

ELECTRONICS

SEPTEMBER 2020

sourcing

NORTH AMERICA

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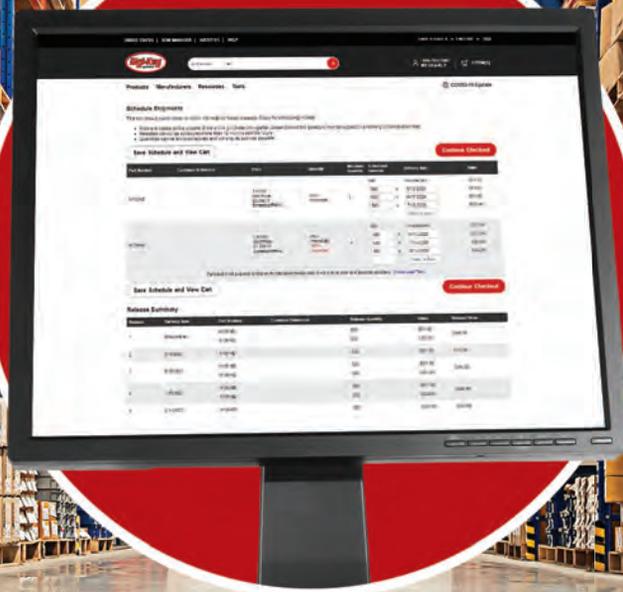
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 **ECIA MEMBER**
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On the cover – September 2020

Strategic sourcing, a juggling act?

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Buyers' Guide

All the facts and figures to help you buy



My IoT weight loss

The first couple of months of lockdown did not do my weight any favours. Snacking and a lack of exercise saw my weight seesaw between overweight and obese. So, when I heard a health professional say that the single most important thing anyone could do for themselves before the start of the winter flu season, was lose some weight, it was the catalyst I needed.

I have an engineer's mind, so any weight management process was going to need sensors, data harvesting, data processing, data visualisation and trend plotting. Sounds like IoT to me.

Measurements include exercise, calories, blood pressure, pulse rate, pulse wave velocity, oxygen saturation, BMI and percentages of fat, water, muscle mass and water. Data is gathered across all those sensors either continuously or intermittently. All devices are Wi-Fi enabled and deliver the data to cloud storage, where applications process the data and plot trends. I see what happened in the past, what is happening now and what could happen in the future. There is nowhere to hide.

In one month, my weight has fallen by one stone in what appears to be a sustainable, straight line graph. I should hit my Covid-19 fighting weight by flu season.

However, the real gain is my blood pressure. It now reads normal or optimal, continuously. I think Covid-19 and the IoT might just have extended, if not saved, my life. Odd really.

Jon Barrett

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Issue 96, Vol.11 No.09

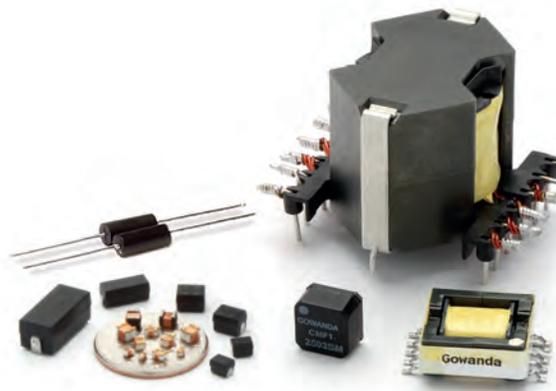
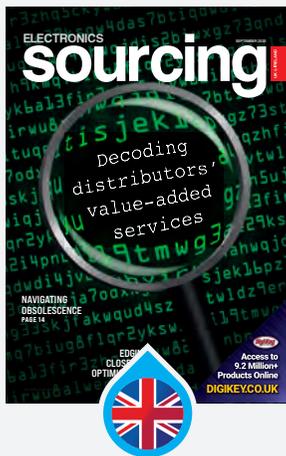
Published 12 times per year by MMG Publishing US Ltd

MMG PUBLISHING US Ltd
 Normandale Lake Center
 8400 Normandale Lake Boulevard
 Suite 920, Bloomington MN 55437
 Tel: 866.364.0951
 Fax: 952.378.2770
 @Electrosourcing

Printed in the United States
 © 2020 MMG Publishing US Ltd



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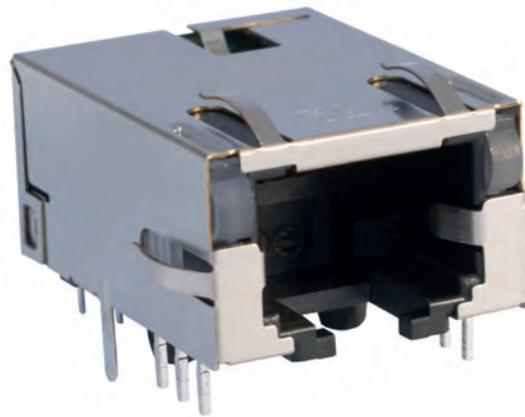
Nationwide distribution of inductors and chokes

Gowanda Electronics has signed a distribution agreement with TTI which becomes an authorized North American distributor of Gowanda's inductors and chokes designed for RF, microwave and power applications. Markets using these components include: military, aerospace, avionics, communication, medical, transportation and industrial.

Gowanda's president, Donald McElheny, said: "We are excited about our partnership with TTI and look forward to leveraging their expertise in the distribution of electronic components with our expertise in the design and manufacture of high performance inductors, to address the needs of the global electronic design community."

"The depth and breadth of TTI's distribution network will assure that Gowanda's high-performance inductors are readily-available to electronic engineers designing next-generation products for industrial, military and medical applications around the world."

gowanda.com



Marketplace for innovation

Digi-Key Electronics has announced the next level of single sourcing with the launch of Digi-Key Marketplace which includes bare PCBs, industrial automation, test/measurement and IoT solutions.

Digi-Key's executive vice president of digital business, Jim Ricciardelli, said: "Digi-Key Marketplace gives engineers and innovators across the US access to more product lines than ever before. As Digi-Key continues to evolve and respond to the industry's changing needs and demands, we are excited to expand into more and more adjacent product categories available with a full-service, one-stop shopping experience to serve the entire ecosystem of technology innovation."

Marketplace offerings are available in the US, with regional global launches anticipated in the coming months. Suppliers added to the Marketplace are vetted, quality technology partners. Suppliers include Siglent, Congatec, Rochester Electronics, and Pololu. Marketplace already provides access to over 300,000 additional products.

Marketplace products typically ship between one to five-days directly from the supplier. Products are clearly labeled Marketplace Product on the Digi-Key website.

www.digikey.com

Single port and eight port ICMs available in distribution

Bel Magnetic Solutions has announced single port and eight-port 2.5GBASE-T MagJack integrated connector modules designed to offer a cost-effective solution for upgrading end-product performance to multi-rate, NBASE-T Ethernet standards.

These ICMs are compatible with new multi-rate Ethernet PHYs and suit: next-generation 5G cellular equipment; low density, 2.5GBASE-T Ethernet switches; high bandwidth 2.5GBASE-T network interface cards; NBASE-T compliant products; and industrial controls equipment.

The ICMs are backward compatible to slower speeds and use industry-standard footprints and pinouts. The 2.5GBASE-T solution doubles product speed and bandwidth at nearly the same cost as 1GBASE-T solutions.

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In Brief

Twice the production space
Würth Electronics ICS is moving to a new site with twice the production space as the old facility. The company develops and produces electronic and electromechanical systems for mobile machines and commercial vehicles. The company is relocating from Dayton to Miamisburg, Ohio, roughly 15 miles south of the current site.
www.we-online.com/ics

South-eastern representation
Raltron has selected Electro-Rep Associates as its representative for the south-eastern US (North and South Carolina, Georgia, Alabama, Mississippi, and Tennessee). Products include crystal resonators, clock oscillators, VCXOs, TCXOs, OCXOs, VCOs, SAW and LTCC filters, ceramic resonators and a comprehensive range of IoT compatible antennas, RF cable assemblies, and RF connectors.
www.electro-rep.com

Sensor solutions
Sager Electronics has announced the addition of Sensata's Cynergy3 products to its line card. Cynergy3 is a manufacturer of reed relays and industrial sensors. Sager's supplier marketing and product manager, Pamela Berigan, said: "Cynergy3's product technologies combined with their flexible design and customization capabilities align well with Sager's strategy to provide effective product solutions to our customers."
www.sager.com

Factory automation ebook
Newark has launched an ebook to guide users through the proper implementation of industrial-grade cables in factory automation settings. Elements of this educational publication include information on components of cables, a cable selection checklist, descriptions of cables for factory automation available from Newark, and the necessary cable accessories to ensure optimal performance.
www.newark.com



20-bit ADCs ready to ship

Mouser Electronics is now offering Analog Devices' AD4021 and AD4022 differential successive-approximation register analog-to-digital converters. The 20-bit ADCs help engineers accurately capture high-frequency signals and implement oversampling techniques to alleviate the challenges associated with anti-alias filter designs.

Mouser states the components are high-accuracy, high-speed, low-power ADCs with Easy Drive features that reduce both signal chain complexity and power consumption while enabling higher channel density. The SPI-compatible serial user interface is compatible with 1.8, 2.5, 3 and 5V logic by using the separate VIO logic supply. The reduced input current, down to 0.5 μ A/MSPS, coupled with a long signal acquisition phase, eliminates the need for a dedicated ADC driver in many use cases.

Applications include automatic test equipment, machine automation, medical equipment and instrumentation and control systems.

mouser.com

New \$12m Cleveland facility supports essential industries

Nidec Industrial Solutions has opened a new facility in Cleveland, OH, which helped support essential industries during the Covid-19 crisis. The site is classified as an essential manufacturing facility because NIS manufactures Nidec Avtron Encoders and large-scale controls and automation systems for renewables and energy storage; oil and gas; steel; PPE production; healthcare equipment; US defense installations; port and specialty cranes; plus pulp and paper machinery.

The investment comprises 67,000ft² of office



Industrial IoT platform available to order

Newark has added Arduino's Portenta H7 to its range of single board computers. The device targets growing demand from enterprise, small-medium businesses and professional makers for low-code modular hardware systems to support IoT development.

The Portenta family provides low-power boards designed specifically for industrial applications, artificial intelligence, edge processing and robotics. The H7 module includes a crypto-authentication chip and communications modules for Wi-Fi, Bluetooth Low Energy and LTE, plus Narrowband IoT.

Newark's global head of technical marketing, Cliff Ortmeier, said: "The Arduino Portenta H7 combines outstanding performance and flexibility and can be used like any other embedded microcontroller board, or as the main processor of an embedded system. It's also capable of running processes created with TensorFlow Lite, so you could have one of the cores computing a computer vision algorithm, while the other delivers low level operations such as controlling a motor, or acting as a user interface."

newark.com

and manufacturing space. The facility is a three-tier building and brings together 130 employees previously housed in three separate facilities.

The facility features a purpose-built area for the assembly and testing of large industrial controls and automation systems, battery energy storage systems and medium voltage drives, plus a production area for Nidec's Avtron encoders.

www.nidec-industrial.com

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Investing in the North American supply chain

Rutronik's chief marketing officer, Markus Krieg, shares his thoughts on the North American component supply chain now and in the future

Q What changes have taken place since you took Rutronik USA's helm and what do you predict for 2021?

As I have been involved with Rutronik USA from day one, the key objective was to establish a warehouse location in the United States. This was a priority, as we recognized the importance of local inventory and quick shipping. The North American warehouse location allowed integration with manufacturers' supply chains, benefitting suppliers and customers.

This year has seen challenges but also opportunities to improve ourselves in 2021. The disruptions of 2020 allowed us to reassess our established methods of business and improve them for the coming years.

Q What developments and advances are being made at Rutronik USA and what is the long-term plan?

Firstly, we have increased local representations in every region of North America to offer better customer support. Increasing local presence is a key objective for the future. We have also substantially expanded our supplier line card.

Long term, we continue on our path to becoming an established North American distributor that customers can rely on. We will continue to increase technical support and become a partner who

accompanies its customers on new projects from the start.

Q Is Rutronik USA inventory ringfenced or do you draw on the stock from Rutronik's global warehouses?

Customers can take stock from any Rutronik warehouse in the world, for any North American franchise suppliers. This is a huge advantage for some of our international customers as we can fulfill their needs everywhere in the world, while upholding Rutronik's high standards. This is done with due respect to local supplier requirements and organizations.

Q Readers say lead times are extending. How is Rutronik managing this?

Our globally connected warehouses guarantee high levels of available inventory worldwide. Moreover, our ordering processes and stock policies are globally aligned, which allows us to foresee and react to lead time changes promptly. The ability to order components from any Rutronik warehouse worldwide, in combination with our logistics and stock handling, provides customers with great product availability and flexibility.

Q What are your thoughts on how the electronics supply chain will evolve, especially regarding reliability?

The recent outbreak of Covid-19 has shown how

sensitive supply chains can be and how things we took for granted can change within days. Higher inventory levels offer short time relief, but keeping supply chains operating remains a key responsibility for the industry. A reliable supply chain requires planning and constant communication with customers and suppliers in times of disruption. We are constantly looking for ways to improve our supply chains and protect them from external and internal disruptions.

Q The semiconductor sector continues to see acquisitions. How has this impacted component availability at Rutronik?

We recognize mergers and acquisitions of this magnitude create a challenge for customers, as it limits choice. Our priority is to aid our customers in these situations by providing technical support and available inventory.

www.rutronik.com



Rutronik's chief marketing officer, Markus Krieg



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The role of independent distributors has expanded

Electronics buyers have always considered independent distributors to be necessary sources for a hard-to-find and obsolete parts, but some are now seen as important supply chain partners as they offer more services



James Carbone

Many electronics purchasers have always turned to independent distributors during times of shortages when parts such as memory ICs, multilayer ceramic capacitors, chip resistors and other components went on allocation because of excessive demand and limited production capacity.

Other buyers would make opportunistic purchases from independent distributors even when parts were not in short supply because they could often buy components for less from independent distributors than from authorized sources. However, while independent distributors are still the go-to source for shortage parts and for lower-priced parts, some purchasers are using independent distributors on a more frequent basis and regard them as strategic distributors that help them reduce cost and supply chain risk.

Some independent distributors help customers reduce cost and risk through value-added, supply chain, inventory management programs, which have resulted in greater customer loyalty and closer strategic relationships with customers.

One independent distributor that provides customers with such services is Smith, based in Houston, Texas. Todd Burke, president, Americas, said the distributor has always provided its customers with end-of-life and lifetime buy support.

But it's overall role has "evolved

significantly over the years and now Smith has grown with our customers and provides comprehensive supply chain solutions," he said. Such solutions include vendor managed inventory (VMI), information technology asset disposition (ITAD), and excess inventory management.

"Smith acts as a strategic partner to our customers rather than solely as a distributor," said Burke. He said Smith is a "strategic ally" to many customers around the world. Besides services, it can also provide market intelligence customers.

"The reach of the services that we can provide has also expanded over time as we've continually invested to grow our global footprint, Burke said. Smith has 16 offices around the world that are connected by a proprietary trading and operations platform which gives Smith "unparalleled visibility into our industry. Smith provides our customers with valuable market intelligence," he said.

Of course, Smith is not the only independent distributor offering value-added and supply chain services. "We are bonding inventory and managing a ton of inventory," said Carleton Dufoe, founder and CEO of independent distributor NewPower Worldwide, based in Nashua, NH. "We are shipping to all their ODMs and EMS partners around the globe. A lot of our customers don't even own factories or warehouses themselves. We manage all their



Steve Calabria, president and CEO of independent distributor **PC Components**

"Many companies consider us to be a strategic supplier and buy from us on a regular basis"

inventory," he said.

Partnering and purchasing

In some cases, NewPower handles purchasing for customers. "We have customers that want us to be their purchasing arm," said Dufoe. "They want us to buy from the manufacturer. They don't want to deal with the manufacturer because they don't have the resources to deal with it," he said.

"We are doing a lot of strategic things for customers and we have pretty strong partnerships with them, said Dufoe.

More customers value the role of independent distributors "a heck of a lot more than in the past," he said. "They now look at us as strategic partners." In the

past, independent distributors were often viewed with suspicion by buyers because some independent distributors have sold counterfeit or substandard parts sourced from unreliable sources.

However, major independent distributors have intensive screening and have invested in testing equipment to detect fake or substandard counterfeit parts. In addition, many parts sold by independent distributors have been purchased directly from authorized suppliers. "The majority of the time we're buying through direct channels: the component manufacturer and authorized distributors," said Dufoe.



Building trust

Because reputable independent distributors have taken steps to reduce the risk of parts, they have built trust with many OEM and EMS provider customers. "Many companies consider us to be a strategic supplier and buy from us on a regular basis," said Steve Calabria, president and CEO of independent distributor PC Components (PCC), based in Seaside Park, NJ. Calabria is the former president of the Independent Electronics Distributor Association who led an effort that released IDEA-STD1010B, an overhaul of the original standard 1010B for inspection of potential counterfeit parts.

One reason that PCC has developed close relationships with customers is that the company has 1 billion parts in stock. It is not a broker but a stocking distributor. "If a customer wants a part and we don't have the part in stock, we don't try to look for it," said Calabria. "We just tell them we don't have it. If we have 2,273 pieces of the part and we tell them we can't get more. Buyers know that when PCC lists a product in its inventory it is there and PCC does not have to find another source for it.

Calabria said there are two types of customers. "Some are

motivated by cost savings and they are going to buy from independent distributors because they get a better price," he said. "There is a core of these companies that place orders with companies like PC Components at least once a week for products as a cost savings.

If an independent distributor has stock of a part, "he knows the price franchise distributors are selling those parts for and he's going to offer it at about 30-40 per cent less below franchise's lowest price because that's what he needs to do to sell it," said Calabria.

"However, today the driving force today has shifted from cost savings to shortages," and shorter delivery times, said Calabria. If a part is not available from franchise distributors because it is obsolete or because of long lead times, buyers go to independent distributors because they want to get a better delivery time.

"They don't want to wait 26 or 52 weeks so they look for an independent distributor that has inventory," said Calabria. "If an independent has the parts on the shelf and ships it today, the customer can have it tomorrow. That is definitely where the focus of the business has gone," he said. He said shortages and the

Carleton Dufoe, CEO and founder of NewPower Worldwide



"We have customers that want us to be their purchasing arm"

need for get parts as quickly as possible is the reason PC Components "keeps hearing from companies we never heard from before. Many are newer companies who need a part and don't want to wait 20 weeks for it so they place the order with us," he said.

Some customers expect value added services. "We do quite a bit of value-added service. We are happy to schedule orders, give blanket pricing and break packages for the customer," he said. If a customer doesn't want to buy an entire reel or tray of parts, PC Components will break the reel and re-reel with the number of parts the customer wants. "We provide reeling and splicing services," he said.

He said his company also can provide testing services using a third-party test lab specified by the supplier.

A mission-critical task

Many customers turn to independent distributors because they need old components to support equipment that have very long product lifecycles and is still in demand.

Such equipment includes some defense and aerospace systems, medical equipment and communication infrastructure gear among other types of equipment. As result a buyer

needs to keep finding sources for the discontinued obsolete parts that are still used in such systems.

"It used to be someone would determine that an obsolete part would be needed for a year, then the buyer would do a last time buy," said Mike Tonneson, president of Arcadia Components, based in Salt Lake City, Utah. However, often the component is needed for much longer because the system that the part is used in remains in high demand for years.

"It might be a microcontroller needed for magnetic resonance imaging (MRI) machine, he said. The chip may be needed for seven, eight or nine years after the lifetime buy, he said.

If the part cannot be found, it could result in a production line going down. "What can be more strategic than keeping a factory from stopping," said Tonneson.

In addition, the MRI machine may still have decent demand and be profitable for the company, making it. The MCU may cost \$30, but the MRI product may sell for \$1 million, he said.

So being able to source the MCU may not only be strategic, it could be "mission critical," said Tonneson.

Jump in concerns regarding supply chain

ECIA's chief analyst, Dale Ford, introduces update 10 of the manufacturer and distributor coronavirus survey ended August 17

The past month has revealed the triumph of hope (and a lot of government stimulus money) in battling the economic impact of Covid-19. In the manufacturing sector, the ISM Purchasing Manager's Index (PMI) registered 54.2 in July 2020, a figure that indicates expansion in the overall manufacturing sector for the third month in a row after a contraction in April.

The health of the electronics components supply chain, as measured by ECIA's most recent survey, reflects the continuation of relative stability and hopeful economic uncertainty, even while concerns have increased in many sectors of the supply chain and segments of the market. Electronics component revenues in the first half of 2020 were much more solid than originally feared and reasonable expectations for the second half remain. However, the ability to manage the pandemic continues to be an ever-present factor for supply chain managers.

Survey responses show a significant jump in concerns regarding the health of the electronics components supply chain. While concerns about end-market demand remain high, the index of concern regarding raw materials disruption, shipping and logistics disruption and electronics components production jumped from their lowest levels measured in July back to the peak levels last seen in April and May. Concerns regarding electronics systems

manufacturing continued to increase from the lows seen at the end of May.

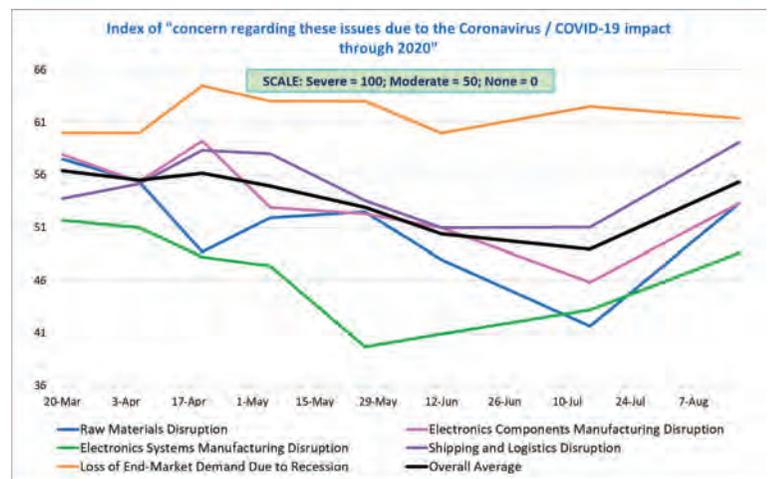
In contrast, the index for the impact of Covid-19 on the ability to supply passive components and semiconductors on time saw a significant reduction and electro-mechanical components only increased slightly since the latest survey. There continues to be some cognitive dissonance in the survey results between the impact on 'on-time' delivery and the overall trends for increased lead times due to Covid-19. The index for all three major component categories registered a notable jump in expectations for increased lead times.

On the impact of government quarantine orders on a company's workforce there was a meaningful shift from 'moderate' to 'minimal'. However, the increase in those reporting 'severe' and 'serious' along with the decrease in those reporting 'no impact' resulted in an increase in the overall index measuring workforce impact.

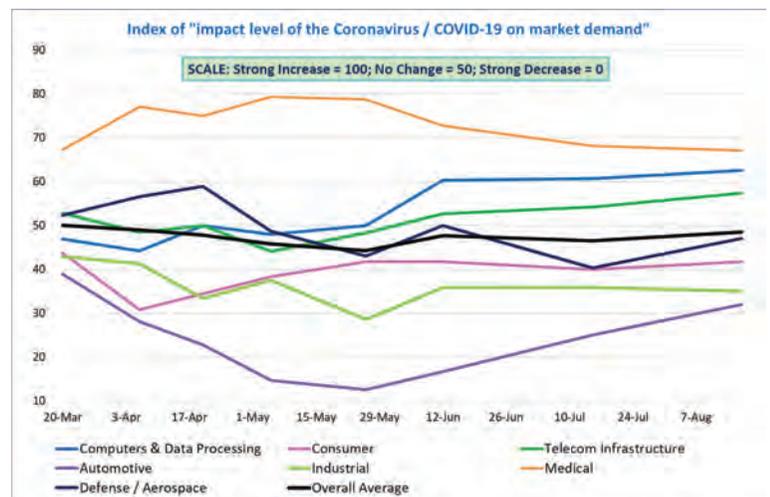
The outlook for individual end markets saw automotive electronics rebound. The brightest outlooks for end-markets continue to be found in medical electronics, computers/data processing and telecom infrastructure. Confidence in order backlog consolidated around 'average' for all three major component categories. Between 70 and 78 per cent reported 'average' confidence overall in the three component segments, a retreat from notable shares

at 'strong' and 'very strong' reported in prior surveys.

www.ecianow.org

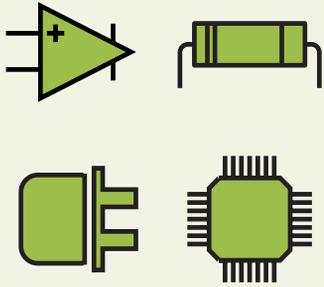


Index of supply chain concerns (Source: ECIA)



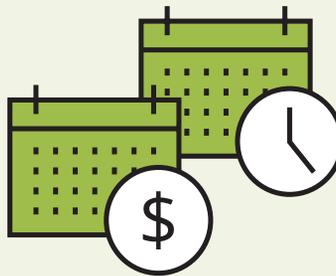
Index of impact on market demand (Source: ECIA)

Top 5 Reasons to Use Authorized Distributors for Purchasing

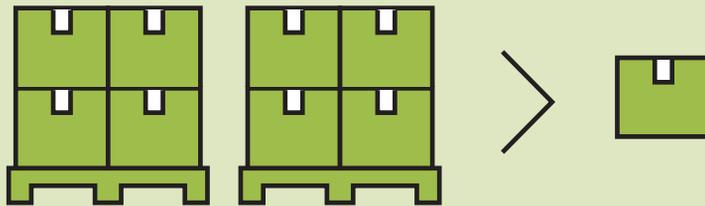


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Supercapacitor technology comes of age

TTI's supplier marketing manager, Pat Denton, reviews the development of supercapacitors and how they're poised to change the ways electronics are designed

While supercapacitors, or electric double layer capacitors (EDLCs), have been around for a while, they are just now gaining a wider acceptance. Reasons for this delayed acceptance include more suppliers, lower price and more packaging options. Also, suppliers have improved component specifications to include higher voltages and wider operating temperatures.

Supercaps, also called UltraCaps or GoldCaps, offer a much higher capacitance

value. Think farads rather than pico or microfarad but with lower voltage limits.

Single cell supercaps range from 2.5 to 3V. Single cell packaging includes: cylindrical radial, 13mm button cell, larger snap-in and screw-terminal packages and surface-mount v-chip. Large-can, single cell supercapacitors are available in an unbelievable 4,000F

Lighter and more capable
Supercaps developments

bridge the gap between electrolytic capacitors and rechargeable batteries. New developments are pushing the crossover further, with single cell hybrid supercaps now available up to 3.8V. Manufacturers can put two or more cells in series to create supercapacitor modules offering 5V to over 200V.

Supercap modules can be as big as a truck battery or a full computer server rack, with almost 100 individual cells in each. Supercapacitors also deliver weight savings: while visiting a customer recently, I was pleasantly surprised at how little a module containing 16 large, snap-in supercaps weighed. Regarding temperature, many supercapacitors offer an operating temperature range of -40 to 85°C, far better than batteries.

Longer lifespan

Perhaps supercaps' biggest advantage is they can be charged/discharged many more times than a battery. Where a battery may be rated for 500 to 1,000 charge cycles, a supercapacitor can deliver 20,000 charge/discharge cycles. Also, supercaps charge in seconds or minutes, versus hours for batteries.

Longer lifespan also delivers maintenance savings. Case in point, real-time clock back-up is the number one supercaps application. In many cases, the supercapacitor lasts over a decade, effectively the life of the product.

On a larger scale, manufacturers have made modules with the form factor of car and large truck batteries. These modules can start a truck, boat or generator, after which a lead-acid battery takes over. Supercaps extend lead-acid battery life and offer plenty of starting power, even in sub-zero temperatures.

Aiding electrification

In one final application example, there is an opportunity to install supercaps at bus stops. Power from those modules could assist with power-heavy tasks, such as opening and closing doors, further preserving the vehicle's drive batteries. Meanwhile, thanks to the fast-charging capability, those capacitors will be recharged while the bus is driving to the next stop.

As electrification comes to other types of vehicles, more applications for auxiliary supercapacitors can be found. For example, garbage trucks could use supercap modules to run their compactor arms instead of revving their engines to generate the extra power.

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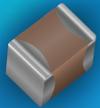
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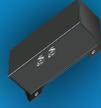
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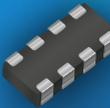
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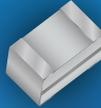
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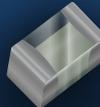
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An active approach to passive components

AVX' vice president sales Americas, Bob Gourdeau, walks readers through a range of subjects from cost management to 5G technology

Q How is AVX guaranteeing product supply during current market conditions?

AVX has multiple manufacturing locations, with multiple shifts running around the clock. In addition, the company uses monthly and quarterly forecasting to ensure it stays ahead on production and capital investments, like the recent expansion to the Malaysia facility.

Q How does the organization remain cost competitive?

AVX focuses on investing in the right type of capacity, in the right regions. Sales representatives keep our SGA at industry lows, affording the company a professional sales force to ensure it remains competitive.

Q How does AVX compete with broad line manufacturers when purchases are looking for vendor reduction?

AVX specializes in its core technologies and continues to expand them. The company acquired Ethertronics to provide antennas solutions and integrated American Technical Ceramics to provide their sales channel a complete line of RF components. Magnetics, diodes, circuit protection and connectors are also offered. With the acquisition of TT Electronics' AB Elektronik Division, AVX reinforced its position in automotive mechatronics which is growing exponentially.

Q How is AVX managing recent regulatory and tariff changes?

AVX has a diversified manufacturing strategy, with multiple locations for different products. The company is always looking for lowest cost, lowest risk options for front-end and back-end processes while optimizing the supply chain.

Q Regarding price and availability, should buyers be focusing on reduced case size MLCC?

Reduced case size MLCCs are preferred since there is more capacity available and prices can be lower. However, it is important to understand the electrical and thermal characteristics of the larger parts to ensure there is no degradation on performance by reducing case sizes.

Q How is AVX positioned to meet HEV/EV requirements for DC Link and snubber capacitors at competitive cost points?

Our development team has been involved in this industry since the beginning and our segmented films provide reliable capacitors. We also have invested heavily in the Czech Republic for a cost effective, skilled work force.

Q How are lead times being managed during the pandemic?

Lead time varies with demand, market conditions, economies and, more recently,

the pandemic. Manufacturers are working hard to maintain consistent lead times. Distribution offers a valuable service by maintaining stock and managing supply chains.

Q How is AVX deploying technology to meet 5G and IoT needs?

AVX listens to leaders in these industries and analyzes their needs. Then a strategy is made to deploy products to meet these demanding applications.

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AVX' vice president sales Americas, Bob Gourdeau



Reduced case size MLCCs are preferred since there is more capacity available and prices can be lower

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Seeds of change



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

Future technology leadership • By John Denslinger

Made in the USA was once the preferred branding for manufactured products. It signaled high quality, American ingenuity and skilled jobs for citizens. Following the post war re-build of Japanese and German economies, the advent of strategic trading blocs such as NAFTA and EU, and the rapid industrialization of South Korea, Taiwan, Singapore and China, the world became equally adept at producing durable goods. One might say it was a natural consequence of advancing societies. Now 50 plus years later quality, ingenuity and skilled jobs are widespread on every continent. So too are sophisticated supply chains that tie it all together.

The seeds of change were visible almost a decade ago. After manufacturing shifted offshore, not all experienced the promises of low cost and high quality. It's only been the last few years where US based companies stepped up reshoring fueled by corporate tax cuts, easing of onerous regulations and ready access to low cost capital. This coupled with increased costs of operating overseas, a known need to lean existing supply chains, and a desire to avoid the tariff shockwaves has executives recalibrating well-established but complicated global supply networks.

Enter the black-swan of a lifetime: Covid-19. Perhaps nothing has disrupted supply chains more than factory lockdowns, port closures, rising transportation costs, reduced demand and shipping delays. Countermeasures varied widely by country and unfortunately were as much politically motivated as medically driven. Consequently, the risk picture just keeps getting murkier.

On the brighter side, a recent Thomas Insights article cited automotive, aerospace, machined parts and electronics as the most likely sectors benefitting from reshoring. Each is a strong contributor to GDP, as well as, job creation. For perspective, a recent analysis of the current US trade deficit and its impact on employment concluded there are three to five million US manufacturing jobs still offshore. That's a huge

potential particularly at a time when we need to re-vitalize our post-COVID economy.

Electronics should lead the way and it is verging on real, stateside growth, especially semiconductors. Since 2000, according to the SIA website, the US was the only country of the top eight semiconductor manufacturing countries whose government provided no grants, no subsidies, no tax incentives or other assistance to domestic manufacturing. Not coincidentally CAGR has been the weakest of the bunch.

Congress was visibly silent for too long. Finally, a recognition that semiconductor research, design and manufacturing are essential to national security and pre-eminent leadership in critical technologies. Legislation is moving forward on two fronts with billions of dollars being proposed. First, there is the American Foundries Act with bi-partisan sponsorship in the Senate. The Act incentivizes building new fabs and R&D facilities, as well as, funds for construction and modernization of fabs that directly support national security, intelligence and critical infrastructure. The second, CHIPS for America Act, is a bi-partisan bill co-sponsored by House and Senate members. This Act offers Federal grants for new domestic semiconductor manufacturing facilities, a refundable investment tax credit for purchase of equipment, establishes a National Semiconductor Technology Center for research and prototyping advanced chips, and creates a center for advanced semiconductor packaging. Both of these bills have broad industry and trade association support.

Whether reshoring operations, growing domestic semiconductor capacity or encouraging foreign direct investment like TSMC's \$12B announced fab in Arizona, the challenge is steep and investment enormous. It seems the Fed is finally serious about localizing and protecting semiconductor expertise. Collectively, these seeds can preserve America's future technology leadership.

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Tapping into interconnect specialist resources

ECCO argues that sourcing from specialist interconnect distributors means buyers get more help when the going gets tough

Buyers sourcing off-board connectors know available inventory can be important because these connectors are often part of a cable or harnesses system and can involve options bought as the last part of a 'system buy'. Usually, these orders have more options and variables than the core BoM and PCB which are more locked down.

Additionally, they may be hard to second source if the engineers tested and chose one approved supplier due to time and resource constraints towards the end of a project. This can leave procurement professionals in troubled waters if issues arise. To address inventory availability issues, specialist distributors typically build

connectors themselves allowing for assembly times and taking advantage of component inventory that is stock-to-build (STB). STB capability from the likes of TTI, Electro Enterprises and ECCO gives a broader account of available SKUs to make since the connectors are not assembled, glued and finished. This gives a

specialist distributor more flexibility on inventory and part combinations. By doing so, those distributors expand the reach of their inventory profile and provide greater service and supply capability to customers.

Specialist interconnect distributors can also perform value added services to assist supply chain and inventory management. Those include customer specific inventory bonding; just-in-time (JIT) software and apps for re-ordering; Kan Ban functionality; consignment programs (popular with wire products); special packaging for marketing or unique security/storage needs; and blind shipment services where direct ship to



President of **ECCO**, Bernard Gizzi

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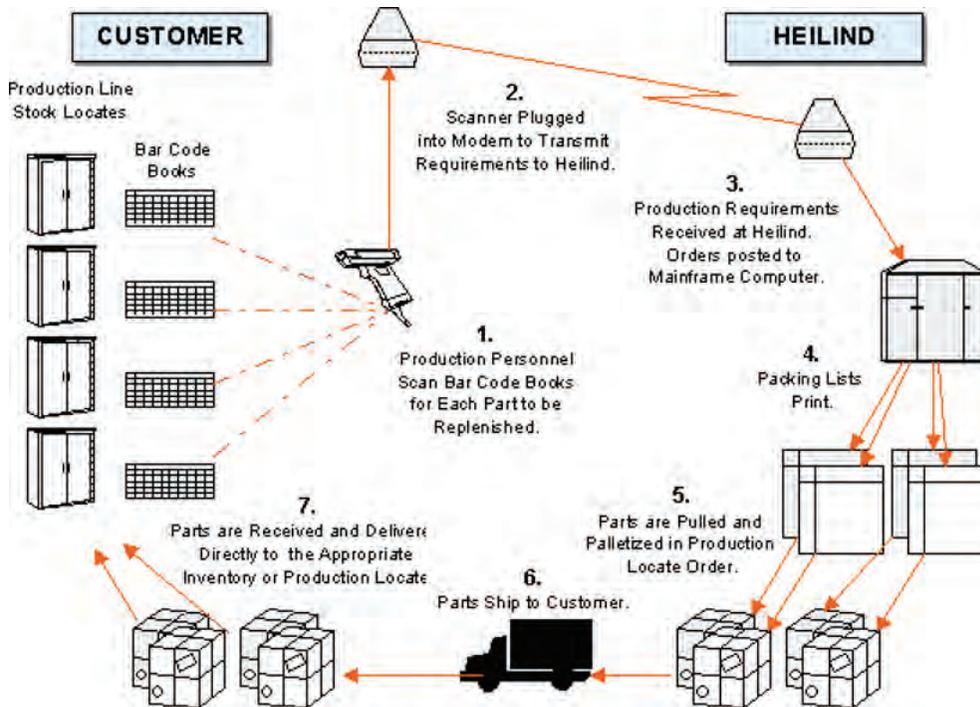
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MIL-DTL-38999 Series II
MIL-DTL-38999 Series III
MIL-DTL-5015 Series I E/F/R
MIL-DTL-5015 Series III
MIL-DTL-83723 Series III
MIL-C-39029
MIL-DTL-83513 Series
MIL-DTL-24308 Series Dsub
MIL-DTL-22992 Class L

Many connector series are supported via building or selling a manufacturer's completed connector

Connectors



an end customer makes sense.

Obsolescence avoidance and lower labour costs contribute to procuring and using those services, thus helping companies stay competitive and reallocate their resources to other areas of expertise and competitive differentiation.

Knowledge is another area where specialist interconnect and electro-mechanical distributors excel. The table on the opposite page many series of connectors that ECCO supports, whether by building

or selling manufacturers' completed connector. By assembling the various parts of a connector, specialist distributors have an innate know-how regarding form, fit, and functional equivalents or options that might work in a customer's design. This allows for more flexibility in sourcing, pricing and performance for procurement professionals.

In summary, to address the problems of inventory availability and part complexity, look to

distribution specialists who can assist with more expansive inventory offerings via STB capabilities, additional supply chain programs and assembly services for JIT support and lowered carrying costs, and overall knowledge of the product. Acting as an extension of your procurement team via a more focused resource with these commodities are what interconnect specialists will do for you.

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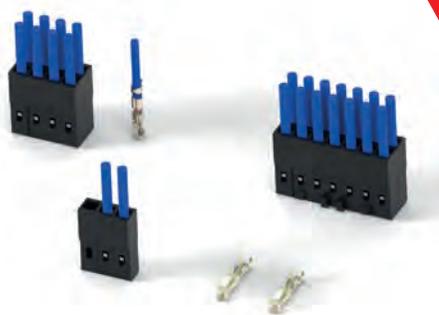

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Connector products

Wire-to-board connectors free up PCB space



TE Connectivity is freeing up PCB space with its new compact Ampmodu wire-to-board receptacles with crimp contacts and shrouded headers. With a center line distance of 2mm, they occupy 38 percent less space than connectors with a 2.54mm centerline.

Receptacles offer a variety of housing styles and crimp contacts for wire sizes between 30 and 24 AWG. Receptacle assemblies provide a large, reliable contact surface between the header pin and receptacle contact by using phosphor bronze contacts with dual cantilever beams with gold or tin

plating. Housings are available in a single and double row, from two to 25 positions per row, and wire termination is easily accomplished with TE hand tooling or applicators.

Common applications include PLC / IO devices, industrial robotics, servo drives, industrial automation and control equipment, material handling equipment, instrumentation, test equipment, and building and home automation devices.

te.com



First ESA-certified D-sub backshell and haloring

C&K is the first manufacturer to seek and obtain European Space Agency certification for a backshell with haloring. The D-sub lightweight backshell is a key element in protecting connectors and cables in space applications with tight weight and space constraints.

The backshell and haloring are available in two quality grades: ESA/ESCC certified and engineering model. Both models focus on the Space market, with applications in launchers, satellites and spacecraft.

With 11 outlet shapes among six different shell sizes, plus a choice of gold or nickel finish, C&K is confident there is a solution for any consumer. This variety comes with reliability, compact size and easier tolerance management.

Global product manager, Rémi Antoine, stated the idea came to him after noticing half the harnesses in space applications use haloring equipped backshells, but no supplier has suggested a solution with space agency approval: "By offering certified products, we guarantee customers a level of quality corresponding to their expectations."

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Impact of pandemic on component supply chains

Lansdale reviews the impact of Covid-19 on JiT production lines and what some organizations are doing to mitigate problems

It is not a good time to practice just-in-time manufacturing. With Covid-19 causing a worldwide pandemic, previously only imagined in sci-fi movies, supply chains can be instantly interrupted by a single production line worker testing positive or a critical supplier going bankrupt.

Since the introduction of JiT and lean manufacturing in the 1980s, most American manufacturers have embraced the idea of minimizing in-process inventory by having product delivered to the production line exactly when required. Once fully implemented, this process had positive effects within factories, forcing operations to balance workloads to reduce inventory building up between operations. This also had the effect of improving lead times, cycle time, product quality, production throughput and disaster recovery, ultimately reducing costs. The most important factor in its success was dependable material suppliers ensuring production lines had the material they needed, when they needed it. Any delay stops the entire

production line, as there is no inventory buffer to draw down.

The pandemic is affecting the material supply chain. Most electronics businesses are considered essential and allowed to stay open. However, they are still impacted by labor shortages and their suppliers' increased lead/cycle times. Some companies have found it necessary to shut down due to low sales and cash flow problems, in spite of government support. Travel restrictions can make it difficult to get critical services such as equipment maintenance or government/ISO quality audits. These problems will be with us until a vaccine is developed and distributed widely enough to control community spread. Thus, manufacturers must constantly reevaluate their supply chain support.

A large defense contractor recently modified its purchasing policies to allow its suppliers to deliver all open purchase orders early. They are willing to store inventory for years, if necessary, to

ensure it is available when their production line needs it. Before this change, they had a disciplined delivery requirement that only allowed delivery within days of the scheduled date. Clearly, they must have recognized the pandemic's impact on their suppliers and decided to increase inventory of important material.

The health of the defense industry supply chain is a manufacturer's highest risk, especially during a pandemic. Many of their suppliers are smaller businesses that have supported maintenance and new builds of older designs that are still in service from the 1980s and 1990s. The volumes are too low for the defense contractors to have second sources to protect them from the loss of a supplier. Therefore, defense contractors should carefully monitor their suppliers and consider volume buys to cover themselves for the next few years as we deal with the pandemic's effects and aftereffects.

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Single device eliminates the need for additional current regulation

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Top View



Bottom View

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POPULAR JFETS: 2N4416, 2N4416A, 2N4391, 2N4392, 2N4393, 2N3819, CMPFJ175, CMPFJ176

Silicon Carbide Schottky Rectifier die: CPC04-CPC15

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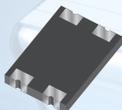
Extremely low profile Schottky Bridge Rectifiers

CBRDFSH series features 1.22mm BR DFN surface mount case

- Multiple voltage and current options to satisfy design challenges (40V, 60V, 100V | 1A & 2A)
- BR DFN case has a **54% lower profile** than Central's HD DIP case
- Ideal for the latest applications requiring highly efficient, space-saving Schottky bridge rectifiers



Top View



Bottom View

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Sixteen-bit MCU market will decline as demand for 32-bit devices grows

Sluggish demand will result in continued price erosion for 16-bit microcontrollers



James Carbone

Electronics purchasers can expect a buyer's market for 16-bit microcontrollers over the next several years as weaker demand and ample supply will result in lower prices.

The average price for a 16-bit MCU fell 10 per cent in 2019 to \$0.61 and the price will decline another 5 per cent to \$0.58 in 2020. Over the next four years, 16-bit MCU tags will fall 3.6 per cent per year declining to \$0.53 in 2024, according to researcher IC Insights.

The decline in average selling prices will result in the 16-bit MCU market falling from \$4 billion in 2019 to \$3.41 billion in 2024. Unit shipments will decline 9 per cent from 6.5 billion in 2019 to 5.9 billion this year.

Analysts say the main reason for the sales decline of 16-bit MCUs

and the overall microcontroller market in 2020 is the coronavirus pandemic. Most industry analysts thought that 2020 would be a bounce back year for microcontrollers prior to the COVID-19 outbreak. In 2019, the overall MCU market was down because the automotive industry, the biggest driver of MCU sales, had a down year because vehicle sales fell. A little more than one third of MCUs used in automotive systems are 16-bit, while 47 per cent of controllers in vehicles are 32-bit devices and 19 per cent are 8-bit controllers, according to IC Insights.

MCU sales also declined because of a weak economy in 2019. "Last year the economy was teetering on recession," said Rob Lineback, senior market research analyst for IC Insights, based in Scottsdale, Ariz. At the beginning of this year business seemed to improve and

"everyone was expecting 2020 to be a recovery year," he said. But when coronavirus hit, factories shut down and demand for some end equipment and some components declined. While many companies are expecting business to pick up in the second half of 2020, "it is going to end up being a down year, but not terribly down," said Lineback.

How disappointing

"It's very disappointing because we were expecting 11 per cent growth for 2020 before coronavirus hit," said Susie Inouye, director and founder of research firm Databeans in Reno, Nev. "Because the market was down in 2019 and because of inventory issues, I was expecting a bounce back. It certainly doesn't look like there will be much of a pickup in the rest of the year," she said. However, many companies are saying there will be an

improvement in the third quarter.

In fact, chip demand from some equipment segments has been strong during the pandemic. She noted that computer sales have increased because more people are working at home and children are virtually learning at home. As a result, many people have opted to upgrade their home computers or buy additional computers for their children.

Chip demand has also been boosted by higher sales of medical and communications infrastructure equipment and defense systems.

Industry analysts and MCU manufacturers now say that the recovery for the MCU market which was expected in 2020 will occur in 2021. "Our assumption is there will be a vaccine developed and deployed" by then and

By the Numbers



-3.6%

The annual price decline for 16-bit microcontrollers over the next five years



0.9%

The annual growth rate for unit shipments of 16-bit microcontrollers over the next five years



\$3.41 billion

The size of the worldwide 16-bit microcontroller market in 2020



-2.8%

The forecasted annual rate of decline for 16-bit microcontroller revenue through 2024



\$0.58

The average selling price for a 16-bit microcontroller in 2020



\$3.41 billion

The forecasted size of the worldwide 16 bit ago control the market in 2024



business, including MCUs, will return back to normal next year, said Lineback.

While the overall MCU market is forecast to recover in 2021, the 16-bit MCU segment will decline about 1 per cent in sales, although unit shipments will rise 3 per cent, said IC Insights. The total microcontroller market, including 32-bit, 16-bit and 8-bit MCUs, will increase 5 per cent in sales and 4 per cent in units in 2021. However, most of the MCU market will be driven by the 32-bit segment, which will post a 9 per cent increase in sales and 8 per cent rise in unit shipments, according to Lineback.

32-bit gains share

Inouye said more electronics applications are migrating to 32-bit MCUs from 16-bit and 8-bit. "Thirty-two MCUs are gaining market share because the prices are dropping," said Inouye. "Thirty-two-bit and 16-bit for 20 are basically the same price. The average selling price is about \$.62," she said.

As a result, 32-bit MCUs are being designed into more systems because they deliver more

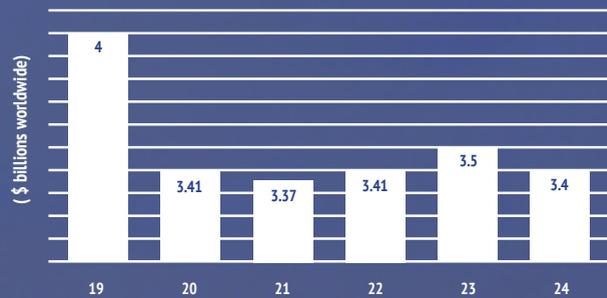
performance for the same price. "Thirty-two bit is eating up the market for 16-bit and 8-bit," she said.

The migration of 32-bit MCUs will mean the 16-bit segment will suffer declining sales through 2024, according to IC insights. Sixteen-bit MCU sales revenue will decline an average of 2.8 per cent per year through 2024, while 32-bit revenue will rise 7.2 per cent per year over the same time. One reason for the sales decline will be falling average selling prices. Sixteen-bit devices will suffer a 3.6 per cent annual price decline while total MCU average prices will decline only 0.04 per cent per year through 2024, said IC insights. While 16-bit MCU unit shipments will rise an average of 0.9 per cent per year, total MCU shipments will increase 6.1 per cent per year.

The overall microcontroller market will increase 5 per cent in sales and 6 per cent in units driven by 32-bit MCUs, which will post a 9 per cent increase in revenue and 8 per cent rise in unit shipments, the researcher said.

The global 16-bit microcontroller market will decline about 2.8 per cent per year through 2024 when sales will total \$3.4 billion
Source: IC Insights

16-bit MCU revenue will dip



However, despite the migration to 32-bit microcontrollers and declining sales, the 16-bit market "will hang in there and won't disappear anytime soon," said Lineback. The 16-bit segment remains "the second largest volume unit volume in the microcontroller world," he said.

The devices still have a niche and are used in automotive, audio and motor control applications. "The 16-bit has a special place in the market as many have a DSP type capability that make it more of a digital signal controller." Such capability is needed in automotive and audio systems and in for "real-time control of motors," said Lineback.

Expect ample supply

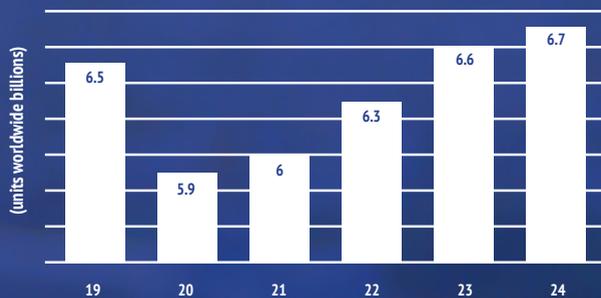
While demand for MCUs will grow from the automotive industry and other segments over the next several years, semiconductor buyers can expect adequate supply because the microcontroller industry is healthy and MCU manufacturers can make the necessary capital expenditures to increase capacity

as it is needed. Lead times will also be mostly stable although price declines will not be as steep as in past years.

Buyers should keep a close eye on consolidation in the industry. However, merger and acquisition activity will not be at the same level as it was five or six years ago when there was a wave of consolidation among MCU suppliers. Consolidation resulted in a reduced number of total microcontroller manufacturers when NXP acquired Freescale, Renesas bought Intersil and Microchip acquired at Atmel.

More recently, Infineon completed its \$9.5 billion acquisition of Cypress Semiconductor in April 2020. Consolidation has made the industry healthier and there's still plenty of competition for business. The question is will that continue if there are more mergers and acquisitions over the next few years.

Units shipments of 16-bit MCUs to bounce back



Unit shipments of 16-bit microcontrollers will post modest growth through 2024
Source: IC Insights

Hub for services and tools

Mouser's VP of Americas customer service and sales, Coby Kleinjan, walks readers through the company's new Customer Resource Center

Mouser Electronics has announced its new Customer Resource Center, which allows customers to take advantage of the company's online purchasing services and tools through a central hub that contains everything customers need to optimize the purchasing process. Customers can simply click the name of the desired tool, and then view or request what they need.

From the Center, 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. Mouser's order automation helps customers reduce their workload by providing enterprise resource planning (ERP) systems such as simple API integrations, PunchOut solutions and more sophisticated electronic data interchange (EDI) integrations.

Mouser's VP of Americas customer service and sales, Coby Kleinjan, said: "Mouser

continually assesses and improves the online resources that we offer to help buyers and engineers manage their product specifications and purchasing. We are very excited to make this new Customer Resource Center available on our website for customers as we continue to make it our mission to provide best-in-class service around the world."

Productivity tools including the Forte intelligent BoM tool. Forte quickly validates part numbers, product availability and price and recommends alternative products to reduce design and product lifecycle risks. The tool also provides a Risk Evaluator feature based on a unique relevancy engine that analyzes partial part numbers and descriptions to suggest the best options for customers.

Another tool is the Price and Availability Assistant, which allows customers to easily check prices and availability on millions of semiconductors and electronic components.

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- Real-Time Inventory Management

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- BOM Evaluations / AVL Alternative Solutions
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Kleinjan added: "With this centralized services hub, Mouser greatly improves and speeds navigation for our customers looking for resources to simplify their buying process, with the

added bonus of alleviating much of the research involved on their part."

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Strategic sourcing advice: lessons from the pandemic

Digi-Key's senior director, global assigned accounts, Tom Treichel, argues that during the pandemic inventory and on-time delivery are differentiators and partnerships are key

The Covid-19 pandemic has taken a toll on supply chains and procurement professionals around the world. So, what have we learned? Long-time Digi-Key customer and SVI's vice president of supply chain and North American operations, Wayne Ellis, said: "The most expensive supplier to work with is the one that can't meet my delivery dates."

SVI is a leading EMS service provider based in Thailand with regional and global operations across South East Asia, Europe and the US.

A 33-year veteran in electronic components sourcing, Ellis has experienced it all including a flood and factory fire within three years. Now, the COVID-19 pandemic proved to be one of his toughest challenges.

Ellis said: "In the past, we have experienced disruptions in supply due to natural disasters, strikes or other geopolitical issues. We have also experienced shortages due to increases in demand. Never have we experienced both, to this extent, at the same time. Military and medical supply chains were filled first, leaving other customers to scramble for the little remaining goods."



SVI is based in Thailand with operations across South East Asia, Europe and the US

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Most manufacturers have since rebounded, for the most part, but some lead times remain stretched. As automotive and consumer manufacturing come back online, Ellis expects some lead times to stretch into Q4.

During the early days of the pandemic, SVI's medical customers saw significant increases in demand and SVI sprang into action working closely with their distributor partners.

Ellis said: "We worked with customers to provide letters stating the end use of the product, then contacted distributors, and in some cases, had regular three-way calls with the manufacturers and distributors to review the demand upsides and negotiate for increased supply to ship to us. I am happy to say that we have been able to meet demand with the tremendous support of our partners, and as a result, have helped to save lives."

Some SVI customers dictate certain parts are purchased from specific suppliers, making sourcing a complex, sophisticated puzzle. Thus, Ellis and his team work with nearly 1,000 active suppliers.

The SVI team uses a 'total cost of ownership' model for selecting suppliers, looking at: payment terms, freight terms, minimum order quantities, etc. Recently they have removed lead time out of the cost of ownership model and made lead time a qualifier. Why? If parts do not arrive on time, and a line sits idle, costs can exceed \$1,000 per hour. This is why Ellis tells his team to choose dependable delivery and flexibility over lowest price.

Working with any distributor is a true partnership and one of the ingredients to building partnerships is information sharing. Sharing forecasts and telling suppliers your true needs is critical. Allow suppliers to build a model around your needs.

According to Ellis, many sourcing professionals tend to tell suppliers what they need to do, but suppliers are the experts in supply chain strategy, so he recommends listening and accepting their help to meet needs. For example, SVI has a vendor-managed inventory program where they provide suppliers with forecasts and their supplier partners ship parts according to the forecasts.

Digi-Key partners with SVI and Ellis has relied on Digi-Key for more than 20 years. Ellis credits Digi-Key's model (deep, rich inventory available for overnight shipping) along with what he calls the 'best website on the planet', top-notch service, support and training, for being a reliable, trusted supply chain partner. Ellis' team also uses Digi-Key's APIs and supply chain programs to streamline sourcing and reduce costs.

As Ellis noted, pricing is part of strategic sourcing, but serviceability is critical.

The ability to support the quoted or awarded price on that part, as well as deliver on time, is key. To get a true understanding of a distributor's serviceability, we recommend looking at historical factors and asking:

- Is this a stocking part of the supplier?
- What is the lead time?
- What is the lead time historically? If they say six weeks, does it arrive in six weeks?
- What is the overall on-time delivery performance?
- Do they ship the correct parts?

Develop a scorecard for each distributor to track these factors and determine how partners are performing.

www.digikey.com

Digi-Key product distribution center expansion



Distributors provide value by reducing cost, creating demand

Distributors' design, supply chain and value-added services help OEMs and EMS providers cut costs, get products to market quicker and manage supply chain risk

While some large semiconductor companies have questioned the value of distribution, many others in the supply chain including chipmakers and other component manufacturers, as well as electronics purchasers, say distribution's role is essential to the continued success and sales growth of their companies.

Last October, Texas Instruments caused a stir in the electronics industry when the company announced it would drop Avnet and some other distributors and would service more customers directly.

Many in the industry feared that other large semiconductor companies and component manufacturers would follow suit and drop some of their distributors and service more customers through websites. That concern does not appear to have legs as many buyers and component manufacturers have voiced support for their distributor partners.

Of course, the notion of distribution disintermediation is not new. Twenty years ago, there were some analysts who had forecast as technology evolved, the role of distribution would be greatly diminished. In fact, the role of distribution in the supply chain has been enhanced as more distributors offer technology-based supply chain

solutions and other services to boost efficiency and help customers compete.

Many electronics component suppliers point out that distributors reach and service customers that suppliers cannot. In addition the cost to service hundreds of thousands of customers would be prohibitive for suppliers.

"If you look at the TTI family of companies, we service more than 600,000 customers," said Don Akery, president, Americas for TTI. "Think of what it would cost to support all those customers. "Whether customers give you a \$1 million order or a \$100 order, there is a cost associated with that and no supplier can handle that unless they can force the customer to buy in a way that the customer may not choose to buy," he said.

For instance, a supplier may require large minimum order (MOQ). There are many suppliers that require a customer to order 10 reels of 5,000 pieces or 50,000, said Akery. "Most distributors offer the same product at one reel or 5000 pieces or in smaller mini-reels of 100s or even in cut-reel quantity at exactly what the customer requires," he said.

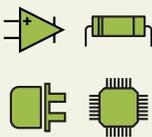
In addition, many OEM and electronics manufacturing services (EMS) providers require design, supply chain and value-added services that

component suppliers cannot provide.

Adding value, reducing cost

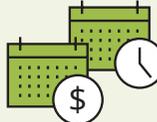
"The distribution channel is very important to us," said Jeff Thomson, senior vice president, global channel sales, for ON Semiconductor.

Top 5 Reasons to Use Authorized Distributors for Purchasing



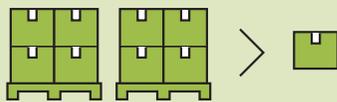
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“They add value to the end customer and take away some of the cost of serving a customer from us by providing value-added services,” he said.

He added that about 60 per cent of ON’s revenue goes through the channel and distributors have provided excellent growth for us. “Over the last eight years, we have absolutely outpaced the industry in our growth of revenue in the distribution channel.”

He said growth has not just been with ON’s larger strategic accounts, but it has also been “in the mass market area, those hundreds of thousands of customers that we would never be able to support without them.”

About 25 distributors support ON, but 11 of them account for 90 per cent of revenue and 90 per cent of the units sold through distribution. “The rest of them are specialty distributors for end-of-life products, excess inventory, wafer sales, or high service,” said Thomson.

One way distributors help ON to grow sales is through demand creation. “We have our strategic accounts that we handle on a direct basis. We rely on our distribution partners to go after the wide mass market base and do the demand creation for that. It has proven to be very successful for us,” he said.

Creating demand

He noted that demand creation takes on different forms. “It could be the discovery of the ability for us to get on an AVL. It could be a design-in of one of our products into a new program. It could be expansion of our share due to work that the distributor does in an existing account,” said Thomson. He said distributors

not only help ON grow its customer base, but they also help the chipmaker to gain more business with existing customers.

“They help us go wider as far as more products or solutions. We call that solutions selling or designing in different types of sockets that we have to offer and they are able to drive even more share for us,” he said.

Distributors bring value to ON in many ways, including providing FAE resources, broad promotion of ON’s products, ensuring component availability through buffer stock, consignment programs and vendor managed inventory and extended credit payment terms for customers, said Thomson.

While suppliers such as ON appreciate such programs, so do OEM and EMS companies who benefit directly from services. One such customer is Data Electronic Devices (DataED), based in Salem, NH.

Michael LaFleur, vice president of operations for DataED, said the EMS provider buys tens of millions of dollars of components from distributors annually. One reason is the inventory and supply chain management programs that distributors offer.

“We have vendor managed inventory, in-plant stores from one of our larger distributors,” said LaFleur. “We also have a VMI cage for 10 other distributors for other parts. Those distributors handle all “the MRP signals they bring the material in and we don’t pay for it until it’s issued out of the cage,” he said. That is typically something a manufacturer would not do.

“We also have bread man programs with some distributors where they come in every week and refill the bins to a min-max level. We pay on a consumption basis,” he said.

DataED’s distributors also manage all end-of-life notifications and make recommendations at the technical level for substitute parts. The EMS provider also uses distributor value-added services such as IC programming and tape and reeling.

LaFleur said its distributor partners also provide crucial market intelligence about the supply chain. “We get reports from distributors on a weekly basis about trends in the industry,” he said. Such intelligence keeps DataED informed about market conditions, including availability, lead and prices for parts such as MLCCs, tantalum capacitors and chip resistors.

Supporting time-to-market

Distributor provided value-added, supply chain services and market intelligence are also important to EMS provider Coghlin Industries, based Westborough, Mass. Such services are essential to Coghlin because they help the company carry out its mission to get customers’ products to market as quickly and as cost-effectively as possible, said Jim Coghlin, vice chairman & chief supply chain officer for the company.

“One way we do that is by leveraging our distribution partners to support us with kitting or special packaging, special labeling, handling lower level subassemblies such as fan or cable assemblies,” he said. Those value-added services allow Coghlin to focus more on



Most distributors that we work with offer an early pay discount if you’re in a good cash position

Jim Coghlin, vice president and chief supply chain officer for **Coghlin Industries**

supply chain management, integration, quality control and fulfillment, he said.

Distributors also provide Coghlin with bonded inventory, consignment inventory programs and vendor managed inventory programs.

Coghlin also values the level of service and technical expertise that its distributors provide. Distributors often have inside and outside salespeople and field applications engineers. “With a single phone call, you can get a high level of service. For instance, an FAE may be able to support you for multiple manufacturers in person and on the phone. In addition,

most distributors that we work with have local feet on the ground and local support,” he said.

Another key value of distribution is flexibility, said Coghlin. “Most distributors that we work with offer an early pay discount if you’re in a good cash position,” said Coghlin. “If you’re not in a good cash position and you need some flexibility with regards to extended payment terms, distribution is usually very good to work with in that context as well,” he said.

Coghlin buys from a handful of distributors. “We have about a half-dozen distributors and our goal is to purchase between 80-90 per cent of our electronics from those half-dozen distributors,” said Coghlin. “Distribution is definitely a core focus of ours.”

Leveraging services

Distributors are also important to the business model of EMS provider SMTC, headquartered in Markham, Ont., Canada. Phil Wehrli, senior vice president global supply chain for SMTC, said his company buys about 30 per cent of SMTC’s requirements through distribution including industry standard semiconductors, passives and connectors.

“Being a tier two or three EMS provider, we don’t have the volume as a tier one EMS provider to leverage things direct,” he said. “What we do is leverage the services that the distributors provide to try to offset the additional cost” of buying through distribution, said Wehrli.

“We have favorable payment terms through distribution and they provide in-plant store services, so we don’t take ownership of the inventory until we pull it from

the store,” he said. We also have some rebate programs when we hit a certain dollar threshold with the distributors,” said Wehrli.

Mark Shiring, president and CEO of ebm-papst Inc., based in Farmington, Conn., said it’s important that distributors provide its customers with the services that ebm-papst cannot. The company makes fans, blowers and motors and other products for companies in many industries.

“In our business we ship pallets of products, not small boxes of parts” except for samples and replacement parts, he said. “Breaking down skids and pulling out material is not our set up,” he said. However, many customers don’t need large volumes of products on skids.

“We have fairly significant customers that buy \$1 million of parts through distribution because that customer is looking for kits,” said Shiring. They want a returnable pack and a certain amount of our products and a certain mix of multiple products.

“I’m not set up for that kind of service,” he said. But ebm-papst distributors are. Distributors break down the parts out of the skids into the quantities and mix customers are looking for, said Shiring.

Some customers want small quantities of parts shipped weekly or biweekly. “Or they want total flexibility to tell us a week in advance when they want,” said Shiring. “I don’t have the bandwidth for that.”

If a customer is looking for smaller quantities of products and flexibility on schedule and preferred payment terms then “distribution is your best channel. We work with the customer to find the right partner and help them move

into a distribution model,” said Shiring.

He said about 20 per cent of his business is through distribution. Our distribution business has been growing in the high single-digits year on year and that has been keeping pace with the rest of our business,” he said.

Shiring said ebm-papst has a core set of authorized distributors, including some broad line distributors, catalog distributors and some local distributors in different regions.” Its distributors share the same values as ebm-papst. “They have the same customer-centric focus as us,” said Shiring.

Agnostic recommendations

While many OEM and EMS customers appreciate the value added and supply chain services distributors provide, they also appreciate the product expertise that distributors have to offer and the fact that they are “agnostic” in the parts they recommend, said Robert Derringer, director, global channel for Crouzet. The company makes switches, sensors, logic controllers and other products.

“We suppliers don’t like that, but quite frankly we would rather have them agnostic and trying to provide our customers with the best solution for their application,” he said.

“A distributor typically is not beholden to one manufacturer within a commodity,” said Derringer. That distributor is going to have multiple component manufacturers, some of whom are providing a standard solution for products, other suppliers may have less standard, more complex solutions.



The distribution channel is very important to us. They add value to the end customer and take away some of the cost of serving a customer from us by providing value-added services

Jeff Thomson, senior vice president, global channel sales, for **ON Semiconductor**

“You don’t need products that are over spec’d, over-powered and over-priced in many cases.” He said distributors can recommend the appropriate solution.

Building supply chains of the future

Avnet's president Americas electronics components, Tony Roybal and Newark's business president, Uma Pingali, review past, present and future supply chain innovations

Over the past six-months, one might conclude that no part of the economy has undergone more dramatic change and rethinking than the global supply chain. Every element, from sourcing to production to distribution and logistics, has experienced massive disruptions and shifts. However, we argue that recent events have simply underscored changes that were underway in building the supply chain of the future.

For years, supply chain strategy watchwords were just-in-time (JIT) supply chain management. It was the pursuit of ultimate efficiency, where labor and material were delivered and moved continuously and seamlessly in perfect harmony and with zero downtime. However, unanticipated events, from trade wars to tsunamis and pandemics, can play havoc with JIT strategies. Business leaders began realizing today's environment puts a premium on planning for the unexpected. Efficiency is less a function of just-in-time and more a function of resiliency or dependably-in-time. After all, supply chain efficiency, especially in the electronic components space, can only be accurately measured if critical components get to their end destination at all, let alone just in time.

All this has accelerated the rethinking and reshaping of three key logistics and supply chain elements: location, transportation and engagement.

Until recently the premium was to centralize and specialize production to maximize efficiency. Everything coming from one source allowed for greater quality control and production efficiencies. With that came source dependency. Environmental, economic, financial, political, and regulatory volatility quickly translated into supply chain vulnerability and instability. That is one reason why we have seen a gradual deglobalization of the supply chain. Companies are balancing the efficiencies of a few large production centers with regional and in some cases localized suppliers to provide greater balance and flexibility. This broader geographical spread is made more possible by advances in production and digital technologies that enable product efficiencies even when production volumes are relatively small. Moreover, these small producers can also prove nimble in shifting production to alternative products with sudden shifts in demand.

Second, is transportation. Today there is greater appreciation and selectivity in how critical resources or parts move from one place to another. The challenge is acute because timeliness expectations of consumer goods, like next-day-delivery, are being seen in commercial and industrial environments. Large online retailers figured this out and pursued a strategy that blended pre-positioned products in close geographic proximity to anticipated demand with a blend of shipping and transportation options, including giving customers a pickup option. That is exactly what we see now in the development and execution of 2020 global supply chain strategies that limit dependencies on transportation modes and logistics.

Traditionally, global supply chain solutions pertained to the production of end goods at the customer facility. Today, high service distributors are providing supply chain solutions to the design engineering and test engineers at customer facilities. Design engineers want in stock solutions to meet their needs and the same product available when designs go into production. Management of design products lets engineers



Avnet's president, Americas electronics components, **Tony Roybal**



For years, supply chain strategy watchwords were just-in-time (JIT) supply chain management

Customers are rightfully demanding greater insight into the mechanics and logistics of their supplier partners

bring ideas to market faster and speed the transition to production. Being first to market with a new design can equal millions of dollars.

Avnet has a global initiative to provide world-class design chain and supply chain services to the automotive industry. In Newark's work with the industry in Detroit, we have stockroom personnel go on site to manage the design engineering stockrooms of major US automobile manufacturers. We work with suppliers so we only stock products that have ample supply should a design turn into production. Making design staff more efficient and getting products seamlessly to market is the value a high service distributor can provide.

Finally, there is transparency. Customers are rightfully demanding greater insight into the mechanics and logistics of their supplier partners. Likewise, businesses are realizing their ability to be innovative and agile requires them to share increasing amounts of product and service information with suppliers so they can plan their sourcing and production accordingly.

For example, in the global fight against Covid-19,

vendors and manufacturers rushed to meet the intense demand for vital hospital and healthcare equipment. Avnet leveraged its global ecosystem and expertise to help public and private sectors develop new technologies and innovative methods to increase production and distribution capacity for ventilators, respiratory units and other vital equipment. To do this, Avnet employees worked around the world and the clock to help customers find alternative component sources when faced with supply constraints. Because Avnet could source, assemble, integrate and service medical devices and peripherals, customers could focus their attention and resources on other urgent needs.

The key to making this possible is digital transformation or Industry 4.0. The ability to collect, store and process vast amounts of information through sensor technology, cloud computing, machine learning and artificial intelligence is giving customers and suppliers greater visibility into each other's operations. In doing so it allows them to anticipate, if not predict, environmental, regulatory and market changes before they happen.

The rethinking of location, transportation and transparency has been taking place for some time. The pandemic was the floodlight that laid bare these trends. This applies at every level: sales to inventory management to supply chain transparency.

Supply chain models are changing, driven not just by recent events but by long-established changes in the demands of markets, technologies and customer experiences. Distributors are adjusting and using new physical and digital operations to be more responsive to customers' needs as staff moved to work from home, but also better plan for the unexpected.

www.avnet.com



Newark's business president, **Uma Pingali**

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
ACOUSTIC COMPONENTS											
BeStar Electronics Ind. Co. Ltd.	BeStar Technologies Inc.	520-439-9204	www.bestartech.com	Y	N/A	\$250,000	N/A	100.00%	50	900	Y
CABLE & WIRING											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23235	N/A	\$0	0.46	50	1,000+	Y
Alpha Wire	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,106	N/A	\$0	93.00%	50	1,000+	Y
Belden Wire & Cable	Mouser Electronics	800-346-6874	www.mouser.com	Y	5,863	N/A	\$0	97%	50	1,000+	Y
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
CIRCUIT PROTECTION											
Bel Fuse	Bel Fuse	+1 201 432 0463	belfuse.com/circuit-protection	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	\$0	68.00%	50	1,000+	Y
Eaton	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	3,487	N/A	\$0	100%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	28,790	N/A	\$0	67%	50	1,000+	Y
Schurter	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	31,445	N/A	\$0	68%	50	1,000+	Y
DISPLAYS & LEDs											
BIVAR	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
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	12,390	N/A	\$0	99.00%	50	1,000+	Y
Dialight	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,179	N/A	\$0	84.00%	50	1,000+	Y
Displaytech	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Electronic Assembly	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kingbright Company, LLC	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	\$0	100.00%	50	1,000+	Y
Lumileds	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Newhaven Display	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	1,690	N/A	\$0	100.00%	50	1,000+	Y
VCC	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
ELECTROMECHANICAL											
ALPS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Apem, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,326	N/A	\$0	83.00%	50	1,000+	Y
C&K Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	27,230	N/A	\$0	90.00%	50	1,000+	Y
E-Switch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Grayhill	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
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

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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)											
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
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

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
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
Apptive (Delphi)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
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
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
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
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
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											
	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/es	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
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

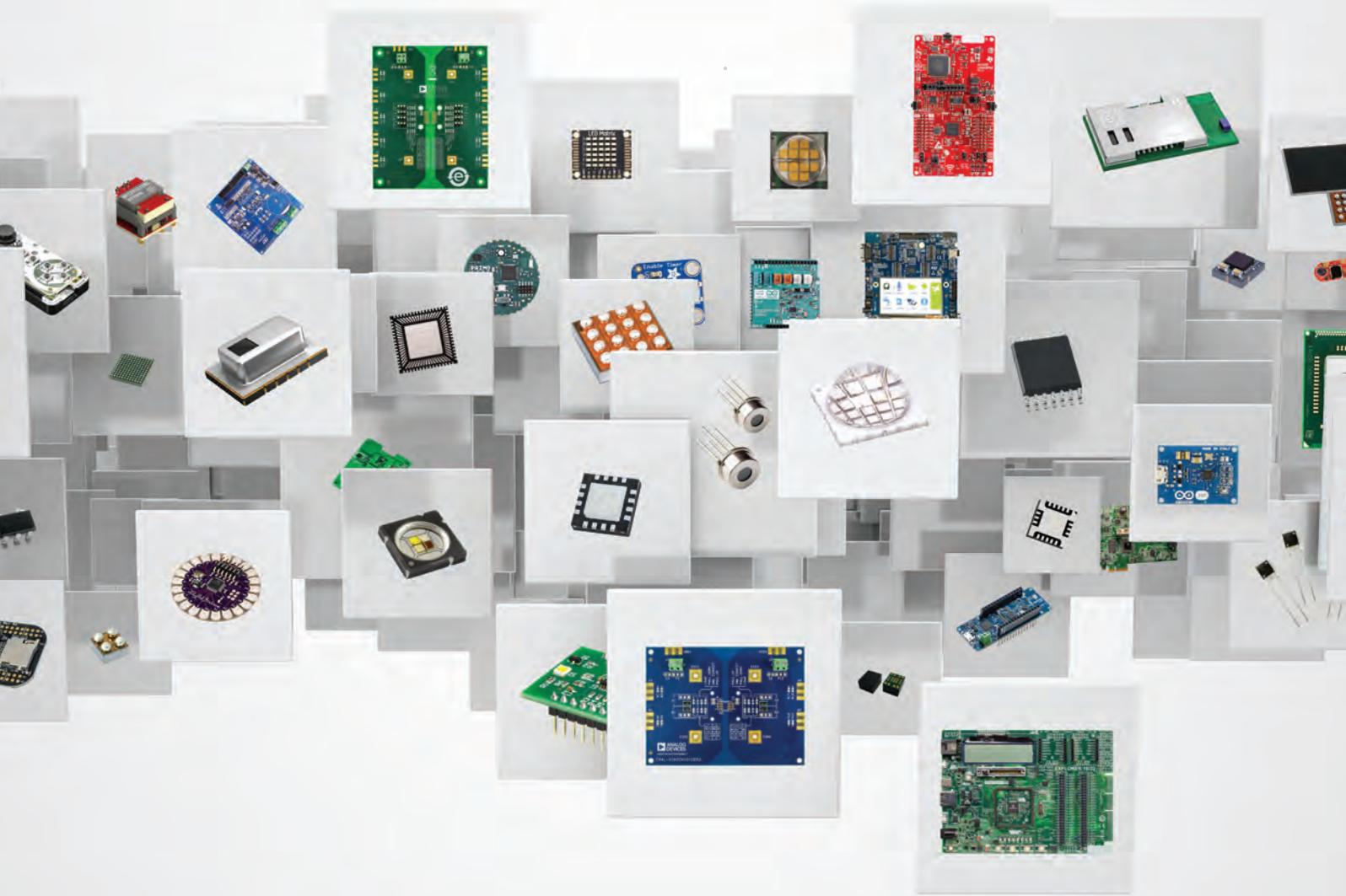
Buyers' Guide

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	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.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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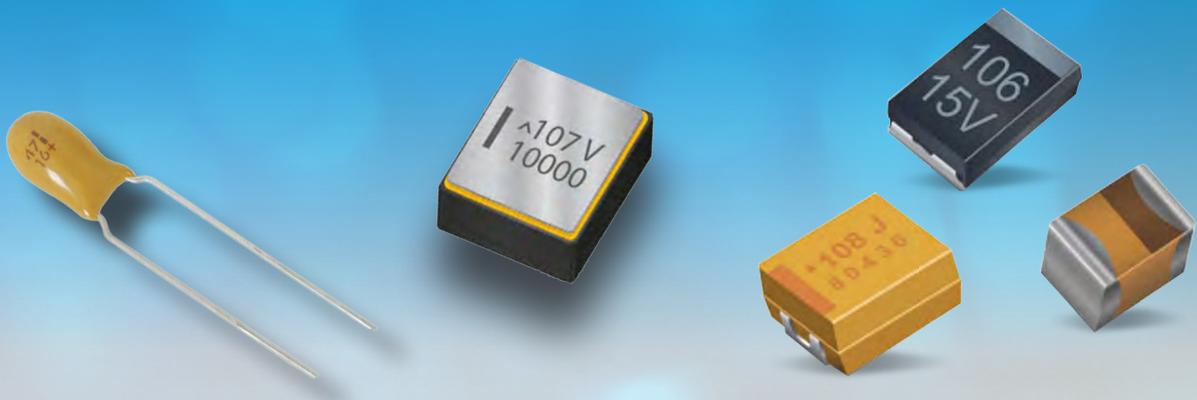
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