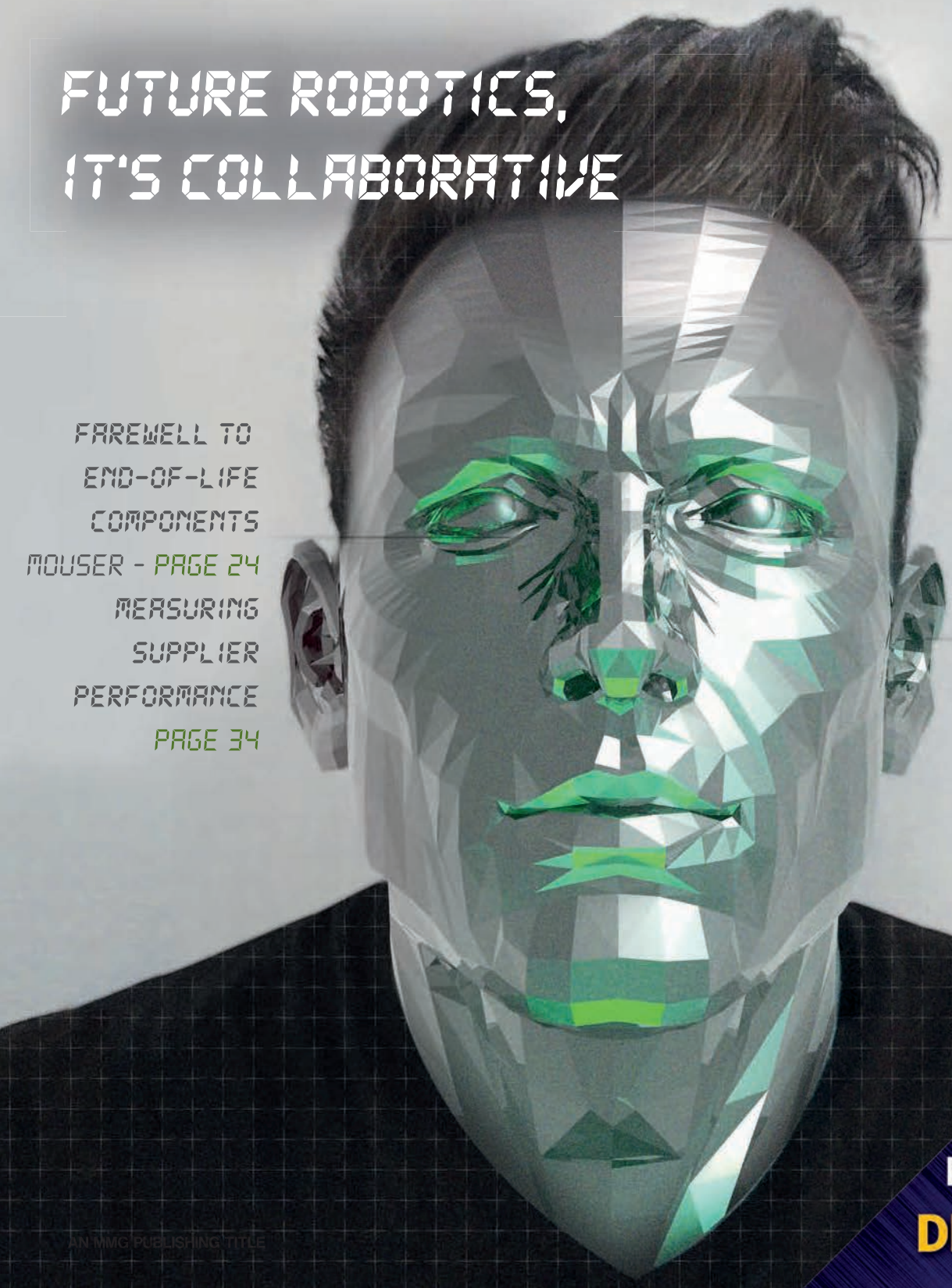
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JUNE 2020
NORTH AMERICA

FUTURE ROBOTICS, IT'S COLLABORATIVE



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On the cover – June 2020

Future robotics, it's collaborative

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When stock is not enough

At the beginning of the pandemic I, like many others, turned my attention to 3D printing face shields for health workers. At that point in time, material stock was not my problem, delivery services were. Understandably, some couriers had become erratic and unreliable. Ultimately the job got done by jury rigging some short-term solutions.

Fast forward several weeks and demand for face shields has dropped to the point where I can direct my 3D printer to new tasks. I went to place an online order with my usual filament provider and, as Old Mother Hubbard would say, when I got there the cupboard was bare.

This came as a shock as I often visit this supplier in person and it's like an Aladdin's cave of printer stock. Isle, after long isle, packed from floor to ceiling with every filament brand and specification you could ever want.

I called the supplier and discovered several things had happened. Firstly, what happens when the maker community is forced to stay at home? Obviously, they start making things. This was demand spike one. Secondly, what happens when health professionals, let down by their professional supply chain, ask people with 3D printers and sewing machines for help? They start making things. This was demand spike two.

Almost overnight stocks of 3D printing materials started to diminish faster than usual. So, distributors placed orders, only to discover that furloughed manufacturers and disrupted courier services slowed the replenishment.

Clearly, local stock is essential. However, so is the capacity to replenish it. Something else to consider when all this is over.

Jon Barrett

ES News

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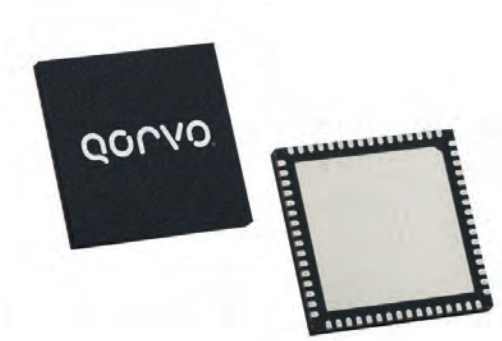
Bolstering block stock

Allied Electronics & Automation is bolstering its terminal block and synchronous drive offerings by adding products from Amphenol-Anytek and B&B Manufacturing.

As a member of Amphenol Industrial Products Group, Anytek provides terminal blocks and electrical solutions for applications including industrial control, commercial equipment, lighting, wind power, rail transit, elevator equipment and communication systems.

B&B Manufacturing is a synchronous drive pulley manufacturer, supplying standard, custom, and prototype synchronous drive applications used by distributors and original equipment manufacturers in the power transmission and precision mechanical component industries. B&B offers thousands of in-stock parts ready for immediate delivery from its $10 million inventory.

www.alliedelec.com



Optimized for motor control

Mouser is stocking Qorvo's PAC5524 motor controller and driver. The 70V Power Application Controller (PAC) features increased input/output (I/O) capability and is optimised for a high-speed brushless DC (BLDC) motor control.

The PAC5524 features Qorvo's Multi-Mode Power Manager (MMPM), which delivers an all-in-one power management solution for multiple types of power sources. The MMPM features a configurable multi-mode switching supply controller capable of operating a SEPIC or buck converter and up to four linear regulated voltage supplies.

The device is based on a 150 MHz Arm Cortex-M4F 32-bit microcontroller and integrates a Configurable Analog-Front End (CAFE) and multiple Application-Specific Power Drivers (ASPDs). CAFE comprises three differential programmable-gain amplifiers, four single-ended programmable-gain amplifiers, digital-to-analog converters, comparators, and several I/Os. ASPDs include integrated level shifters and pre-drivers designed for H-bridge, half-bridge, 3-phase, and general-purpose driving.

mouser.com

Reaching out with RF support

RFMW has announced a global distribution agreement to support KCB Solutions' product offering, focussing on standard RF and microwave components including attenuators, switches and amplifiers.

RFMW's president, Joel Levine, said: "The partnership with KCB Solutions will further RFMW's extensive offering of RF and microwave components, particularly for the military market. KCB Solutions offers a wide selection of high reliability components for a variety of market segments including military communications, radar, electronic warfare, aerospace and space."

KCB Solutions' president, Ralph Nilsson, added: "RFMW will enable us to expand our global reach and allow us to better serve our customers."

www.rfmw.com



Right product, right price, fast

Fabless DRAM and eMMC memory provider, Insignis Technology, has strengthened its cooperation with Rutronik as part of the company's new, focussed distribution strategy.

Insignis' CEO, Bill Lauer, said: "Rutronik offers us a truly global, integrated sales footprint with significant field based technical sales and support. Having a partner that can offer true application advice combined with high level system solutions is key."

Rutronik's senior marketing manager digital, Adrian Elms, added: "Commercial trading has also been enhanced with the agreement of a ship and debit process together with a stock in the value of a six-digit Euro amount, meaning customers can get the right product at the right price delivered quickly. Insignis' ability to offer longevity of die revision combined with enhanced test flows makes a very interesting proposition for our memory customers."

www.rutronik.com

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N ES News

In Brief

Supporting over 5.3 million US jobs
A new IPC report shows how electronics manufacturing contributes powerfully to the US economy. It finds the sector supports over 1.3 million US jobs and for every US electronics manufacturing job, three other jobs are supported in the US economy, contributing to a total of 5.3 million. Also, the industry indirectly and directly contributes $714 billion (3.7 per cent) to US GDP.
www.IPC.org

Time to buy
Pasternack has introduced a new line of GPS timing antennas, vehicular antennas and a 118 to 174MHz tunable, telescopic antenna to address mobile wireless, portable instrumentation and wireless monitoring applications. Product line manager, Mark Miller, said: "This new antenna line was developed to address the growing need for wireless communications in vehicular applications."
www.pasternack.com

Filtered for success
New Yorker Electronics is currently stocking the Union Technology Corp 's high-reliability switch mode power supply filter caps. These military-grade MIL-PRF-49470 SMPS series capacitors are primarily used in input/output filters of high-power and high-voltage power supplies as well as in bus filters and DC snubbers for high power inverters and other high-current applications.
www.newyorkerelectronics.com

Best practice infection control
ECIA has compiled a comprehensive list of best practices in Covid-19 infection control to aid companies as they adapt to the unexpected challenges associated with the pandemic. As the world emerges from the peak of infections, a recovery process will begin, requiring substantial changes across the supply channel. The list includes information for gatherings, protocols, cleaning and enforcement, and employee morale.
www.ecianow.org

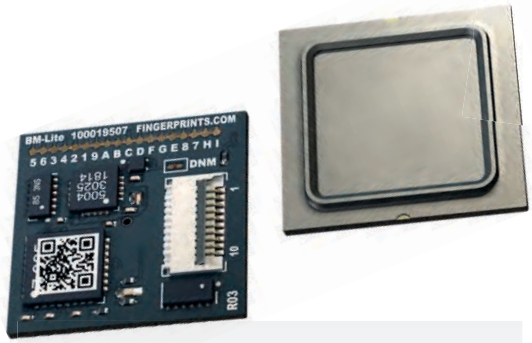
Expanded HVCB stock on high precision options

High voltage applications frequently require high voltage resistors with high accuracy for voltage division, monitoring and control. Some applications with more moderate working voltages may experience high voltage surges which may damage general purpose chip resistors. For applications such as these, the HVCB series from Stackpole provides a high precision, low VCR chip resistor with high stability.

Specifications include resistance values from 10k to 50G, in tolerances as low as 0.1% and TCR as low as 25 ppm. Expanded inventory includes more values in 1206 and 2512 chip sizes and added common values in the 0805 chip size, in 0.1% tolerance and 25ppm or 50ppm TCR depending on size.

Applications range from power supplies to data acquisition.

www.seielect.com



Touch the future

Digi-Key has signed a global distribution partnership with Fingerprint Cards, providing customers with standalone, compact biometric fingerprint sensor solutions. Fingerprint's solutions provide safe and convenient identification and authentication with a human touch.

Digi-Key's vice president, global supplier management, David Stein, said: "Biometric authentication is growing as it continues to be implemented into new applications and devices. Digi-Key now offers customers an easy path to develop secure devices with integrated capacitive fingerprint sensor technology."

Fingerprints' senior vice president, payments & access, Michel Roig, added: "This is a step for us to be able to scale with FPC BM-Lite and to reach new verticals that require additional sales channels to drive business. Digi-Key will help us reach out and find new potential markets and application areas."

www.digikey.com



Connectors and cables unite

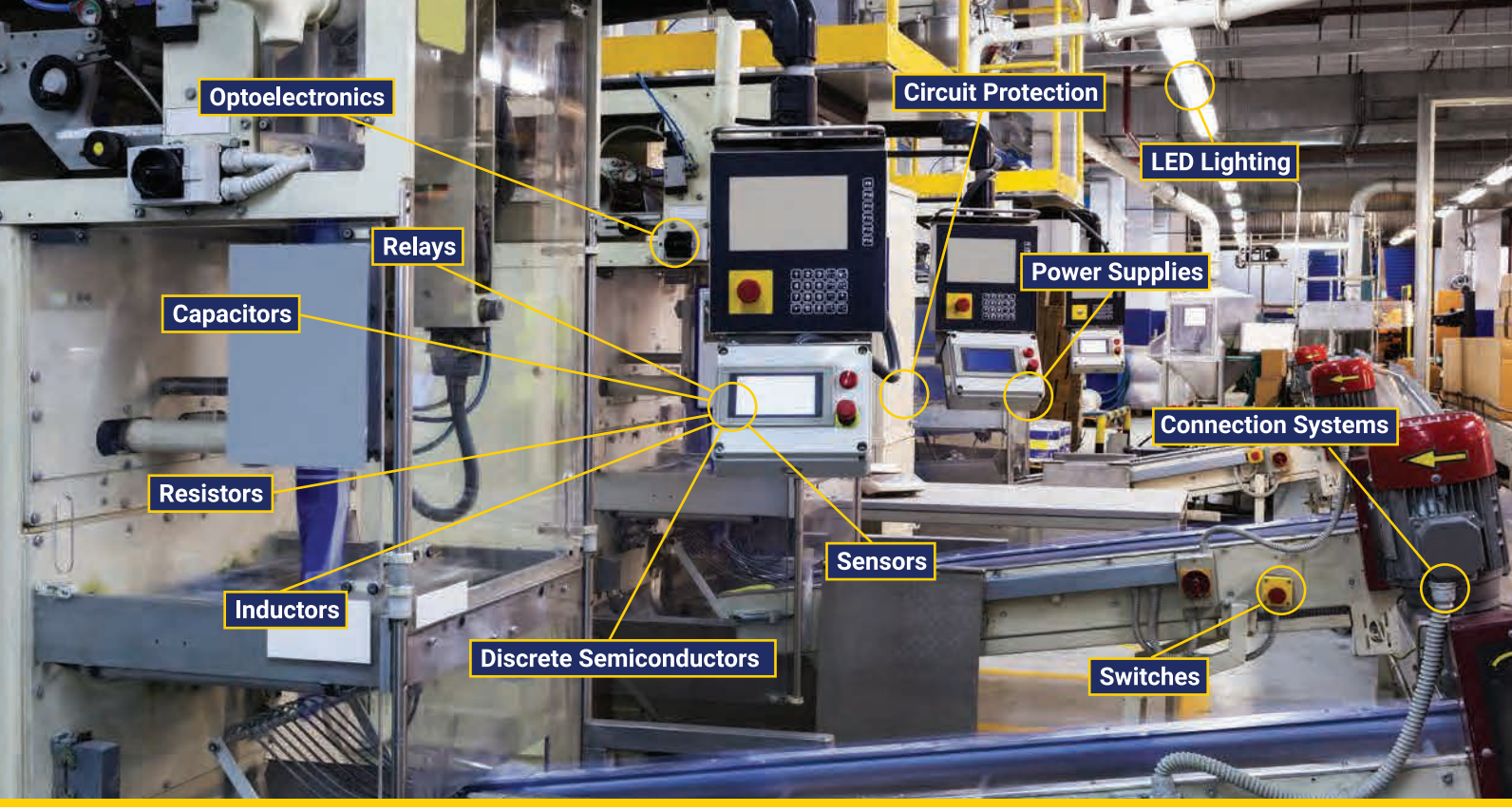
Cinch Connectivity Solutions has introduced 2.92mm, 40GHz cable assemblies utilizing two Cinch brands, Johnson connectors and Semflex low loss PTFE cable.

Assemblies comprise 2.92mm connectors coupled with Semflex HP160S cable with velocity of propagation (Vp) of 76 per cent, said to offer industry leading performance for test and measurement environments. The assemblies are designed to provide 40GHz operating performance and VSWR max of 1.25. Applications align with the company's product development of 5G/mmWave products to support communications, military, telecom and test & measurement industries.

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Distributor partnerships can reduce cost, mitigate supply chain risk and reduce time to market

Some OEMs and EMS providers have forged strategic relationships with a few select distributors to leverage their supply chain expertise

James Carbone

While most electronics distributors want to grow their customer rosters, some also want to forge strategic relationships with key customers, providing them not only with components for design and production, but also timely market intelligence and advice concerning the supply-chain.

Many large distributors have hundreds of thousands of customers. It is impossible to have close strategic relationships with all of them. But some OEMs and EMS providers leverage the design, supply chain and value-added services that distributors offer and see the value of buying a large percentage of the parts that they need from a handful of capable distributors. They view their distributors as key partners that can help them reduce cost and identify and mitigate supply chain risk.

"Our objective is to be our customers' and suppliers' most preferred distribution partner and we accomplish that by earning their respect and delivering value," said Tom Vanderheyden, senior vice president, Americas sales for TTI Inc.

TTI has earned the respect of customers by doing the fundamentals. "We do what we say we are going to do: delivering the right parts and delivering them on-time more than 98 percent of the time," said Vanderheyden. " We also work to protect inventory for our customer partners when product becomes constrained and we maintain a high level of quality in all that we do, he said.

TTI has a mix of customers including OEMs, EMS and ODMs. "We have deep relationships with many OEM customers because we've worked closely with their engineers to design in components that meet their specific needs," said Vanderheyden.

He said OEMs value TTI's product expertise and its ability to introduce new solutions and technologies from our suppliers. TTI works with customers to help them design for manufacturability, not just be a fulfillment partner, he said.

Helping with NPI

Part of the relationship with customers is introducing them to the latest technologies. "Customers depend on our expertise and our ability to help them design in new components, and suppliers count on our ability to help them with new product introductions," said Vanderheyden.

Customers also want TTI to help them with their supply chain challenges. "We've helped customers identify alternate sources and technologies," he said. When disruptions like the MLCC shortage or COVID-19 occur, we help customers find compatible parts so they can add to their approved component lists and keep their lines running," said Vanderheyden. TTI's specialized product expertise and deep inventory provide the customer greater flexibility and options, he said.

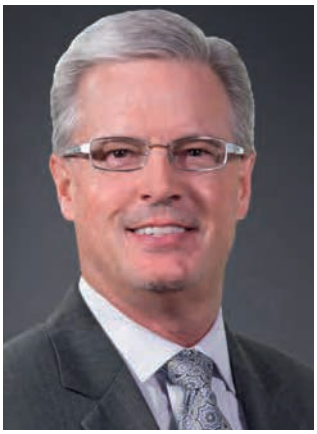
TTI's inventory provides continuity of supply for its established customers helping them avoid production disruptions when there are shortages.

Besides assuring supply to key customers, TTI is a "trusted advisor" providing them with insight, and information about suppliers. " In some cases that includes the opportunity to participate in internal meetings so customers can draw on our knowledge and experience," Vanderheyden said.

Strategic customers look to TTI to help them identify and manage risks. "Most recently, we were able to stay open and be 100 percent operational during the COVID-19 pandemic, shipping to any critical or essential infrastructure customer," said Vanderheyden. "We support our customers in good times and bad."

Partnering with suppliers

Of course, other distributors have developed close relationships with some customers. For instance, Avnet has a "large set of sizable customers" that the distributor considers to be partners, said Tony Roybal, president of Americas Electronics Components for Avnet. Such customers "buy the bulk of their products from Avnet," he said. "They turn to Avnet first when



"Our objective is to be our customers' and suppliers' most preferred distribution partner and we accomplish that by earning their respect and delivering value"

Tom Vanderheyden, senior vice president, Americas sales for **TTI Inc**

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they run into challenges and need solutions," he said.

Customer partners include both OEM and EMS providers who leverage Avnet's "vast, end-to end ecosystem of capabilities. OEMs primarily value our design and supply chain capabilities as well as our global reach," said Roybal. EMS providers tend to focus on purchase price variance (PPV), but also find great value in the "breadth of the Avnet line card, application program interfaces (API), EDI, and our supply chain programs," he said.

Avnet collaborates and shares its business experiences with its customer partners on a wide range of issues such as mergers and acquisitions, tariffs, and design and supply chain solutions. In some cases, Avnet conducts an on-site workshop if a customer needs to collaborate on such issues, said Roybal.

One example of such collaboration occurred when a major defense/aerospace customer was in the midst of an acquisition. It turned to Avnet for help in the consolidation and relocation of some of their facilities.

"Together, we reviewed the customer's material flow and made recommendations on ways to improve the process and optimize space. Through this process, Avnet proposed a solution that would reduce inventory space by 86 per cent," said Roybal.

With strategic engagements where Avnet is the primary partner to a customer, the OEM or EMS provider will buy more than 50 per cent of the parts it needs from Avnet. "When we have a turnkey engagement, these customers basically buy everything that we can provide from Avnet, including some non-franchise elements," said Roybal.

Leveraging services

OEMs and EMS providers that partner with Avnet frequently leverage Avnet's supply chain and value-added programs including embedded, board level and integrated solutions, programming, special handling, freight forwarding, logistics, custom cable assemblies, in-plant stores, VMI, bonded inventory, consignment, turnkey solutions, he said. In addition, such customers view Avnet "as a trusted advisor to provide market intelligence, insight on suppliers, technology, lead times, and quality, as well as insight on supply chain disruptions such as those brought on by the China tariffs and COVID-19," said Roybal.

He added customer partners trust Avnet to notify them well in advance of shortage situations, product change and end of life notices, lead time changes, value-added services and market updates affecting lines of supply.

"They expect Avnet to lead them through obsolescence issues without interruption of supply and risk mitigation strategies," he said.

The advantage for Avnet having strategic customers is such customers buy the bulk or large portion of the requirements they need and may provide Avnet the opportunity to support all franchised content on the bill of material."

He added that EMS providers tend to spread out their risk among different distributors, while OEMs typically consolidate their buying with a few chosen distributors. "These customers are always looking for opportunities to consolidate distributors and place a greater spend with them to gain operational efficiencies and simplify their supply chain," said Roybal.

Tony Roybal, president of Americas Electronics Components for **Avnet**



"OEMs primarily value our design and supply chain capabilities as well as our global reach"

"Startups do typically have many more resource and support needs. Non-traditional and IoT customers need us for board-level design, IoT design and cloud-based analytics, DFM services, manufacturing, and post-sales support and Avnet is the go-to partner in these cases," he said.

Helping OEMs and EMS

Digi-Key, a high-service, small-volume distributor, has hundreds of thousands of customers that it supports globally. But it also has a "strong subset of customers that it works with very closely, said Paul Dosser, vice president, business development for the Thief River Falls-based company.

Digi-Key supports them in design efforts and "small quantity requirements," but also their higher mix, lower volume production needs, said Dosser. Some of Digi-Key's strong relationships are with EMS providers. He said sometimes EMS companies struggle with OEM customers' forecasts, which aren't always accurate. Sometimes OEMs have a sudden unforecasted spike in demand for their products, which puts pressure on their EMS providers.

"There is no perfect forecast," said Dosser. "There are highs. There are lows and there are industry interruptions," he said. EMS providers need help managing that.

"The biggest thing that we look to offer with our supply chain solutions is risk mitigation and helping them smooth out spikes in demand," said Dosser.

He said Digi-Key also helps customers improve efficiency, lower cost and speed time-to-market. One way is by moving toward a more digital engagement with customers.

"That involves things like application programming interface type of tools, punch out catalog, EDI, bill materials manager, price and delivery tools," he said. Customers continue to look for ways of driving efficiency in the supply chain and "digital engagement is definitely a part of that, "said Dosser.

"The more you can help a customer drive faster turnaround, improve time-to-market, drive out bottom-line cost, the better it is," he said.

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Advocating electronics

Electronics Sourcing North America quizzes ECIA's president and chief executive officer, David Loftus, about the associations' current activities and future plans

Congratulations on your appointment as the ECIA's president and chief executive officer. How did you perceive the ECIA and what attracted you to the role?

I've known about ECIA for many years and its predecessor, NEDA. Both have established standards our industry utilizes daily. ECIA's integration of manufacturers, independent reps and distributors sets it apart from other associations which focused on a single part of the supply chain.

While I spent nearly 30-years with Silicon Valley semiconductor manufacturers, I was excited about leading the ECIA which integrates a broader cross section of industry. For example, ECIA's diverse manufacturer members include semiconductors, interconnect, passives and electromechanical.

Also, I will be working with long-time friends in distribution and the rep world. Many of the issues the association is addressing resonate with me from my earlier career. ECIA is a highly cooperative group committed to establishing and sharing best practices. So far, I am having a great time despite the Covid-19 challenges.

What changes, improvements or developments are you planning and what can readers expect over coming years?

I would like to facilitate greater interaction between our manufacturer, distributor and rep councils, particularly sharing best practices. Currently a significant focus is providing guidance and information on Covid-19.

We are ramping several cross-functional projects tackling weighty issues such as Design Registrations for Demand Creation. A key improvement and investment is increasing our market research and data analytics. In these uncertain times, we need the best and latest information to help manage our businesses. Extensive fortnightly surveys help us stay on top of the rapidly changing environment. Late last year chief analyst, Dale Ford, started heading up these activities. Dale has deep experience in market research with iSuppli and IHS and is doing a great job with outreach to members and peer associations. Also, we are tracking government action, providing best practices and advocating electronics as an essential business.

Late last year there were rumours of a new global association. Is this still on the cards and will ECIA develop into new global regions?

We continue to expand our membership of global companies. Our staff are Americas-based but our membership includes many companies headquartered in EMEA and Asia and we look forward to continuing to build our international base. We continue to work with international associations where appropriate. Also, our authorized inventory website has localized versions in many languages.

What do you see as ECIA's key benefits and future challenges?

Our association's tag line is Connect, Influence, Optimize. ECIA is the ideal platform for meeting one's peers and learning from each other. It's important for leading companies to have a seat at the table when new standards are established. The biggest member benefit is Optimize because together we improve efficiency. With manufacturers, reps and distributors in the same room, we can quickly help companies improve their efficiency. The biggest bumps in the road are situations like Covid-19 that make it difficult for members to travel and meet. While we are learning new ways to increase our effectiveness working remotely, there is no substitute for face-to-face meetings on important topics.

With *EDS* cancelled this year, hopefully readers can meet you in person at October's *Executive Conference*. Is *EDS* scheduled to take place in 2021 in Las Vegas?

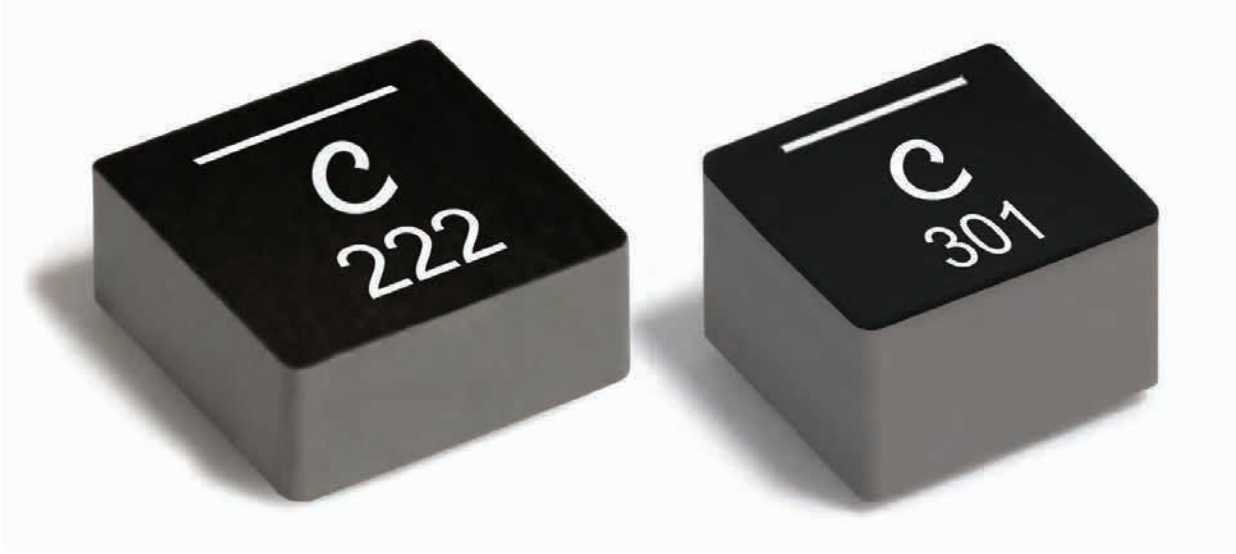
It was unfortunate we cancelled the event but it was certainly the correct decision for the safety of members and guests. We certainly hope life will be mostly back to normal by October and look forward to welcoming everyone to the *Executive Conference* in Chicago. We also eagerly look forward to welcoming the industry to *EDS Las Vegas* in 2021. We are working with venues and vendors to ensure the hard work in preparing for the 2020 show can be reapplied to 2021.

www.ecianow.org



ECIA president **David Loftus**

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Collaborative robots offer big value in a small size

Collaborative robots are fast becoming the benchmark in industrial automation for their ability to offer higher productivity while working safely alongside human workers

Collaborative robots, or cobots, are compact and lightweight, making them ideal for factories of the future. Machines like ABB's YuMi are more than just robots able to carry out high-quality work with maximum consistency. Cobots offer benefits that add value at every step of the production process.

One example is their ability to work safely alongside humans without the need for guarding, greatly reducing their overall footprint. This makes them ideal for applications ranging from simple small-parts assembly to more complex packaging and palletising tasks where the robot can maximise productivity without compromising safety.

Another avenue for cobots to maximise flexibility and efficiency is synchronised collaboration, where operator and robot work together in a planned but more intermittent manner. Tasks including final trim and assembly in automotive manufacturing, where human interaction is needed alongside the robot's speed and precision, are ideal for a collaborative setup.

Collaborative robots also offer manufacturers the flexibility to manage the shift to low-volume/high-mix production. Collaborative robots add agility to change between products and introduce new products faster. People on the production line contribute their problem-solving capabilities, insights and adaptability to change, while robots bring tireless precision and endurance for repetitive tasks.

Originally launched in 2015, ABB's YuMi robot is carving its own niche due to agile movement on seven axes and industry-leading features making it the world's safest collaborative robot. In addition to meeting the ISO regulations for collaborative robot safety, YuMi has enhanced safety features on three levels:

• Mechanical measures. With the dual-arm robot weighing 38kg and the single-arm variant 9.5kg, YuMi's lightweight design reduces the power it can exert on collision. The robot's rounded geometry increases the contact area of the YuMi and inversely lessens impact.

• Inspired by humans. Complete with an 'elbow', the arms of the seven and 14-axes YuMi robots have been inspired by humans in size and shape. This friendly design makes humans feel safe and comfortable around the robot, increasing the readiness to work closely with them.

The fully integrated arms have no external wiring or hardware and have soft-padding for added safety. Moreover, YuMi's back-drivable brakes allow a human operator to push the robot's arms away in the case of contact.

• Control system measures. Force sensing technology built throughout the YuMi's arm and gripper, advanced friction modelling and collision detection technology limit the robot's power and force capabilities to levels that make contact situations safe for humans. This also allows the robot to continue working at high speeds even in close proximity with a human operator. Technology like ABB's SafeMove2 robotic safety solution can make ABB's other industrial robots also work collaboratively. Replacing physical barriers like fences with virtual barriers such as laser scanners, SafeMove2 automatically stops a moving robot before it can collide with a worker.

Big potential in a small size

The global market for collaborative robots is estimated to be worth $12.30 billion by 2025, with a compound annual growth rate of more than 50 percent, according to research firm Markets and Markets.

But where is that potential stemming from? One key driver for growth is the development of collaborative robots for workplaces outside large manufacturing environments. While robotic automation technology has evolved to meet the growing demands for high volume industrial production, it has also led to the creation of smaller collaborative robots such as YuMi, which are designed to fit easily into

existing production lines to increase productivity while working safely alongside people.

The inherent qualities of collaborative robots such as the ability to mount them on tables, walls and roofs, and their easy-to-install and program features make them ideal automation solutions for smaller manufacturers. With their smaller size and reduced need for peripheral equipment, collaborative robots are also much less costly to install, typically reducing the investment needed for a robotic work cell to under $50,000.

Filling the talent gap

Many manufacturers are experiencing difficulties finding experienced workers. Many young people who have grown up in the digital world see manufacturing as involving dirty, dull, dangerous and repetitive tasks such as assembling parts, tending to machines or packaging finished goods. Also, with shorter product life-cycles, small manufacturers which operate in high labour cost countries and are closer to their end customers cannot simply outsource to low-cost countries like large corporations do. In these conditions, collaborative robots not only reduce the need for manual labour, but can work tirelessly and with higher quality, allowing their human co-workers to perform more stimulating work that can lead to higher job satisfaction.

By automating monotonous and physically demanding jobs, manufacturers can also improve employee safety. Anodica is an Italian family-run business that makes high-end metal handles, knobs and trimmings for appliance and automotive industries. It uses a dual-arm YuMi alongside a human operator to assemble its products. The robot cell was designed around the operator so that all activities are ergonomically managed. By doing this, the company helps employees avoid short- and long-term injuries related to factory work.

Another example is payments software provider Abrantix. The Zurich-based company commissioned a dual-arm YuMi to automate the testing of Diebold Nixdorf's ATMs. The robot tests common ATM operations such as inserting cards, punching in PIN codes and withdrawing and inserting money, just like a human. During the day, developers create new ATM software features that are then tested by the robot overnight. Feedback is checked the following day, enabling testers to perform more meaningful tasks.

Hit the ground running

The plug-and-play qualities of modern cobots mean they can be installed more quickly, minimising interference with production processes. Their small footprint and portability make cobots suitable not only for automating existing production lines, but also more diverse applications.

Such mobility makes the YuMi a perfect testing ground for developing automation capabilities in the medical field. At the Texas Medical Center in Houston, a prototype mobile YuMi robot is being trialled as a way of assisting medical and laboratory staff with laboratory and logistics tasks in hospitals. The robot will be able to autonomously sense and navigate its way around its human co-workers, while learning to find different routes between locations. It has the potential to undertake a wide range of repetitive and time-consuming activities, including preparation of medicines, loading and unloading centrifuges, pipetting and handling liquids



and picking up and sorting test tubes.

Technological advances have made collaborative robots far more intuitive than their conventional counterparts. Features such as lead-through programming and user-friendly touch screen interface allow operators with no programming experience to quickly program the robot. Offline simulation tools such as ABB's RobotStudio allow operators to program the robot and simulate an application on a PC without shutting down production. This helps reduce the time taken to get the robot running, ideal for organisations that have short product cycles. Moreover, digital twin technology can be used to develop a complete and operational virtual representation of a robot on which diagnostics, prediction and simulation can be run to optimise the machine even before it is set up.

Innovating for the future, today

The future of collaborative robotics will be in developing enhanced software features such as cloud connectivity, artificial intelligence and machine learning that increase their functionalities and make them even safer, intuitive and easier to use.

ABB is constantly developing new ways to make collaborative robots safe and effective. Software features like ABB's QuickMove and TrueMove guarantee superior motion control, thereby increasing shop floor productivity. In short, collaborative robots represent an unprecedented opportunity to transform industrial automation and improve work dynamics.

new.abb.com

"The future of collaborative robotics will be in developing enhanced software features such as cloud connectivity, artificial intelligence and machine learning



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24 million parts you can trust

Electronics Sourcing North America asked ECIA to introduce its newly rebranded inventory aggregation site, TrustedParts.com

Our readers will be familiar with ECIAauthorized.com. Can you share the strategy behind the rebrand to TrustedParts.com?

The site's primary value is listing genuine components from authorized sources. TrustedParts.com communicates this key differentiator more clearly compared with the old brand which promoted that participation was restricted to ECIA member distributors. Requiring ECIA membership to participate on the site limited our success in driving greater adoption, especially outside the Americas.

ECIA membership criteria is very strict, making it difficult to vet companies in other regions. To create a better user experience, and support manufacturer members, the ECIA Distributor Council decided that allowing non-members to display authorized inventory would increase participation, thus expanding the distributor network from which users can buy components.

Are there any functional changes?

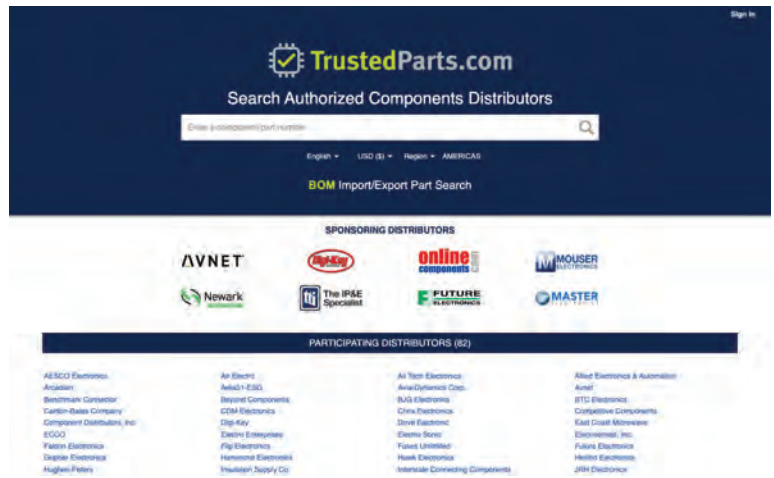
While the site will have a new name, new logo and fresh look, functionality remains the same. Users who bookmarked the site will automatically be redirected to TrustedParts.com. Accounts and tools will continue to work seamlessly. No action is required by users. We continually invest in new features and tools to enable users to locate components they need more efficiently.

Will TrustedParts.com be 100 per cent authorised distribution focused?

TrustedParts.com only displays price and availability data for genuine components from authorized distributors. We continue our extensive efforts to verify this is so. Although ECIA membership is no longer required (neither is the need to be 100 per cent authorized for all the products a distributor sells) a manufacturer's proof of authorization will be needed before any products can be displayed. Since TrustedParts.com is funded by, and dedicated to, supporting the authorized distribution channel, only inventory from franchised distributors will be shown.

How do distributors include their inventories?

Distributors can participate in one of three ways. First, they can apply for ECIA membership and, if approved, they become eligible to display all their authorized products. Secondly, they can forgo ECIA membership, but are restricted to showing the ECIA member manufacturers' products for which they are authorized. Lastly, a manufacturer member that uses our Distributor Stock Search (DSS) widget or API to enable searches for their products on their site, can request that an authorized distributor, who is not a TrustedParts.com participant, be added to the system for inclusion in search results on that manufacturer's site.



TrustedParts.com only displays information from authorized sources

All participating distributors are required to upload their inventory files via FTP. Files are in a specific CSV format and most distributors update daily. Files are automatically loaded into the system when received, any time of day. Some larger distributors also send information in real-time via an API, in which case their files are used as a back-up in case of performance issues with the API. Each search result lets the user know the age of the information.

What message would you like to say to electronics purchasing professionals who have not yet tried TrustedParts.com?

Sourcing components through the authorized channel is the greatest safeguard against unknowingly introducing counterfeit products into your supply chain and ensures that the products you buy are fully warrantied by the manufacturer. TrustedParts.com is the only inventory aggregation site that only displays price and availability information from authorized sources, so you can search for components you need with confidence. With over 24 million unique part numbers in the system, from more than 4,000 manufacturers, you can fulfill your requirements through the authorized distributors on TrustedParts.com. We also offer local language and true local currency in various regions to enhance your search experience.

Unlike other sites and services, use of TrustedParts.com, the BOM management tools and stock/price alerts is always free. Access to the API allows integration into your quote tool or ERP system to make your sourcing process more efficient. So, the next time you need electronic components I would encourage you to start your search on TrustedParts.com. It is fast, easy, accurate and always authorized.

trustedparts.com

Prevention is better than cure

Antistat explains why the damage caused by electrostatic discharge can be costly, then explains the products purchasers can buy to solve the problem

Electrostatic discharge (ESD) can damage sensitive electronic components, resulting in failures, reduced reliability, increased rework costs or latent component failures. The cost of in-house failures can be significant, while cost of a single in-field failure can be astounding. Whilst it is difficult to attribute specific failures to ESD damage, companies can minimise or prevent possible damage and reliability problems by storing, assembling and handling equipment under electrostatic safe conditions.

Regarding ESD packaging, antistatic bags and static shielding bags are the biggest sellers. Most standard product lines are sold in packs of 100. Case quantities and custom options can also be provided.

Pink antistatic or poly bags dissipate static charge to ground, when handled by a grounded operator or placed on a grounded surface, keeping static charge from building up on the package or device. Pink poly's resistivity is in the dissipative range and they have no shielding ability. A static field or discharge occurring outside bag will penetrate the bag and damage electronics inside. Their primary use is to package support or processing materials such as nuts and bolts that will be in close proximity to static sensitive devices within an ESD protected area (EPA).

Shielding bags provide similar dissipative and antistatic properties to pink poly bags but add a metal shield to stop static from entering the bag. A four-layer construction guards against charges inside and outside the bag, while being semi-transparent for easy content identification. Static shielding bags are silver and typically used for transport and storage outside an EPA.

Moisture barrier bags protect electronics from both moisture and static damage. Bags can be vacuum sealed. They are available in different thicknesses depending on the moisture and vapour transmission rate required. To verify dry packaging methods are not compromised during storage and transportation, humidity indicator cards and desiccant sachets can be used.

ESD packaging also includes a wide range of solutions such as Corstat conductive corrugated board, ESD storage bins, waffle trays and custom component tubes. Corstat boxes offer a convenient and safe way to store and transport static sensitive devices due to its conductive coating providing Faraday cage protection and the antistatic foam which provides ESD-safe cushioning to protect the box contents.

Antistatic mats and ESD flooring are effective methods of controlling electrostatic discharge within the EPA. Matting slows down and controls discharge, allowing static electricity to transfer safely to ground. It can also protect the surface of sensitive devices from wear and tear. Different colours and textures are available, and matting can be cut to size.

The primary means of protecting ESD susceptible items is to provide a controlled ground path for ESD sensitive items. There is a wide range of ESD personnel grounding wrist straps, sole and heel grounders, ESD plugs, bonding points and other grounding accessories in addition to the tools to facilitate this.

www.antistat.com



Pink antistatic bags dissipate static charge to ground



Shielding bags stop static entering

The primary means of protecting ESD susceptible items is to provide a controlled ground path for ESD sensitive items

Making the CASE for mobility's future

TTI's vice president of the Transportation Business Unit, Jim Hawersaat, looks at four factors changing how the world approaches transportation and what they mean for consumers and components suppliers

What do Amazon, GM, Samsung, Honda, Blackberry and AT&T have in common? They are among the many companies shaping mobility's future. Think CASE: Connected vehicles, Autonomous vehicles, Shared mobility and Electric vehicles.

Technology-driven transport

Connected vehicles are designed to avoid construction, crashes and congestion. Your car alerts you of stopped traffic and changes your route. Meanwhile, other connected vehicles are rerouted appropriately so traffic stays in balance.

As new types of vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), Dedicated Short Range Communication (DSRC) and Cellular to Everything (C2VX) technologies emerge, manufacturers of antennas and RF solutions will be challenged to create robust technologies with lighter components that occupy smaller footprints. Also, network infrastructure upgrades will be needed to process, analyze and prioritize up to 4,000 GB of telemetry and location data per day. A huge opportunity is waiting.

Autonomous vehicles can also prevent over 5 million crashes and almost 40,000 highway deaths each year in the US alone. By integrating connected technologies with next-gen sensors, autonomous vehicles will avoid roadway obstacles and potential collisions. As systems are refined, they'll likely react faster and more accurately than human reflex allows.

We've already seen driverless vehicles in use from grocery delivery robots in Scottsdale, Arizona and Houston, Texas, to tests of driverless delivery trucks and passenger vehicles. At current rates of implementation, experts say 80 per cent of Chinese, European and US miles will be covered by self-driving vehicles by 2030.

The design challenges are great. Signal and data downtime are unacceptable when a vehicle's safety depends on 'seeing' other traffic. Hardware must handle information at unprecedented speeds. Many suppliers and business partners for these new technologies will not be traditional transportation companies.

Shared vehicle revolution

Shared mobility—collective, organized use of a vehicle by a number of people—is likely to disrupt current car-ownership models. Millions of workers who began telecommuting during the coronavirus pandemic could accelerate the move away from personal vehicle ownership.

Shared vehicles could become the preferred option for commuting, shopping or travelling to leisure activities. The financial or quality-of-life benefits of no longer owning a vehicle could lead to fewer vehicle sales. However, we can expect greater use of mass-transit services and multi-passenger vehicles. This means increased demand for larger, more complex wire harnesses and components.

Finally, electrification continues to impact passenger vehicles, shipping fleets and OTR trucks. The three biggest drivers are: reductions in battery price; increased range; and lower lifetime costs. Tesla continues to set milestones for passenger electric vehicles and Volvo already has electric commercial vehicles on the road. It is if or when this change will happen, but how quickly.

This evolution creates new challenges for makers of wiring harnesses, connectors and power electronics. Not just to design safe, reliable in-vehicle systems, but to create an entirely new infrastructure to deliver this energy to homes, business and public charging stations.

New inflection point

In 1920, automobile pioneer Henry Ford was quoted as saying, "If I had asked people what they wanted, they would have said faster horses." Instead, Ford supplied the invention that brought society to the first great inflection point in mobility, the family car—and with it, a new American landscape. Advances in electronic components and technology are bringing us to a new inflection point, making the next evolution in mobility happen even more rapidly.

www.ttiinc.com



TTI's vice president of the Transportation Business Unit, **Jim Hawersaat**

> **The design challenges are great. Signal and data downtime are unacceptable when a vehicle's safety depends on 'seeing' other traffic**

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Post Covid-19: re-imagining life



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

John Denslinger prepares for more robotics, kiosks, touchless, protection, detection and more re-imagining life as we know it

Covid-19 • By John Denslinger

My editorial last month dealt with the 'great American reboot 2020' where I discussed an onslaught of issues confronting procurement as operations restart. Undoubtedly, those challenges will continue until the virus impact becomes a distant image in the rear-view mirror. As the reboot begins, fresh opportunities are about to be exposed.

In the wake of natural and man-made disasters, it's human nature finding solutions, implementing effective countermeasures, inventing new products and applying technology in ways not imagined before. Just look at the innovation that happened when the nation issued a crisis call for N95 masks, face shields, ventilators, sanitizers, protective clothing, swabs, test kits, faster testing processes and vaccines. With little fanfare, manufacturers big and small responded in droves producing products and services atypical of their normal business. No words can express our admiration for these unsung American heroes.

All this to say, the virus has made it abundantly clear a sweeping change is underway. In the post Covid-19 world, many of our daily activities and personal interactions must be modified, fortified or re-designed for a healthier peace-of-mind. This is the silver lining I see ahead for manufacturers of electronic components, products and systems. Just think of the areas for re-imagining.

Medical care administered via tele-health 24/7/365 to our vulnerable elderly, at-risk and handicapped individuals in nursing homes or other isolated locations. Productivity augmentation for tele-commute workers especially in the areas of communications and connectivity. Hygiene assurance everywhere via more hands-free options. Devices that surveil continuously for proper sanitization and contaminate free surfaces. Temperature scanning of employees, customers and individuals attending typical gathering spots from large stadiums to small local establishments. Social distance shadowing both ground-based and airborne. Robust data collection and notification systems for contact tracing. Quick/reliable virus testing and diagnostics. Digital solutions that eliminate currency transactions. In general, more robotics, more kiosks, more touchless, more protection, more detection, more re-imagining life as we know it.

Ingenuity is a beautiful thing. Quite honestly, the applications mentioned above are not totally unknown to most: it's the immediate scale and scope of need that will shock the industry. Each of these opportunities require electronic components. Besides the foundational capacitors, resistors, semis and connectors, demand will be strong for IoT devices, sensors of all types, RFID tags, wireless communications, low power multi-point networks, power supplies, and displays. As for devices, the leaders will be smart phones, servers and scanners. On the systems end, it will be 5G deployment, ultra-high speed broadband and GPS that seamlessly connect it all.

The pandemic heightened public's awareness of everyday personal health and safety risks. Lives were upended. Pocketbooks depleted. A tolerance for future mass quarantines seems unlikely. The public expects more. While the US Congress debates a massive infrastructure bill to revitalize the economy, businesses should heed the public's concern and revitalize their own surroundings. As a society, we are blessed with great technology, exceptional products and the wherewithal to create a safe and secure environment for everyone. That's re-imagining life.



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Steps to reduce counterfeit risks

In the fight against counterfeit or other non-conforming parts, 4 Star Electronics steps readers through a standards-based series of solutions

Procuring electronic components, especially end-of-life or obsolete components, can be a difficult task. Buyers often face challenges such as part allocations, shortages and long lead times, but the most complex issue can be the battle against counterfeit or other non-conforming parts. When sourcing end-of-life or obsolete components, it's important for buyers and procurement specialists to be aware of the supply chain risks and for their employers to develop programs to increase the probability of receiving good product. Luckily, there are many processes and tools available to combat non-conforming material.

Develop a standards-based program to validate parts

In 2009, the SAE published *AS5553 Counterfeit Electrical, Electronic, and Electromechanical Parts; Avoidance, Detection, Mitigation, and Disposition* to introduce general requirements that OEMs and CEMs could use and flow down their supply chains. This standard has evolved to better address the risk-based nature of counterfeit mitigation and to refine the industries' definitions and best practices. Revision C is a good starting point.

An important part of AS5553 is the requirement to source material from authorized sources, including OCM, their authorized or franchised distributors, and authorized aftermarket manufacturers. When these sources are unavailable due to obsolescence or other factors, trusted suppliers the organization has fully qualified should be used, along with risk-based inspections and tests appropriate for the parts' end-use.

These trusted suppliers are typically high-level independent distributors who have addressed the need for part validation by utilizing other standards such as AS6081 *Fraudulent/ Counterfeit Electronic Parts: Avoidance, Detection, Mitigation, and Disposition – Distributors* and the even more detailed AS6171 *Test Methods Standard; General Requirements, Suspect/Counterfeit, Electrical, Electronic, and Electromechanical Parts.*

Although the AS standards target high-reliability military and aerospace electronics, commercial and industrial OEMs and CEMs all have need for obsolete and hard-to-find parts, so the principles apply.

It's important for organizations to fully qualify and develop a small group of trusted independent distributors to ensure a smooth supply of material when the authorized supply chain cannot perform due to obsolescence or other factors.

How does an independent distributor ensure quality material?

Modern, high-quality independent distributors are no longer just brokers, moving boxes from one place to another. Top-level distributors have developed thorough risk-based vendor management systems and in-house test and inspection labs to validate components as new and original.

Typical tests, based on IDEA-STD-1010, AS6081 and AS6171, that are performed in the test and inspection labs include:

- Review of packaging and documentation
- Manufacturer datasheet validation
- Research of industry databases such as ERAI and GIDEP
- External visual inspections, including surface analysis and marking tests
- Digital photographs and microscopy of components
- X-ray and XRF analysis
- Decapsulation and die examination

Higher levels of application risk may require additional levels of testing. Electrical testing, C-SAM, SEM, FTIR and other customer specified tests may be used to aid component authentication or to demonstrate reliability. Independent distributors may have these capabilities in-house or employ specialized outside labs.

Steps to reduce the risk of receiving non-conforming or counterfeit parts include:

- Develop a risk-based counterfeit mitigation plan based on AS5553 and other industry standards
- Buy parts from authorized sources whenever possible
- Develop relationships with high-quality independent distributors who can supply critical parts such as end-of-life or obsolete components
- Specify testing for non-traceable parts, performed by a qualified independent distributor or laboratory, to the most current standards and best-practices

www.4starelectronics.com



It's important for organizations to fully qualify and develop a small group of trusted independent distributors



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Farewell to end-of-life components

Sometimes service excellence for purchasing professionals means telling customers what not to buy, as Mouser Electronics explains

In the quickly evolving world of electronic components it's reassuring to know that Mouser works hard to identify products 'not recommended for new designs' (NRND). Buyers can be confident they're always sourcing the most advanced electronics available. They can subscribe to receive these product notifications online. This is just one way Mouser helps to foster its customers' speed to market.

Mouser's vice president of Americas sales and service, Coby Kleinjan, explained: "Having the newest, most advanced technology to develop cost-efficient prototypes limits costly redesigns, manufacturing delays or even the termination of a project.

"It also leads to a design edge in delivering more product features and capabilities as well as longer lifecycles. That's why we work closely with all of our manufacturer partners to provide the fastest and easiest access to the industry's newest components."

Each transaction is about more than a sale, it's about building relationships. Few things are more frustrating than a delay because of obsolete products. So, Mouser updates its website many times per day to provide options to help buyers easily find what they want.

Customer service and technical support representatives are available weekdays from 7am to 8pm (CST) to assist with requests including price quotes, order placement and order status, real-time product availability, technical support and more.

The company's website which features over 800 manufacturers and access to more than 5 million orderable part numbers. For added service, buyers can order and communicate with Mouser representatives via phone, email, fax and live chat. Orders are shipped same-day in most cases from Mouser's global distribution center, which features state-of-the-art automation for expedited processing.

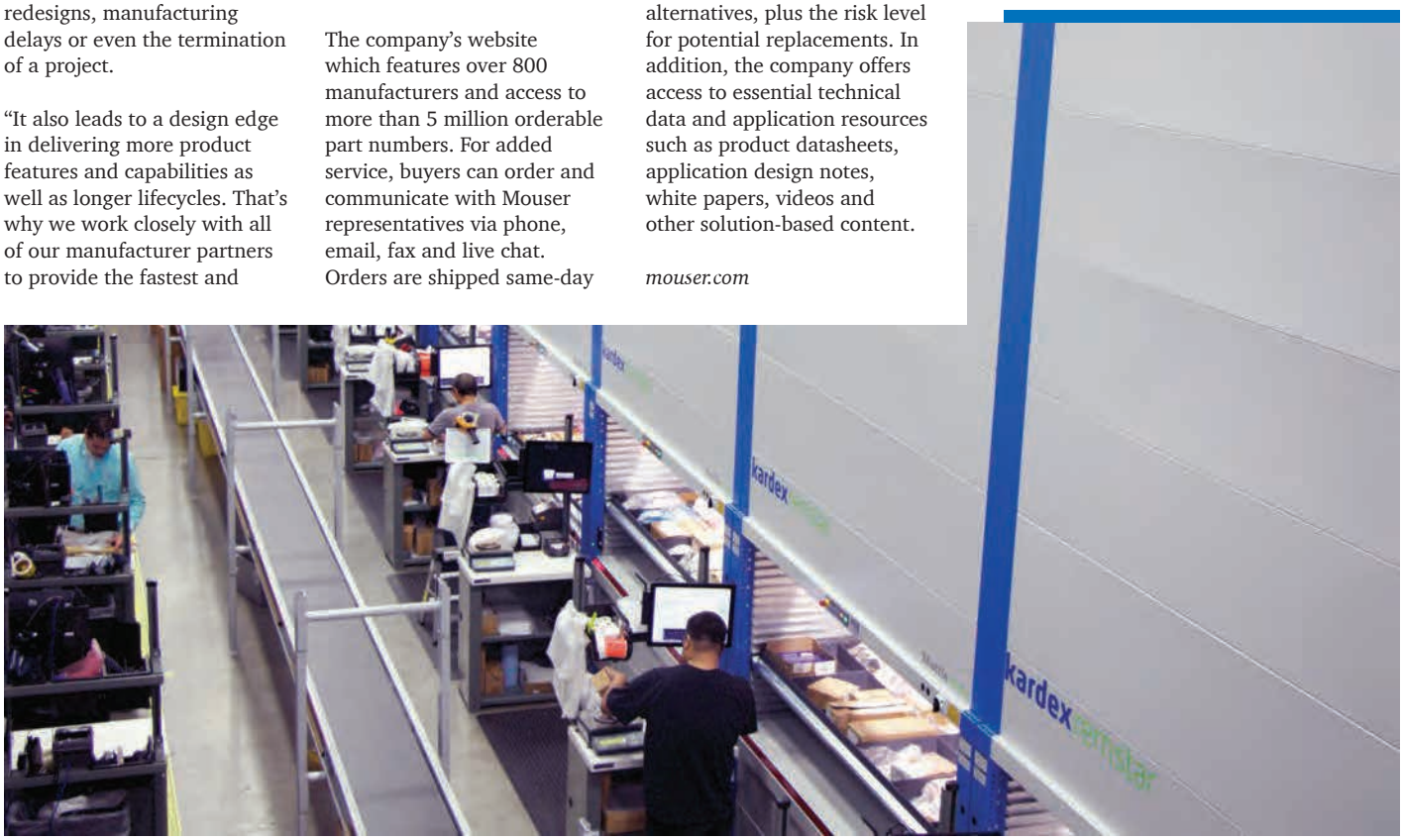
For buyers who need to know real-time inventory, Mouser offers real-time product availability through its website and customer service representatives, providing the most accurate product information to make confident buying decisions. The company identifies end-of-life, obsolete and NRND products to avoid the use of older components in new designs, providing a speed-to-market advantage.

Mouser also suggests alternatives, plus the risk level for potential replacements. In addition, the company offers access to essential technical data and application resources such as product datasheets, application design notes, white papers, videos and other solution-based content.

mouser.com

Having the newest, most advanced technology to develop cost-efficient prototypes limits costly redesigns, manufacturing delays or even the termination of a project

Mouser's distribution center features the largest installation of vertical lift modules in North America



Special skills of aerospace procurement

Debbie Rowland explains that purchasing components for mission-critical or harsh applications needs a tougher approach than buying parts for commercial designs

The sourcing of components for aerospace applications places demands on procurement professionals which require a careful balancing act. Limitations which are part of sourcing components for critical applications have several factors: components can sometimes only be sourced from an approved supplier list; parts must comply with operational and regulatory standards; and equipment typically has an extended lifetime.

The lifetime of aerospace systems can be up to 20-years. This means component obsolescence is a factor which must be considered from the design and prototyping stages and beyond. It is certainly a factor in maintenance, repair and overhaul (MRO) programmes which deliver support throughout the equipment's lifetime. Whilst any approved distributor should be able to supply the parts, aerospace OEMs and EMSs should also ensure distributors have active obsolescence strategies which can check a component's long-term viability. This strategy limits component obsolescence and needs to be supported by specialist knowledge and experience.

Distribution supplier or partner

Buyers can take one of two approaches to purchasing components for tough or critical applications. Parts can simply be purchased from a distributor on the approved list; or the buyer can decide to use the distributor as an in-depth procurement partner. The partnership approach means the distributor should have the skills, processes and commitment to work as an integral part of the procurement process.

For a new design, the real question for the buyer is not just price and availability but also the component's longer-term availability. Whilst the full component lifespan cannot be guaranteed, the distributor should have the experience of supplying components for long-life and critical applications as well as a close relationship with the manufacturer. The relationship between component manufacturer and distributor will provide an understanding of the component's proposed lifetime and any risk of an imminent end-of-life (EOL).

For components which become obsolete during the equipment's lifetime there are several potential solutions from a partner distributor. A last-time-buy (LTB) could provide inventory and the distributor may hold the inventory for the OEM or EMS. An alternative is for the distributor to identify and supply a replacement component to ensure ongoing viability throughout the programme's lifetime. Later in the lifecycle, obsolescence can affect the continued need for the spares to support maintenance, repair and overhaul.

Understanding component compliance

Industry standards which the parts must meet are an essential element in the purchasing decision. For some aerospace systems, the most stringent approvals are not mandatory and passive components which are approved to automotive-grade AEC-Q200 can be used to deliver reliability at a reduced cost. The use of automotive devices requires specialist knowledge to identify where these devices offer a suitable alternative. Aerospace parts are often specified for high temperature, high reliability and high tolerances but may also need to be released to CECC or a MIL-SPEC.

Strict industry standards, such as JOSCAR and AS9100, give OEMs the confidence the distributor is operating to the highest standards. These accreditations indicate the distribution process is backed by in-house expertise and robust quality control systems.



Charcroft director, **Debbie Rowland**



From design to through-life

Distributors should certainly understand the full range of approvals, but through-life support demands specialist technical expertise and the commitment to assess the bill-of-materials (BOM). Stringent quality systems and checks should be used before shipment to ensure the parts are correct, undamaged and have the appropriate documentation. In aerospace applications, buying components from a franchised distributor ensures the parts are genuine and fully traceable. This overcomes the huge risk of sourcing from non-approved suppliers which can add to potentially receiving counterfeit devices.

Through-life support for a programme emphasises the longevity and experience of distributors which can also be important. Support during design and prototyping is crucial for ensuring a component has the best fit and performance characteristics. Specialist support on pricing can also be pivotal during design. A specialist franchised distributor should be able to liaise with the manufacturer on the longer-term validity of pricing, quantity price breaks and additional support such as component testing.

Partnering with a distributor which offers specialist support for the aerospace market will help purchasing professionals manage demanding procurement processes.

From ensuring the long-term viability to providing through-life support, the distributor's knowledge and skill can be crucial to the continued success of aerospace procurement.

www.charcroft.com

Industry standards which the parts must meet are an essential element in the purchasing decision

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Obsolescence: not the end of the world

Electronic Component life-cycles—the time between market introduction and formal end-of-life—are shortening. A large part of the world's semiconductor demand is driven by consumer electronics, and this market typically has shorter and shorter product lives. Component obsolescence is affecting more companies, more regularly than ever before. Manufacturers in the automotive, industrial, medical, transport, aerospace and military markets have product lives which now far exceed those of the components which go to make them

When long-term product availability is vital, companies need to ensure a reliable source of components is in place, even after the component is made obsolete. This means companies need to plan and manage obsolescence strategically. Failing to do so could lead to:

- Line-stops
- Unnecessarily large financial commitments tied up in last-time-buy stocks
- Long-term storage costs
- Forced product re-designs
- Premature product end-of-life (EOL) and reduced service lives

Here are the top tips to minimise the cost of obsolescence.

Obsolescence management starts at the design phase

Poor component selection in development can lead to premature product re-design and re-qualification. We have all heard of stories of products being launched with obsolete components inside. This is particularly relevant for customers with long development and qualification cycles. A new car, aircraft or industrial controller will typically spend up to five years in design and qualification. Add to this: five to seven years of production; and seven to 10 years of after-sales support and it is not uncommon to need a total of 20 years of component supply.

Choosing the right component technology and supplier can have a dramatic impact on long-term availability. Lowest cost may not be best choice for long-term supply. The first question to ask your supplier is 'what are their commitments to long-term availability'. It is always difficult to obtain absolute guarantees of availability over the long-term. There are unforeseen natural disasters, market instability and company acquisitions: all of which cannot be predicted years in advance. But can your supplier demonstrate a controlled transition process through the EOL and into long-term authorised supply or even long-term production?

Other important questions to ask your supplier. Are the heart-beat components of your design, the software packed microcontrollers, FPGAs or ASICs comprehensively documented? Can the true design files (VHDL, Spice models, test-vectors) be retained and archived at the design phase to offer a chance of re-build if the unexpected happens? Do they contain proprietary intellectual property? If so, the ability to port such designs when/ if the components are made obsolete, will be compromised or at least subject to re-licensing/royalties.

Understand the total cost of obsolescence

Does the company understand and model the cost and risks associated with obsolescence? Component obsolescence is not just a purchasing problem to be addressed as an after-thought. Does the project plan need to include anticipated product re-designs during its life? How will the capital locked down in long-term component storage be accounted for? How will component obsolescence impact on after-sales service commitments?

Plan for obsolescence and resource to management it

If your equipment has a long qualification, production or in-service life you will face component obsolescence. Customers who are surprised by component obsolescence and treat its resolution as an inconvenience to be overcome as cheaply as possible, will ultimately pay a heavy price in terms of disruption, cost and risk. The best-in-class devote skilled multi-disciplined resources to the task of obsolescence management. Preventative planning by purchasing, component engineering, design and programme management can reduce or eliminate the cost and risk. The devil is in the detail and analysis must be line-by-line.



Poor component selection in development can lead to premature product re-design and re-qualification

Unexpected obsolescence of a 1 cent transistor can stop a programme as easily as the obsolescence of the main microcontroller.

Pro-active monitoring of component life-cycles

Regular component monitoring allows a user to anticipate problems before they occur. There are some excellent tools such as IHS Parts Intelligence and BOM Intelligence which track a component's life-cycle, lead-time and specification changes during its life. Such tools provide a life-cycle prediction, and alerts can be triggered when product discontinuation notices (PDNs) are issued.

Be aware of product discontinuation notices

Many component management databases can provide PDN notification services. This can be generic, where you are shown everything, or specific where you load BoM structures into the database, and it matches and highlights PDNs which affects the products. Each manufacturer has its own unique PDN format so it can be time consuming to assess and log all the part numbers affected. There are attempts to standardise formats with initiatives like SmartPDN but this will take time.

It seems bizarre but it is increasingly difficult for customers to know which PDNs affect their products. Increased system integration, and the use of embedded processing mean that sub-tier suppliers control these BoMs. A poorly managed component obsolescence in either of these areas can still trigger a forced re-design for the owner of the overall system. Will your sub-tier suppliers share their BoMs? Do your sub-tier suppliers have adequate obsolescence management processes in place?

While many CEMs offer pro-active component life-cycle management, some are completely re-active. PDN notifications are typically only aimed at the direct purchasers of the component in the last two years. Intermittent or irregular production, or low level after-sales service support, may not trigger the PDN notification. Does your CEM have an adequate obsolescence management process?

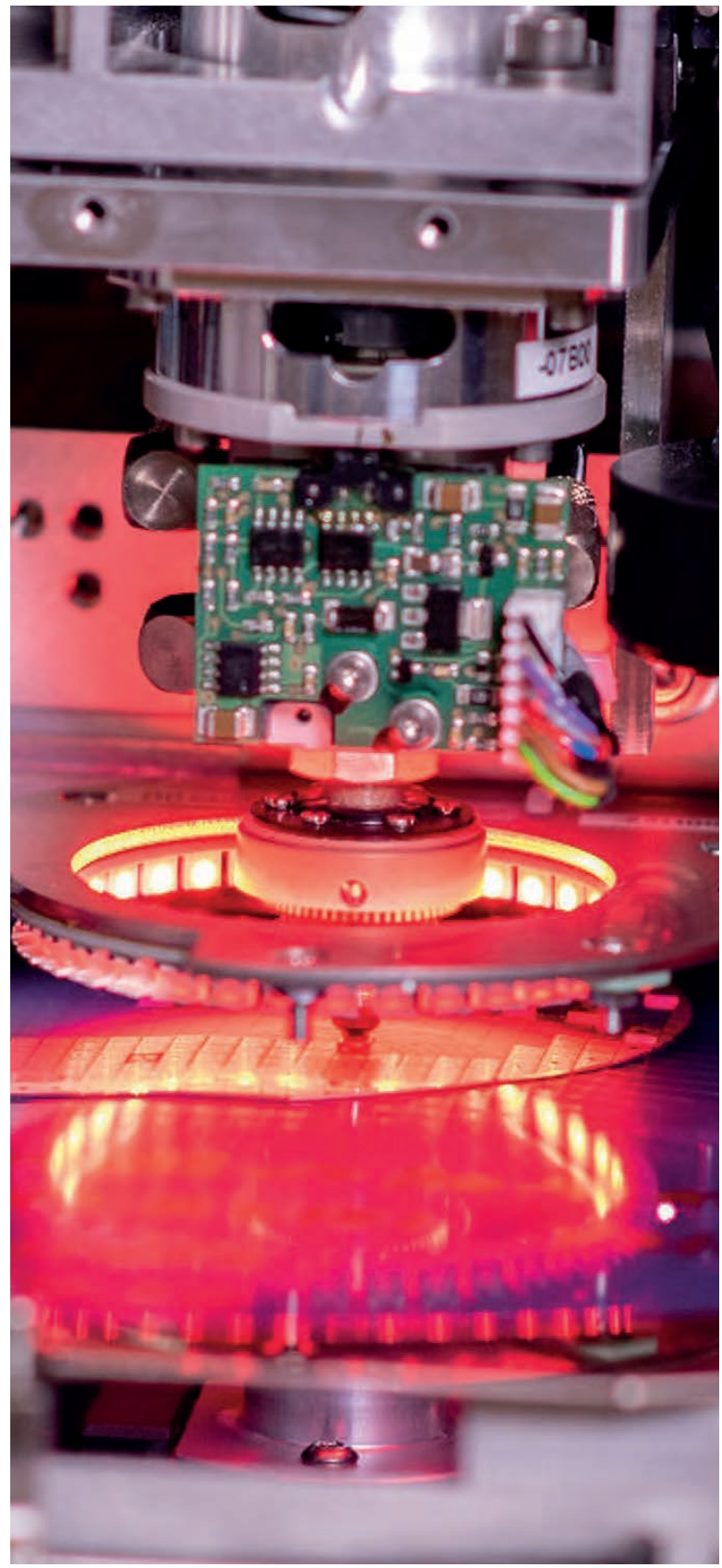
Last-time-buy: What to forecast?

Forecasting is not an exact science. It is almost guaranteed that your forecast will be wrong. If production forecasting is difficult, after-sales needs are a nightmare. Underestimate your needs and you risk prematurely killing a product and losing sales. Overestimate your needs and you will tie-up unnecessary capital in stock, whilst paying excessive storage costs. Should you plan a re-design in the future to limit your LTB? The design and re-qualification costs, plus the opportunity costs of using precious engineering resources looking backwards rather than forwards, need to be factored in.

Whilst there are few options except to place a traditional LTB order, a supplier with an established EOL transition path offers at least the hope of risk-free ongoing authorised stock and production. If demand rises, re-designs are delayed, or in-service commitments extended, then these aftermarket partners will be able to support. They provide an extra layer of security to the forecasting process.

Purchase from authorised sources

There is a common misconception that once the original manufacturer stops making a component,





unauthorised/grey market sources are the only option. Nothing could be further from the truth. The zero-risk option of an authorised after-market supplier like Rochester Electronics, should always be the number one choice.

The risk of counterfeit and simple poor-quality product from unauthorised sources represents a significant risk to production yield and mean-time-between failure rates (MTBR) in the field. Inferior or substandard 'testing' by unauthorised third parties gives a veneer of confidence that 'goodness' can be tested. In truth, the testing is visual or x-ray or a poor partial copy of the original manufacturers test processes. Full tri-temp testing can rarely be offered, and the risk of commercial grade components being re-marked as industrial, automotive or military parts has never been more real.

Unauthorised component risks include:

Poor handling. Resulting in ESD damage and the destruction of the device. Externally there will be no indication that a failure has occurred

Poor storage. Excessive heat, cold or moisture during any part of its storage life. Leading to: external lead corrosion and failed solderability; or moisture ingress into the plastic devices and a catastrophic failure when subject to reflow temperatures.

Fake documentation.

Recovered, re-marked or re-packaged components claiming to be something else.

There are also documented quality problems related to foreign chemicals. Cleaning chemicals used to recover, wash and re-mark used components, slowly migrate into the products, shorting and corroding bond wires and pads alike. Superficial testing will not guarantee to find these faults. Recovered components may pass these tests and survive for a period in-service. However, the ultimate failures will destroy MTBR figures, and result in reduced reliability and damaged reputations.

Original component manufacturers do not provide guarantees for products purchased through unauthorised channels. Many explicitly prohibit the sale of components to unauthorised sources. Sources like Rochester Electronics receive their stock exclusively from manufacturers.

Components never leave the authorised bubble so Rochester can offer the original warranties and guarantees. Increasingly, Rochester can offer ongoing build from known-good-die and test product according to original test procedures. Rochester produced parts are current date code with no solderability risk and marked with the original manufacturer's part number, 100 per cent compliant with the original specification. In some cases, Rochester continues to build components first made EOL by the OCM 25 years ago.

Rochester is the trusted authorised partner for most of the world's leading semiconductor industry. All product from Rochester is 100 per cent authorised.

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The risk of counterfeit and simple poor-quality product from unauthorised sources represents a significant risk to production yield and mean-time-between failure rates (MTBR) in the field

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Power MOSFET and IBGT revenue will fall as demand from automotive weakens

Electronics purchasers can expect stable lead times and some price declines for power transistors because of waning demand caused by the pandemic

James Carbone

Overall weaker demand from automotive and consumer segments due in part to the coronavirus pandemic will result in a steep revenue decline for discrete power metal oxide semiconductor field emitting transistor (MOSFET) and insulated gate bipolar transistor (IGBT) sales in 2020, according to market researcher Omdia.

Power MOSFET revenue will fall from about $8.1 billion in 2019 to $7.15 billion in 2020. Power MOSFET revenue had peaked in 2018 when the market totaled $8.18 billion. Power MOSFET sales will not return to that level over the next four years. In 2024, the power MOSFET market will reach $7.4 billion, said Omdia. IGBT power transistor sales are forecast to drop from $1.4 billion in 2019 to $1.27 billion in 2020.

Overall weaker demand will mean that lead times for MOSFET and IGBTs won't stretch and buyers can expect some prices declines, according to industry analysts. MOSFETs are widely used in electronics systems for switching and amplifying electronic signals. MOSFET is the most common transistor and can be used in both analog and digital circuits. IGBTs are also used as a switch in medium- to high-power applications like switched-mode power supplies, traction motor control and induction heating.

One key reason sales will decline for MOSFETs and IGBTs in 2020 is weaker demand for components from the automotive segment. Automakers closed production plans after the pandemic hit. In addition, many workers in all industries were furloughed and many people put off purchases of high pricetag items including cars which resulted in vehicle sales plummeting.

Automotive is a huge market for power MOSFETs, according to Richard Eden , senior principal analyst, power semiconductors, at Omdia. He says the total MOSFET market is about $7.1 billion and MOSFETs sold to automotive will total about $1.9 billion in 2020.

Dave Valletta, executive vice president of worldwide sales for Vishay Intertechnology, said the decline in MOSFET demand from the auto industry will contribute to flat to slightly down sales for Vishay in 2020. Declining sales are due to the impact of coronavirus.

Prior to COVID-19, Vishay's MOSFET business had been "growing like crazy" and automotive had been the fastest growing part of the business, he said. "Last year was a relatively soft year, but we saw growth in MOSFETs."

Automotive contraction

The pandemic seems to have impacted the auto industry more than other Vishay customer segments. "The automotive segment is the only segment that has fallen down," said Valletta. "You really see the contraction in the auto industry." Other customer segments have not been impacted as much by the pandemic and in the first quarter, MOSFET orders for Vishay increased, perhaps because of panic buying.

"Customers were nervous about not being able to get parts," said Valletta. There's a lot of stocking going on. We are busier in terms of expediting orders," he said.

Many of those orders could have been from the computer industry because PC sales increased in the first quarter. Jim Feldhan, president of Semico Research,

By the Numbers

6.9%
The expected rate of decline of the overall power semiconductor market in 2020

$7.15 billion
The forecasted size of the power MOSFET market in 2020

$7.45 billion
The dollar value of the power MOSFET market in 2024

$1.9 billion
The expected dollar value of power MOSFETs sold to the automotive industry in 2020

$1.28 billion
The expected size of the IGBT market in 2021

Source Omdia

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said demand for computers is increasing because more people are working at home and many children are being taught through virtual learning which has increased PC demand

"A lot of people had PCs and laptops that were five, six, eight years old and no one wanted to upgrade them," said Feldhan. "Now all of a sudden they felt they needed a new PC so Dell, HP and others had a big spike in orders in the first quarter. The increase in first quarter demand should result in stronger growth in the PC market "which has been lagging for years," said Feldhan. Robust computer demand also means greater overall semiconductor demand including MOSFETs at least in the short term.

However, computer demand by consumers will be somewhat limited as will demand for other consumer electronics equipment because of high unemployment as many businesses have shut down and furloughed workers because of COVID-19. Other important segments are also being impacted including wired and wireless communication, industrial.

However, one subsegment of communications that should remain healthy for the MOSFET market is 5G infrastructure. Wireless communications providers such as Verizon, AT&T and T-Mobile, say they plan to continue to build out 5G networks despite the pandemic, according to Feldhan. "When you look at Asia, they were already implementing 5G. Asia and Europe are ahead of the U.S. in terms of rolling out 5G," said Feldhan. With more people working and learning at home, more bandwidth is needed and 5G can help supply it.

V-shaped recovery?

Fifth-generation wireless technology is one reason that the MOSFET market will rebound and continue to grow for years. But other segments will also be drivers for MOSFETs, including automotive and consumer electronics once the pandemic subsides and businesses rehire workers.

"Hopefully, we should get a V-shaped recovery," said Eden. "There will be a bounce back, particularly for consumer, computer and data storage. MOSFET revenue growth should recover in 2021, but growth will be modest through 2024 when revenue reaches $7.4 billion.

Omdia said driving the recovery will be based on expected healthy demand for vehicles after two years of weak sales. The researcher said that consumers will want to spend again on televisions, mobile device upgrades and other consumer goods once they are back to work. However, the recovery is dependent on an easing of restrictions in the developed world by mid-year, a manageable reoccurrence of the virus and a successful vaccine rollout within 12 months, the researcher said.

Eden said the question is will the virus "crash so many industries that consumers won't have the income to spend on goods like "new cars, new televisions, notebook computers" and other products. If that happens "the recovery could be pear shaped" and not V-shaped, said Eden.

Like power MOSFETs, the IGBT market should begin to recover in 2021 as revenue increases from about $1.28 billion in 2020 to $1.32 billion in 2021. Low single-digit increases should occur through 2024 when sales total $1.48 billion, according to Omdia. IGBT posted strong growth in 2018 when sales totaled $1.42 billion.

A key trend, buyers should keep an eye on is growing use of silicon carbide (SiC) MOSFETs rather than silicon-based MOSFETs. SiC can handle higher voltages than silicon. Silicon MOSFETs have voltages from 40V to 650V. "But silicon carbide MOSFETs go from 600V to 1200 V and even higher," said Eden.

SiC MOSFETs have a very high temperature handling capability (200°C) and reduced switching losses, according to chipmaker STMicroelectronics, which makes SiC MOSFETs for inverters and electric vehicles. SiC MOSFETs also have low on-state resistance which results in higher system efficiency, the chipmaker said.

SiC demand to rise

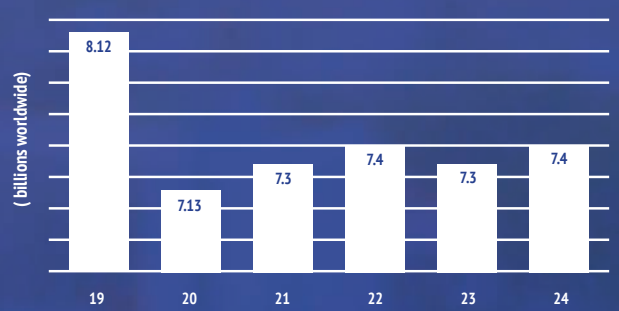
The biggest application right now for silicon carbide has been for power factor correction (PFC) circuits in power supplies, said Eden. "That probably will be the case for two to three years," he said. After that, there will be greater demand for SiC MOSFETs for inverters used in hybrids and electric vehicles.

Tesla uses SiC MOSFETs in its Model 3 electric vehicle ."It has lots of MOSFETs for each inverter and has an inverter for each wheel," said Eden. ST supplies SiC MOSFETs for the Model 3. ST went from doing $10 million on silicon carbide MOSFETs to $100 million and then $200 million last year," said Eden.

More companies are expected to use silicon carbide in their EV inverters but it won't occur until 2023 or 2024, according to Eden. Delphi and other automotive suppliers have announced they are building factory capacity to use silicon carbide wafers from Cree, he said.

Eden said it will take those companies a while to get their devices designed and in production, and approved for automotive, but "I am confident that silicon carbide will appear in lots of hybrid and electric vehicle and inverters by 2024."

Power MOSFETs to post modest growth



Power MOSFET revenue will decline in 2020, but will slowly grow through 2024
Source: Omdia

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Measuring supplier performance: It's not just about quality, cost and delivery anymore

Some electronics OEMs and EMS providers are changing how they rate supplier performance

In the not-so-distant past, when electronics purchasers rated supplier performance, the focus was primarily on product quality, delivery and cost.

Electronics OEMs and EMS providers pushed their suppliers to continuously improve product quality by using Six-Sigma practices in an effort to produce components with defect levels of 3.4 parts per million or less. They also rated suppliers on how well they met delivery windows, which for some manufacturers was zero days late one or two days early, and how much suppliers reduced the cost of parts and met cost targets.

Of course, those criteria are still important, but manufacturing and quality processes have improved, resulting in Six-Sigma level quality levels for many components. High product quality is now a given, and other criteria, such as total cost of ownership, productivity and responsiveness have become more important and are measured by OEMs and EMS providers.

In addition, some electronics manufacturers have added corporate social responsibility and environmental sustainability to their scorecards. Electronics companies say this is important because the electronics supply chain became more global as more electronics production moved to China and other Asian and Eastern European countries. Laws and norms regarding child labor, treatment of workers, workplace safety, business ethics and use of conflict minerals in some of Asian and Eastern European countries were sometimes weaker than in the U.S. and other Western European nations.

Many electronics OEMs and EMS providers had adopted a CSR code of conduct and insisted their suppliers do the same. EMS provider Celestica recently revamped its supplier scorecard to include CSR and environmental sustainability criteria.

"We had a very comprehensive supplier performance measuring tool in the past that we used for years," said Mike Madsen, Celestica's chief procurement officer. "We are part of the Responsible Business Alliance (RBA), but we didn't really track our suppliers if they were complying to RBA expectations."

RBA was formerly the Electronics Industry Citizens Coalition (EICC). The organization developed standards to ensure that working conditions in the electronics industry and its supply chains are safe, that workers are treated with respect and dignity, and that business operations are environmentally responsible and conducted ethically.

"There's a lot of environmental and social responsibility that lies within the RBA expectations," said Madsen. Celestica's scorecard did not include CSR as a criteria. This year, Celestica changed how it rates suppliers and now includes CSR.

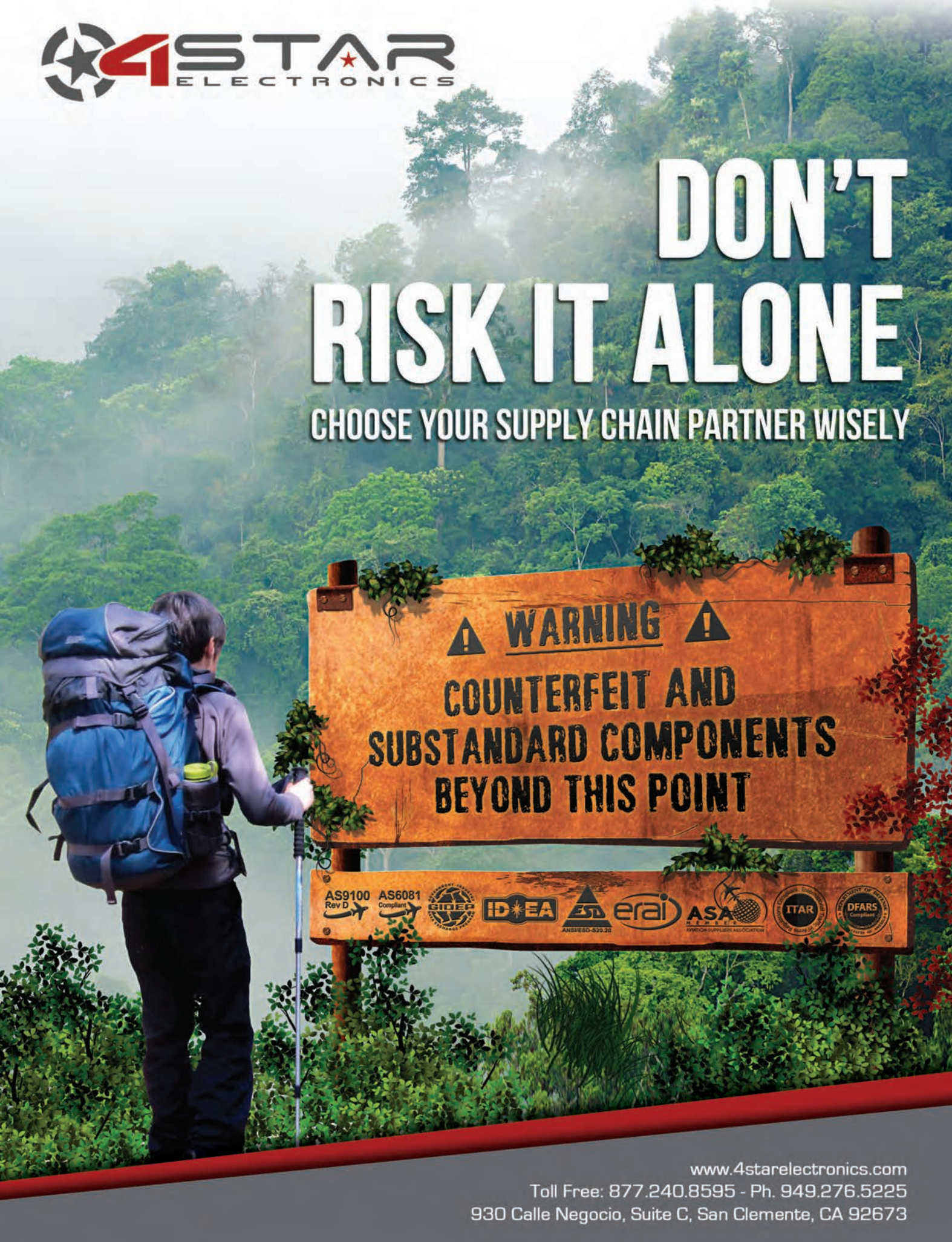
Many companies will evaluate CSR performance by suppliers by conducting site visit audits to make sure they comply with RBA expectations. For instance, Xerox Corp. conducts an initial risk assessment to identify suppliers that pose higher CSR risks. Suppliers classified as high-risk and those considered critical to the company's supply chain are required to complete a self-assessment questionnaire (SAQ) annually.

If significant risks are indicated on the SAQ, then Xerox will schedule a site visit audit of a supplier. Xerox uses the RBA audit format to evaluate key critical sustainability areas, including labor practices, freedom



Mike Madsen, chief procurement officer at **Celestica**

> **There's a lot of environmental and social responsibility concerns within RBA expectations**


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Since 2010, Xerox has conducted over 350 SAQs and has audited more than 100 suppliers. After the audit, the supplier is provided a written performance assessment. Corrective action plans are agreed upon for significant findings of potential risk. Closure audits are performed to validate progress, the company said.

Other OEMs and EMS providers have changed their supplier scorecards to monitor CSR and sustainability. However, there are other reasons why companies updated their scorecards criteria. In Celestica's case, while the EMS provider wanted to include CSR, other changes also needed to be made to the scorecard.

Madsen said Celestica's previous scorecard took "a one size fits all approach" rating suppliers, said Madsen. "It did not matter if you were a high-end semiconductor supplier or build-to print supplier. You were measured the same way from a defect parts per million standpoint, from a quality standpoint and from a total cost reduction standpoint," he said. Cost and quality issues can be different for different production materials and parts and Celestica felt the scorecard should take that into account.

Get out of limbo

Celestica's new Supplier Performance Tool (SPoT) measures every Celestica supplier across five categories—productivity, technology, quality, delivery and sustainability, which includes CSR. The highest possible score is 100, but the highest performing suppliers achieve scores in the high 90s. Lower achieving suppliers may have scores in the 70s or 80s and would be considered "acceptable suppliers."

An acceptable supplier is "not really good, but not bad either. You're in limbo there and you don't want to stay there too long," said Paul Kelley, director, supply chain management for Celestica. An acceptable supplier can move up to the "green" category which is a good supplier," he said. The top category is preferred suppliers who often score in the 90s.

With product quality, suppliers are rated on the defect levels of the products they manufacture. "Defects per million is something that we rate every single supplier on and every commodity. Actually, every single commodity manager is being measured on their suppliers and their commodities from a defect per million standpoint on a monthly basis," said Kelley. "That's a key metric within our scoring system," said Kelley.

Suppliers are also rated on the response to a quality issue. "When we do have a quality issue with a supplier, we measure how well suppliers respond to the problem and get back on track," he said. "That is probably more important than the DPM."

He notes that with electronic components, DPM is very low, about 1.5-2 ppm. Product quality is probably the most important thing for Celestica and our customers, he said. However, quality in electronic components is more taken for granted today than it was 10-15 years ago. "So today we anticipate that the quality is high. The same is true with on-time delivery," said Kelly.

Madsen says Celestica measures delivery in two ways: time to request and time to commit. "If a supplier is committing to a certain date, obviously we're expecting that the supplier will deliver to that date. That's a given. It's close to 100 percent," he said.

On time to request means that Celestica may have received an order it did not expect and needs parts from the supplier and "we request that a supplier delivers the parts at a certain time," said Madsen. Those expectations are less stringent versus the commit date but are important.

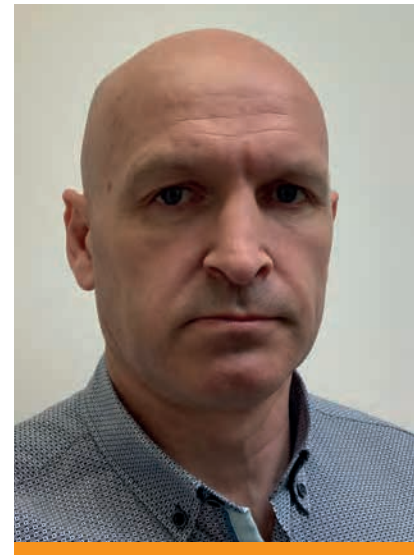
"As an EMS, we see a lot of opportunity to gain additional market share," he said. That can occur if Celestica can turn around an opportunity quickly and provide customers with the services that they expect in a short period of time. To do that "we have to have a very agile supply chain and delivery is extremely important," said Madsen.

The need for flexibility

Suppliers are also measured on productivity, or total cost of ownership. We look at "our suppliers' flexibility" and if suppliers provide inventory programs, said Kelly. "We look at how they take the orders, what their lead times are. We look at their minimum order quantities."

Suppliers often will have a low price for a part but require a customer to buy a large number of parts to get the low price. If Celestica needs to buy a relatively small quantity of a part, "a supplier's price may be low, but if we have to buy 100,000 pieces, that does not help us," he said.

Celestica sets annual price targets for different



Paul Kelley, director, supply chain management for **Celestica**

> **An acceptable supplier is not really good, but not bad either. You're in limbo there and you don't want to stay there too long**

commodities because cost expectations are going to be different for high-end semiconductors versus a build-to-print product. For passives, such as resistors "we see what the market is doing and see what our customers are expecting and make sure that's aligned as well," he said.

Celestica obviously wants suppliers to meet cost targets, but if a supplier does not, the EMS provider will work with the supplier to determine the problem. Celestica may look at the supplier's processes to see if there any inefficiencies. If it's determined the cost targets are not realistic because of changes in the market, "we will work with them to reset the target," said Kelly. If it turns out the target was realistic and the supplier is not willing to work towards meeting the target, "then we are not going to be awarding any new business and we will have a path of disengagement with them," said Kelley.

Suppliers that score in the 90s can be candidates for Celestica's Global Preferred Supplier List which generally can mean more business for a supplier. "They are our strategic suppliers. They are our go-to folks for each of the different commodities. If you scored in the 90s and you are not on a preferred supplier, you will be in for consideration. It depends on the commodity," said Kelly.

Kelly said Celestica measures supplier performance monthy. "We take the monthly data and then roll it into the scorecard quarterly. We measure quality and other key metrics, he said. If a supplier is not performing well overall, Celestica will work with the supplier. "We put a lot of work into developing suppliers so we don't want to throw them away" because of a bad score, said Kelley.

He said Celestica will go through the reasons why the supplier scored poorly. "Is it productivity? Is it a quality problem?" Whatever it is, Celestica and the supplier put together a "get well" plan and "we track them to the plan," said Kelley.

If the supplier improves, then we moved forward. "We operate on the policy that everyone can make one mistake." But if the supplier continues to have problems over time, "we have plans we call passive exit or inactive exit. If the problem is really bad and they go completely off the chart then we try to disengage rapidly," said Kelley.

Key to supplier management

At EMS provider Flex, supplier scorecards are integral to supplier management. "We spend a lot of time in front-end assessment of suppliers with audits and then we rate them on a quarterly basis on a scorecard system which is used by our commodity management of suppliers," said David Gessler, vice president, procurement and commodity management at Flex.

Flex measures quality performance, on-time delivery, commercial terms, communication, performance, inventory management, cost reduction, and purchase order automation, he said.

Most of the criteria can be measured objectively. For instance, Flex measures delivery performance based on delivery to request and delivery to commit, said Gessler.

When Flex measures suppliers on cost, it looks at the supplier's ability and history of cost reduction. "We look at the tail end of our spend versus the high runners and then we assess how the supplier does overall," said Flex.

He said scorecard performance is shared with suppliers. "We are moving towards more real-time connections with our suppliers," said Gessler. "I've challenged my team to create real-time collaboration awareness with scorecards. We are discussing providing the scorecards to our suppliers automatically on a regular basis," he said. It is part of a plan for Flex to have a more connected supplier relationship management platform, he said.



David Gessler, vice president, procurement and commodity management at **Flex**

> **We rate suppliers on a quarterly basis on a scorecard system which is used by our commodity management for management of suppliers**

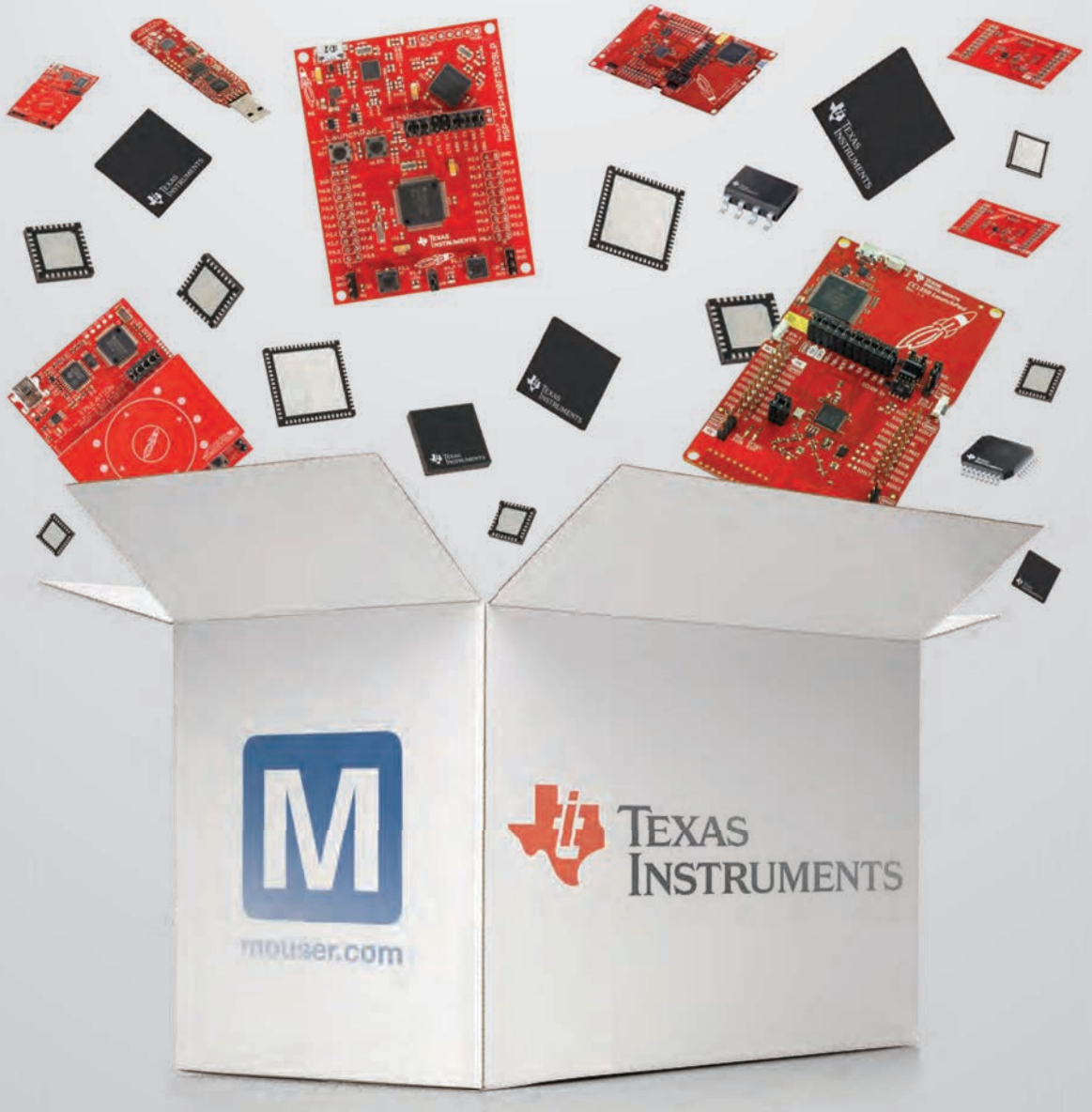
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CIRCUIT PROTECTION											
Bel Fuse	Bel Fuse	+1 201 432 0463	belfuse.com/circuit-protection	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	$0	68.00%	50	1,000+	Y
Eaton	Mouser Electronics	800-346-6873	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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MOUSER ELECTRONICS

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											
Abracon 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
Aptive (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	
	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

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

Contract Manufacturers Buyers' Guide

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

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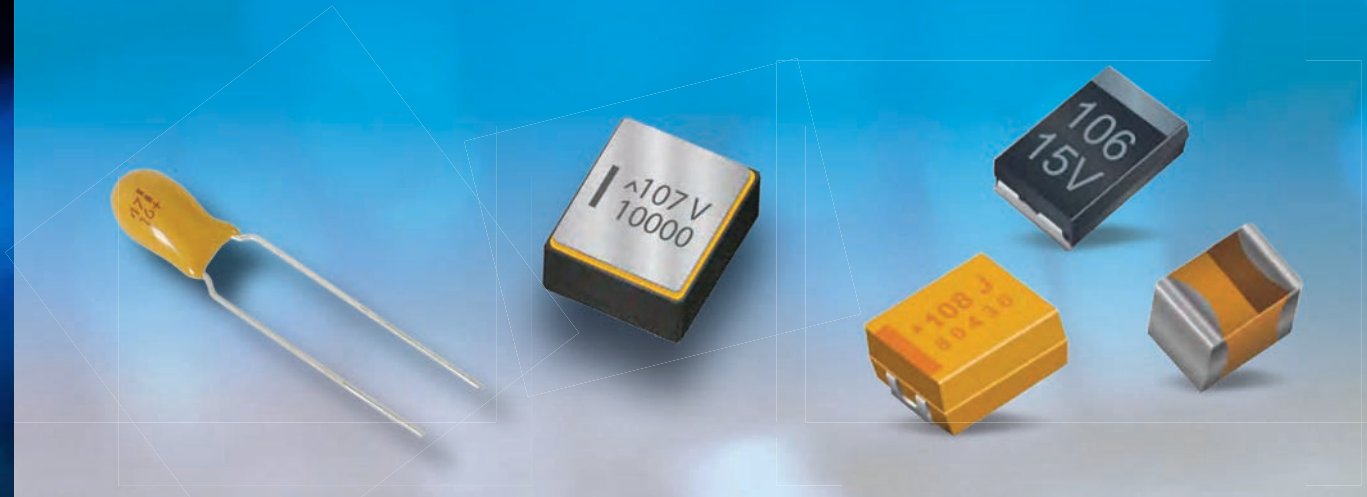
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