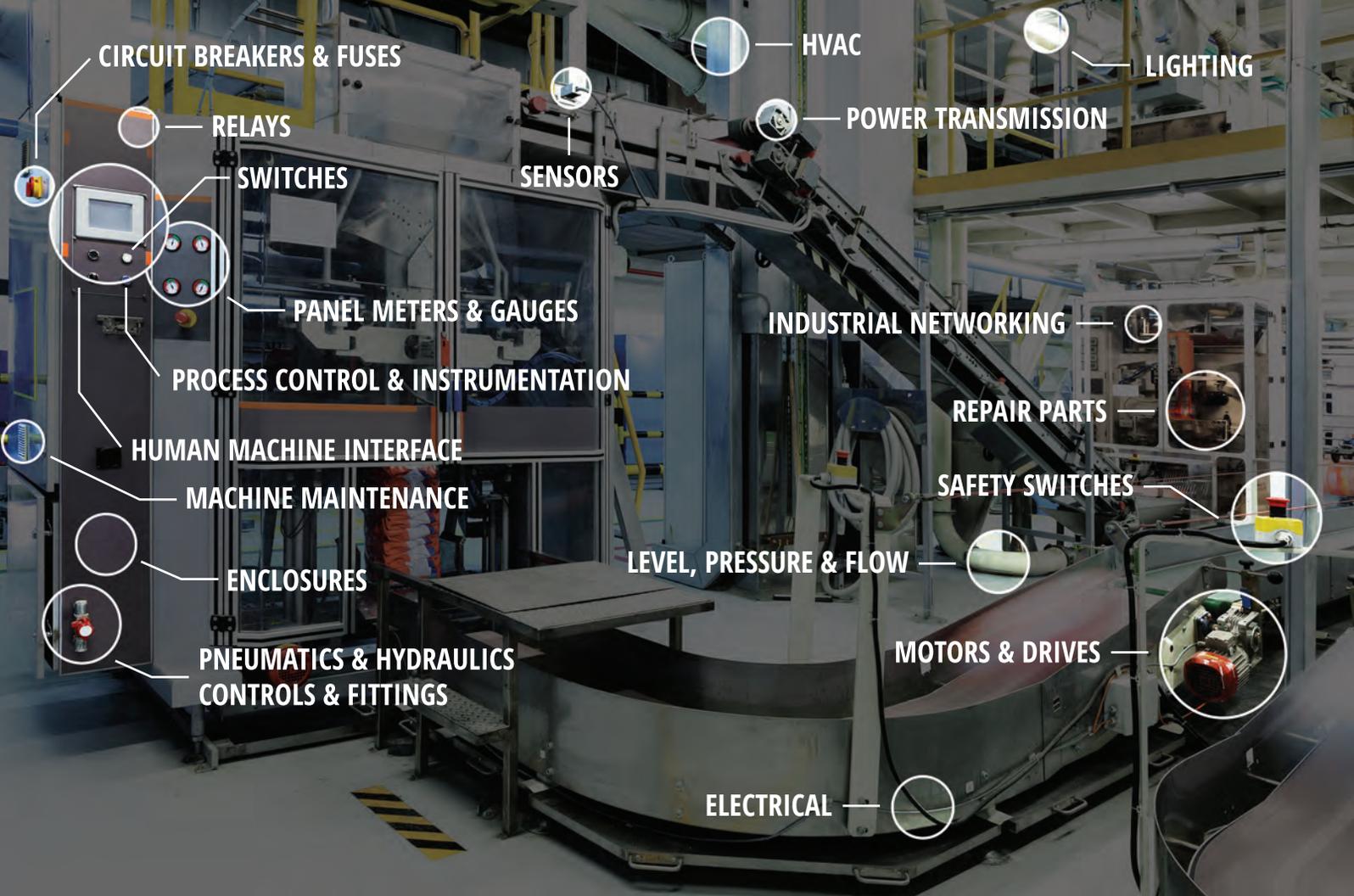
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Streamlining the online buying process

Mouser's vice president of Americas' service & sales, Coby Kleinjan, introduces Price and Availability Assistant, a tool designed to optimize component purchasing

Whether a buyer is purchasing one component or filling a bill-of-materials featuring hundreds of parts, Mouser Electronics offers a portfolio of tools designed to support customers throughout the purchasing process.

Mouser's Price and Availability Assistant is designed to help buyers check prices and availability on millions of semiconductors and electronic components. Customers can drag-and-drop, type in or copy-and-paste a parts list with desired quantities for pricing and availability results. Buyers can add up to 200 part numbers, with up to three different quantities per part number. The tool returns exact part matches for each line and offers replacement options for non-orderable part numbers.

The Price and Availability Tool can be found at Mouser's Customer Resource Center, a hub containing tools customers can use to optimize the purchasing process.

Mouser's vice president of Americas' service & sales, Coby Kleinjan, said: "At Mouser, we are continually improving the tools we offer to help buyers and engineers manage their product specifications and purchasing. The Price and Availability Assistant is just one more way that our teams are providing best-in-class service to our customers."

The Price and Availability Assistant is the latest addition to a full suite of productivity tools from Mouser, including the FORTE intelligent BOM tool, ECAD design resource solution and Inventory Management Tool, all accessible through the comprehensive Customer Resource Center.

From this site, customers can access and learn how to view or track orders, request technical support and data sheets or place orders via API or EDI through order automation. The hub helps customers get more information for parts and any other assistance they require for purchasing.

As an authorized distributor, Mouser Electronics is focused on the rapid introduction of new products and technologies, helping customers speed time-to-market. The world's leading semiconductor and electronic component manufacturers count on Mouser to introduce their products into the global marketplace. Mouser's customers can also buy with confidence, knowing they are buying 100 per cent certified, genuine products that are fully traceable from each manufacturer.

Kleinjan added: "At Mouser, we continually assess and improve our online resources to help buyers and engineers manage their product specifications and purchases. We strive to help customers streamline the buying process as we continue to make it our mission to provide best-in-class service to all of our customers."

www.mouser.com
www.mouser.com/customer-resource-center/



We are continually improving the tools we offer to help buyers and engineers manage their product specifications and purchasing

Jumpstart your organization's digital transformation

Digi-Key's director of regional supply chain solutions, Margaret Cunha, encourages purchasers to begin their digital transformation and reap the benefits

The challenges of 2020 have accelerated a digital revolution for purchasing and procurement professionals. The transformation has been so profound that Digi-Key has created a range of digital solutions to help procurement professionals work smarter, not harder, along with providing educational resources including a Digital Transformation eBook.

The company has developed three major digital solutions for procurement professionals. It's important buyers select the one that will be best for their organization.

Electronic data interchange (EDI) provides more of a standardized format for sending purchase orders, acknowledgements, what's on hand, etc. This technology has advanced over the past 10-years and organizations can now use EDI to effectively manage their procurement, pricing and ordering processes

all at once. EDI is most widely adopted by larger organizations, universities and new product introduction (NPI) engineering companies since it requires an organization to have an EDI infrastructure prior to use.

A punchout solution streamlines the purchasing process by making it easier for users to create accurate and detailed purchase orders through an automated process. Punchouts use an organization's existing technology to procure goods and services. These are most popular among medium to large B2B organizations and are even becoming a requirement for many RFPs.

Application Programming Interfaces (APIs) are a newer digital solution, but they're quickly gaining popularity because of how customizable they are. Digi-Key's APIs are free to use, and digitally connect customers' systems

with the distributor's system to provide automated, real-time product search, price and availability, quoting and ordering, barcode, product change notifications and more. Digi-Key's solution is the first real-time API on the market. Customers who use it have a competitive advantage because they can receive all the critical information on products they need at speed due to the automated, machine-to-machine connection.

Undergoing a digital transformation may seem like a daunting task, but everyday your organization goes without digital solutions is another one that you're at a competitive disadvantage to those who do. Now is the time to take the first step toward streamlining your processes for efficiency and you'll experience the ROI that accompanies digital solutions.

www.digikey.com



Margaret Cunha, Digi-Key's director of regional supply chain solutions



A punchout solution streamlines the purchasing process by making it easier for users to create accurate and detailed purchase orders



Strong demand, limited capacity will boost PMIC tags

Expect a seller's market for power management integrated circuits for the rest of the year because of strong demand and limited production capacity



James Carbone

A double-digit increase in unit demand, tight supply and higher prices will result in the worldwide power management integrated circuit (PMIC) growing 19 per cent this year.

PMIC unit demand will rise 13 per cent while prices will increase five percent, resulting in revenue growing from \$14.6 billion in 2020 to \$17.4 billion in 2021, according to researcher IC Insights. Unit demand will increase through 2025. Unit shipments rose 68.4 billion in 2020 to 77.5 billion in 2021 and will rise to more than 110 billion in 2025. The average price will increase from \$0.21 in 2020 to \$0.22 in 2021 and hold steady through 2025, according to IC insights.

The researcher noted that despite the pandemic that shut down or slowed production of a lot of electronics equipment for weeks in the first half of last year, the PMIC market still grew four per cent as unit demand and prices increased about

two percent as equipment and component demand bounced back in the second half of 2021.

PMICs include linear and switching regulators, power management application specific standard products, battery charging and management chips, supervision/sequencing/motor control devices and voltage reference products.

The projected increase in revenue and demand for PMICs is coming from a wide range of customer segments including the automotive industry, computers, 5G handsets and infrastructure, among others.

"Power management ICs are critical components in just about every system," and demand for vehicles, computers, 5G phones and other equipment is rising, said Brian Matas, vice president, market research for IC insights. With increased demand and limited production capacity, there are shortages of PMICs and prices are increasing.

In fact, shortages started to occur in the second half of last year when demand for PMICs increased when the auto industry rebounded in the third quarter after suffering a downturn in the first and second quarters. When the auto industry recovered "other end-use segments were going strong such as computers, 5G cell phones and video game consoles," said Matas. There was not enough capacity to meet all the demand resulting in serious shortages for PMICs and other parts.

The bad news for chip buyers is shortages continued in the first quarter of 2021 as many semiconductor manufacturers, including foundries, are running at full capacity or near capacity, said Matas.

Low inventories for automotive

While shortages are affecting all industries, the auto industry's shortages problem is exacerbated because automakers and their key systems suppliers do not keep large inventories because of

the just-in-time system they use, said Paul Pickering, senior analyst, power semiconductors for researcher Omdia.

"The auto industry likes to minimize inventories. When the inventory gets depleted, if they don't have the next batch coming in within a couple of days then there's a problem," said Pickering.

Adding to the problem is the qualification requirements for power management ICs and other semiconductors "are much more rigorous than commercial industries so a similar chip used in other industries cannot be used for automotive systems," said Pickering. Automakers and their systems manufacturers that supply them "don't have the flexibility in the supply chain to find other sources of supply" quickly because new suppliers and their parts need to be qualified to automotive standards, he said.

Automakers require high volumes of parts and semiconductor

By the Numbers Source: IC Insights



\$17.4 billion

The size of the worldwide power management IC market in 2021



10%

The compound annual growth rate for power management ICs from 2020-2025



\$0.21

The average price of a power management IC 2020



19%

The expected growth rate of the global power management IC market in 2021



5%

The projected increase in the average price for a power management IC in 2021



\$23.8 billion

The projected size of the power management integrated circuit market in 2024



fabs have automotive demand “built into their manufacturing schedules,” Pickering said. But when automakers cut forecasts because of declining demand, semiconductor companies will reallocate chip manufacturing capacity to other customers in other industries which is what happened last year. Automakers initially had a sharp decline in vehicle demand that shut down production at many plants. Semiconductor capacity that was targeted for automotive was re-allocated to other industries. However, later in the year vehicle demand increased and there was not enough production for PMICs and other semiconductors needed by automakers and their system suppliers.

Strong demand, limited supply

The bad news for PMIC buyers in the auto industry as well as other industries is PMIC and overall semiconductor supply will likely remain tight through 2021 because capacity will remain mostly limited and demand for PMICs will continue to grow especially from wireless communications, industrial and automotive.

“All together those segments make up about 70 per cent of the power IC market,” said Pickering. He said with each segment there are different demand drivers. In wireless communications “obviously the big story is 5G. We are just starting to see 5G handsets,” said Pickering. Five-G handsets have more power ICs than earlier generations of cell phones.

“The other side of it is the rollout of 5G infrastructure,” which will also need PMICs, said Pickering. Five-G phones operate at higher frequencies than 4G phones. Millimeter wave frequencies used in 5G “don’t go through walls very well,” he said. Cell phone carriers will have to install any micro-base stations for 5G, said Pickering.

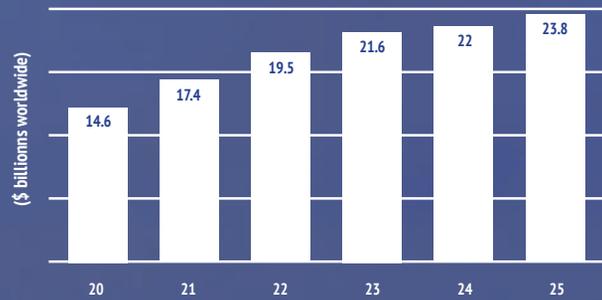
“Some people said every street in every city will have multiple cell phone micro towers and they will all need power management ICs. That will be a huge growth,” said Pickering.

EVs will boost PMIC usage

The electric vehicle segment also will drive PMIC sales next year and beyond. EVs use 2 to 3

Power management IC revenue will have a compound annual growth rate of 10 per cent through 2025 when sales reach \$23.8 billion.
Source: IC Insights

PMIC sales power upward



times as many semiconductors as an internal combustion engine car, said Matas.

“Electric vehicles are clearly heavy users of power semiconductor devices,” said Pickering. Lithium electronic vehicle batteries “require careful management of the controller,” he said. “Lithium batteries are very sensitive to slight changes in their operating temperature,” he said. If they are charged too quickly or they are discharged too quickly, operating life declines, said Pickering. If the temperature is outside a certain range, operating life also declines.

“What that means is you have to continuously monitor the battery to make sure you’re always in the sweet spot – the safe operating area of the battery,” he said. Power management ICs are needed for that.

Power ICs are also needed for the traction motor itself which uses a lot of power, said Pickering. “That has spawned increases in the drive circuitry for the motors and the controllers,” said Pickering.

In addition, electric vehicle charging stations will drive power management IC growth. “It is hand in glove with electric vehicles,” he said. “There needs to be a large number of power

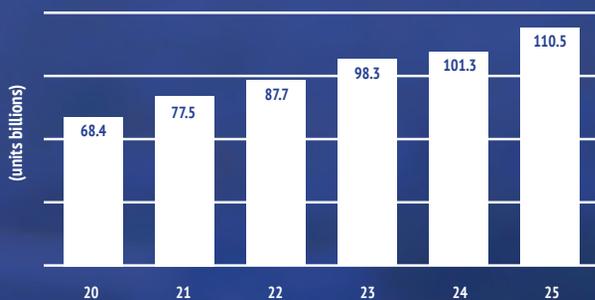
stations to charge EVs.”

PMICs are seeing growing demand from industrial IoT applications. “In general, factories are getting more and more electronic,” he said. More factory machines and processes are being connected to the Internet as manufacturers move towards Industry 4.0, which “is basically the next wave in manufacturing,” said Pickering.

Industry 4.0 involves monitoring and controlling every industrial process with computers and sending data to the cloud so decisions can be about how manufacturing can be optimized for different operations and when factory automation equipment needs to be serviced or if it is about to fail, according to Pickering.

For instance, a mechanical machine such as a lathe will have the ability to transmit all data of its operation to the cloud. “What that means is you need to have a microcontroller and sensors in a wired or wireless network to send all that information up the chain to the next level,” said Pickering. Power management ICs are needed in such an application. “That’s a big area of growth,” he said.

PMIC unit shipments skyrocket



Unit shipments of power management integrated circuits will rise from 68.4 billion units in 2020 to 110.5 billion units in 2025.
Source: IC Insights



Professional displays offer 5-year minimum availability

Tianma has introduced its P-Series TFT LCD modules for industrial and medical display markets. The first products include XGA displays (8.4, 10.4 and 12.1in), plus wide format products, from 7in WVGA to 13.3in FHD.

P-Series displays are offered in advanced, basic and entry grades to meet different customer needs, including specifications around pixel density, viewing angle, contrast ratio, color gamut, black level uniformity, etc.

The advanced grade is designed for demanding applications that call for more robust product specifications and performance requirements, including: high-contrast rating and longer-life LED;

high brightness and wide temperature range; and ruggedization to withstand shock and vibration.

The basic grade is designed to offer a good performance-to-cost ratio, meeting the standard specification and performance requirements of the market with typical brightness ratings and long-life LED backlights. Entry level provides more cost-effective solutions for price-sensitive markets and applications.

All three grades of the P-Series family will be available in production for a minimum of five years (typically seven years or more) with a small minimum order quantity (MOQ).

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Twisted pair offers more data, power and distance

Remeo Wire & Cable has launched a new family of 21 AWG utility Twisted Pair (uTP) cables. This innovation is a twisted pair power cable that allows for data and power to run over longer distances than any other twisted pair cable.

The Activate by Remeo cable is 100ohm, RJ45 compatible and can be used for network appliances that require data and power to be delivered to locations that fall outside of the traditional Ethernet ring topology. This encompasses more potential applications than PoE or powered cables can provide, including: cameras, thermostats, PoE lighting, PoE Type 1, 2, 3 and 4 devices in the IoT and industrial factory floors.

Features of uTP cables include: riser, plenum, OSP and LSZH versions; 21 AWG copper to reduce performance issues caused by heat; enhanced headroom for useable bandwidth up to 1Gb/s at extended distances; and ultra-low loss, high speed dielectric.

www.remeo.com

IoT, 5G and alternate energy will help drive the North American EMS market

EMS providers say while the pandemic slowed production of equipment last year, demand is recovering and single-digit growth for many contract manufacturers is possible

Electronic manufacturing services providers say they are optimistic that they will grow business over the next five years because of rising demand from companies making products for alternative and clean energy, industrial applications, 5G and Internet of Things (IoT) and an overall increase in outsourcing by OEMs in some industries.

Many North American EMS providers struggled last year as some industries shut down production for a time because of the pandemic, but many contract manufacturers still managed to post sales increases for the year when demand picked up in the second half. EMS providers say demand in the first three months of this year has been healthy and they believe demand for manufacturing

services will continue through the year and in the near future. The North American EMS industry is off to a good start in 2021. Trade association IPC said EMS shipments grew 9.7 per cent in January over January 2020 and bookings increased 10.2 per cent from December 2020.

Contributing to sales growth will be the trend of OEMs and their EMS providers to build products in or near the markets where the products will be sold rather than in low-labor cost Asian countries. In fact, some manufacturing that had moved to China years ago has moved back to North America.

While year-in, year-out double-digit growth of North American EMS business probably is not possible, many EMS providers say

that mid-single-digit growth is achievable and there will be double-digit growth in certain segments. The idea of single-digit growth would have been considered unlikely early last year after production of many electronic products and systems were shut down or slowed because of the pandemic.

Ed Smith, CEO of EMS provider SMTC, based in Markham, Ont., Canada, said when COVID hit last year, "some parts of our business went to zero but overall we are going to grow year on year even with COVID." SMTC builds products and systems for a wide range of industries including medical, semiconductor, defense and aerospace, retail, test and measurement, telecom and networking and clean



When COVID hit last year some parts of our business went to zero, but overall we are going to grow year on year

Ed Smith, CEO of EMS provider SMTC

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energy, among others.

He said SMTC's avionics and restaurant payment systems business was hard hit especially in the second quarter of last year. Those segments are not back to pre-COVID levels but are recovering. Other EMS providers suffered sales losses early in 2020, but eventually recovered in the second half.

Shifting focus

"For some EMS providers, the pandemic had impacts on business other than lost sales. Rob Crawford, chief revenue officer for EMS provider Benchmark, said the pandemic resulted in Benchmark shifting "its focus in the connected point of care medical device space" because demand for certain medical products increased sharply last year.

"Technology trends related to patient-centric healthcare and healthcare solutions that don't require a visit to the hospital or doctor's office had been growing, but the pandemic accelerated the demand for it greatly," he said. Benchmark, based in Tempe, Ariz., builds devices for medical OEMs including connected and portable medical products, medical resonance and imaging (MRI) systems, computerized tomography (CT) scanners, optical imaging products such as endoscopes, among others. It also services, aerospace, industrial, defense and semiconductor capital equipment markets.

While 2020 was challenging for EMS providers, many contract manufacturers are upbeat about 2021. One reason is industrial IoT. Some EMS providers think there will be strong growth for the segment in 2021 and for several years after because of the rollout of 5G networks, which many industry analysts and electronics executives say is pivotal to IoT growth. IoT is not new, but it has not

grown as robustly as many executives believed it should have. For instance, Smith said he had expected IoT products and solutions would have posted double-digit plus growth, but "it pretty much has grown at the same rate as the overall market. I think everyone was waiting for 5G networks to be built. Now that 5G is getting to be more in place and starting to become mainstream, IoT will pick up," he said.

Analysts say 5G technology will be an enabler for many IoT applications. Once fully deployed, 5G will boost capacity. It will have data transmission speeds 10-100 times faster than 4G. It will also have very low latency, less than a millisecond compared to tens of milliseconds for 4G. It will allow more than 1 million devices per square mile to be connected to the Internet simultaneously.

When 5G infrastructure gets more prevalent, "I think we will get to double-digit growth at some point," said Smith.

IoT, 5G drive growth

Graham Scott, vice president of procurement for EMS provider Jabil, based in St. Petersburg, Fla, said enabling technologies such as 5G and IoT are already driving significant growth in industries such as automotive, connected healthcare, mobile, consumer packaged goods, retail (POS) and alternative energy."

He said as 5G adoption increases over the next few years, so will the ability for connected and autonomous vehicles to take advantage of 5G's high bandwidth and low latency benefits. Scott noted while 4G is well suited for most IoT applications in today's automobiles, the "full promise of 5G remains a few years away for connecting into these high-speed networks and infrastructure. Scott is also bullish about

alternative/renewable energy and smart power products used in data centers and electric vehicles. He said Jabil is finding opportunities in alternative energy. "We're seeing an increased demand for renewables, microgrids and EV charging." In addition, there are also opportunities in solar photovoltaic systems and energy storage, said Scott.

SMTC also builds battery charging products for the EV industry. "I think those markets will continue to grow for us faster than the rest of our markets," said Smith.

Scott added that there are also growing opportunities building systems that support data centers, the cloud and the retail industry, which is shifting to digital, no-touch customer experience and the IoT. AI and data analytics heighten the levels of consumer personalization and inventory precision, he said.

Other opportunities

While alternative energy, electric vehicles, 5G and IoT will help drive EMS providers sales over the next five years, EMS providers say there are also opportunities for sales growth with traditional customer segments. Computing and telecommunications historically have been industries that have outsourced production.

"That model will continue," said Crawford. However, higher value markets of medical, industrials, including semiconductor, and aerospace and defense "still retain a lot of internal manufacturing capacity," said Crawford.

"By our estimates, these higher value market sectors are less than 50 per cent outsourced" to EMS providers. "We see future growth in the North American market primarily from these sectors as they re-evaluate their

long-term investments in internal manufacturing," said Crawford. In addition, the medical segment and some industrial markets tend to be highly regulated and some products can't be built offshore.

Crawford noted in the recent past with more stringent tariffs, increasing international labor costs, and higher freight and logistics costs, some companies have rethought their entire global supply chain to balance flexibility, time-to-market, and overall costs.

"Some customers have chosen to maintain manufacturing in Asia for their Asian customers, and dual source those products in Mexico for their North American customers," said Crawford. However, it varies by industry and by global strategy of end customers, he said. Crawford added demand for outsourced manufacturing operations in Asia remains strong for many industries that ship products within Asia and export as well.

Smith noted that SMTC had operations in China but closed the facility in 2019 because of customer concerns about uncertainties relating to the prolonged impact of tariffs and microeconomic factors.

Facing challenges

While EMS providers are optimistic about business in North America, there are some challenges they face that could impede sales growth this year and beyond. Tariffs, the possibility of higher interest rates and logistics issues could impact both sales and profitability of EMS providers.

Logistics has been a problem for many companies since the pandemic began. "There are fewer planes in the air going internationally and more things being transported by ships," said Smith. "There's less room on boats, so prices have gone up." In

addition, the time to “load and unload has significantly increased,” said Smith.

Smith said interest rates “make me very nervous. If inflation increases, the Federal Reserve could raise interest rates. The federal deficit is also increasing and some EMS providers fear taxes could be increased.

One challenge for EMS providers is building a supply chain in North America that is as strong as the Asian markets, according to Crawford. He noted many of the electronic components used for manufacturing will continue to be fabricated in Asia.

“There is still some work to do to build a strong supply chain in North America for custom and build-to-print items to support further manufacturing growth in the region,” he said. Transferring manufacturing takes much less time than moving a supply chain. So, suppliers will need to adjust to meet the rising demands in North America, said Crawford.

Attracting new customers

A key and continuing challenge for any company is attracting and retaining OEM customers. To do so, some EMS providers believe they have to

offer customers more services and expertise to compete and grow their businesses.

Scott said Jabil will introduce value-added offerings, such as design services, and end-to-end supply chain services. He said offering such services will be important to the health of EMS providers.

Pandemics, trade policy uncertainty, climate change, geopolitical tensions and evolving macroeconomic conditions “will compel OEMs to re-examine their manufacturing and supply chain networks and continue to seek out EMS providers in support of their business initiatives.”

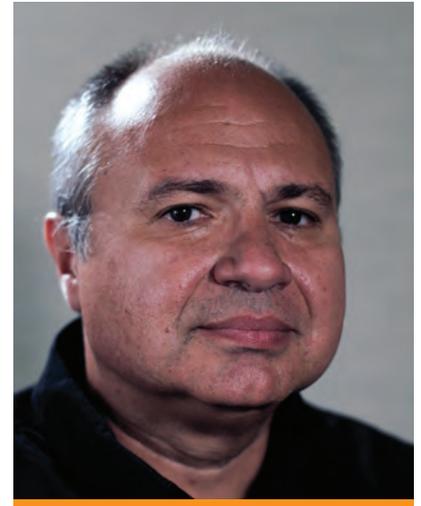
Flavio Magalhaes, senior vice president of operations for EMS provider Flex, said as product ideas become more complex, integrating more features and technologies is required. “Customers are looking for partners who have the advanced design and engineering capabilities to help turn these ideas into manufacturable products,” said Magalhaes.

EMS providers must have a deep understanding of the industry specific applications because “there are no one-

size-fits-all solutions,” he said.” You must have specific domain expertise to apply to your customers’ challenges.

He said an example is Flex’s “homegrown battery backup module for data centers that was developed by our industrial business.” He said there is a trend away from traditional backup systems to battery backup systems. “We can combine this capability with our in-house developed battery management system technology and offer it to our automotive electrification platform,” said Magalhaes.

Crawford said OEM customers are looking for additional support in design engineering and solutions to get their products to market faster and at a lower cost. “There is an opportunity for North American EMS providers who can deliver on these needs through innovative technologies, state-of-the-art manufacturing expertise, and an efficient supply chain, especially in medical, industrial, and A&D markets, said Crawford.



Customers are looking for partners who have the advanced design and engineering capabilities to help turn these ideas into manufacturable products

Flavio Magalhaes, senior vice president of operations for EMS provider Flex

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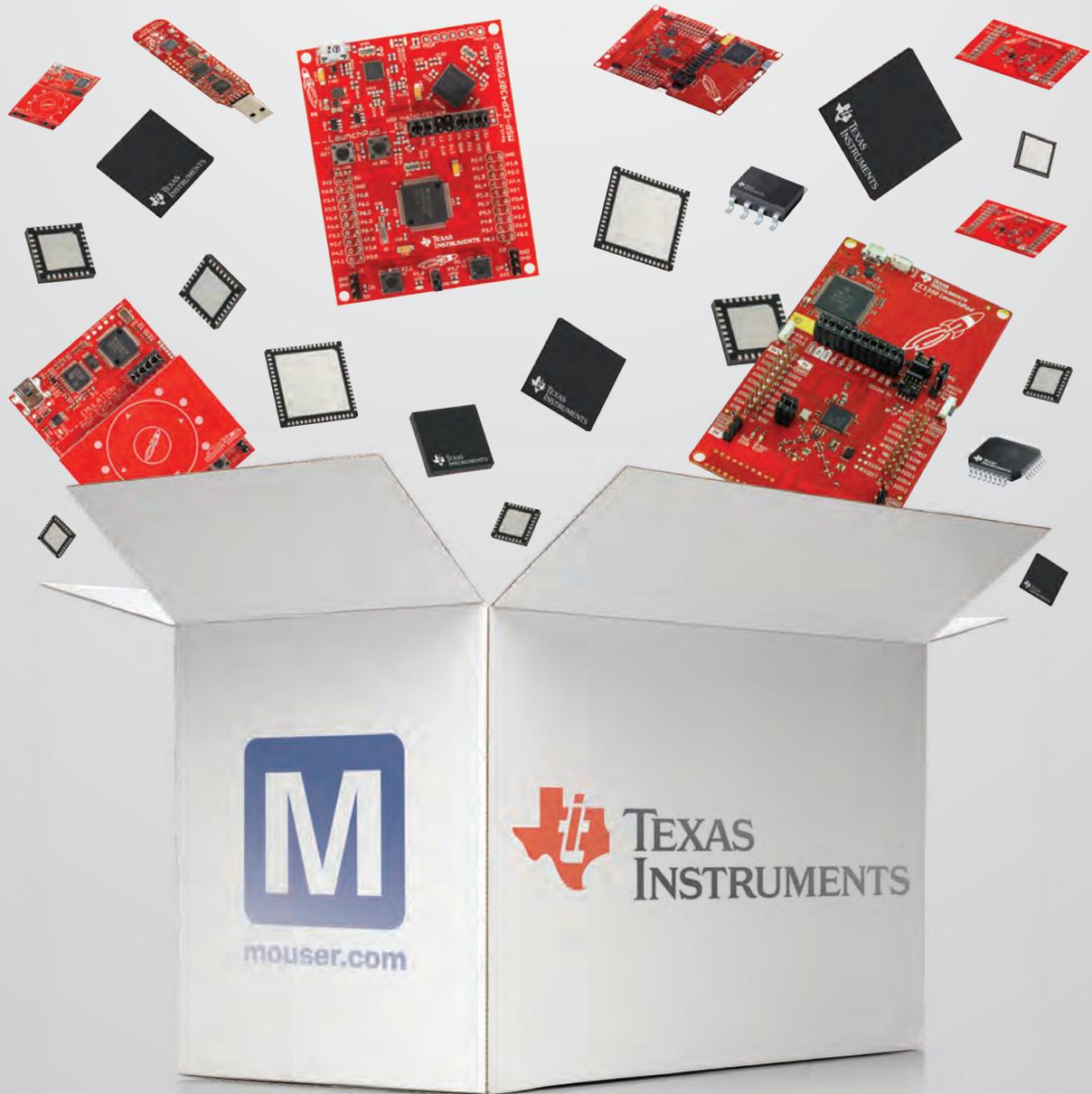
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Molex	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
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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
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Bel Magnetic Solutions	Bel Fuse	+1 858 676 9650	belfuse.com/magnetic-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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Cinch Connectivity Solutions	Bel Fuse	+1 507 833 8822	+1 507 833 8822	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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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	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
Stewart Connector	Bel Fuse	+ 1 717 235 7512	belfuse.com/stewart-connector	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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
OBSOLESCENCE / HARD TO FIND											
	Lansdale	602-438-0123	lansdale.com	Y							
	Lantek Corp.	973-579-8100	www.lantekcorp.com	M	186,000	\$22M	\$0	75.00%	5	62	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
Bourns	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
Signal Transformer	Bel Fuse	+1 516 239 5777	belfuse.com/signal	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	\$0	98.00%	50	1,000+	Y

Buyers' Guide

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
PASSIVES (Continued)											
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
Bel Power Solutions	Bel Fuse	Power & Batteries	belfuse.com/power-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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+
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.hsising.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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