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Obsolescence: seeking support

page:18



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Editor's Word



When to redesign?

I spent a wonderful day at the *Electronic Component Show* doing what I enjoy most, talking to suppliers of electronic components and services about their businesses. The dominant topic was how to deal with significant, long-term supply chain problems. For some companies, the simple solution—wait and see—has now stretched from six to 12 to 18-months. During this period, component costs have skyrocketed and time is finally up. It's time to redesign.

My own professional design experience started at a special purpose machine builder back in the '80s. I enjoyed it so much I can remember every detail. Our design projects fell into four categories. Firstly, firefighting shopfloor problems such as raw materials arriving out of specification. Secondly, refining standard machine designs to meet customers' nuanced needs. Thirdly, designing completely new machines to customers' specifications. Finally, research and development designed to feed the latter two categories.

Because my time there was pre the introduction of fast-paced consumer electronics and pre the concept of outsourcing, I can't remember a single design project triggered or driven by obsolescence or supply chain problems.

I imagine my stoic response to facing such a problem would have been to prepare for it by running two bills-of-materials: one live and the other a standby of alternative parts and approved workarounds.

At the time I would have had to compile the second BoM manually, with distributors via phone and fax. Today, manufacturers have access to a wealth of digitised BoM analysis software, obsolescence prediction services and cross referencing tools. Please, please, please use them.

Jon Barrett

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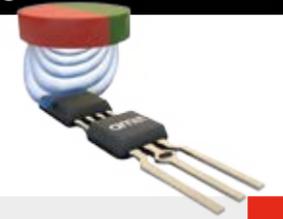
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Growing AC/DC converter range

Recom's E-K series has been expanded with the 20W RAC20E-K/277 AC/DC converter. Features include OVCIII rating up to 2000m altitude (OVCI up to 5000 m) and an operating temperature range of -40 to 90°C with derating, suiting the device to harsh environment applications such as auxiliary power supplies in roadside EV chargers, industrial environments and test and measurement. Household applications with a nominal voltage of 277VAC can also benefit from the power density.

Measuring 52.7 by 27.6mm, the design has the same dimensions as the 20W K-Series modules and is compatible with other industry standards through different pinning.

Isolation rating is 4kVAC and input range is 85 to 305VAC. Single outputs of 5, 12 or 24V are available, each with over 80 per cent efficiency. Idle power consumption is less than 200mW, meeting ECO guidelines.

The RAC20E-K/277 is UL/IEC/EN 62368-1 and IEC/EN 61558-1/2-16 certified. No additional external components are required to comply with the EMC limits of EN 55032, Class B.

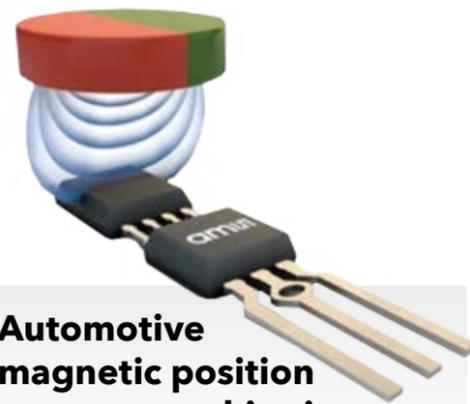
www.rutronik24.com

New source for micro batteries

Sager Electronics has added Murata's micro battery products to its portfolio. Murata Electronics' manager business development Connectivity Business Unit, Ismeet Chadha, said: "With decades of technology development and manufacturing expertise, Murata offers a wide range of coin manganese dioxide lithium, silver oxide and alkaline manganese micro batteries with high performance and reliability. Building on our strong relationship with Sager, we look forward to developing new battery customers with Murata's micro battery product offering."

Sager Electronics' supplier marketing and product manager, Kristin Bryant, added: "We're excited to enhance our product portfolio with micro batteries from Murata. Murata micro batteries are designed for demanding applications in the industrial, medical and IoT markets. Murata's products, combined with their state-of-the-art design and production technologies, will provide effective product solutions for our customers."

www.sager.com



Automotive magnetic position sensor now shipping

Mouser Electronics is now stocking ams Osram's AS5172E high-resolution magnetic position sensor. With AEC-Q100 Grade 1-qualified construction, the sensor offers durable performance for automotive applications including brake and gas pedals, fuel-level measurement systems, steering angle sensors and contactless potentiometers.

The sensor is designed to provide an accurate angular position measurement by determining the orthogonal component of the magnetic flux density over a full-turn rotation. Featuring a 14-bit sensor array and analog front end, the sensor uses a differential measurement method to compensate for external stray magnetic fields, ensuring accurate results through a 12-bit PS15 output (V1.3 and V2.1) at 90deg minimum arc.

The sensor supports an extended operating temperature range of -40 to 125°C and a supply voltage up to 16.5V, with overvoltage protection to 20V and reverse polarity protection to -18V.

www.mouser.com



1887

Emile Berliner receives the patent for the gramophone.

James Blyth builds the first electricity generating wind turbine.

Herman Hollerith receives a U.S. patent for his punch-card calculator.

Sager opens its first location in Boston, Massachusetts.



All great things begin with a single step – or in Sager's case a single storefront.

Recognized as the first distributor in the industry, Sager opened for business one hundred thirty-five years ago in downtown Boston, Massachusetts, servicing the growing interest in radio technology.

Under the vision and leadership of Joe Sager, the company established a thriving business that put the needs of its customers first. Since then Sager has grown into a North American distributor of interconnect, power, thermal and

electromechanical products and a provider of custom design and manufacturing solutions.

And after 135 years, Sager still operates just as Joe envisioned – based on a commitment to exceeding expectations and keeping the customer at the center of its business philosophy.

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In Brief

Higher energy density

Omni Pro Electronics has added Tecate Group's new 3V TPLH series of small-cell ultracapacitors to its TPL and TPLH 2.7V small-cell ultracapacitor offerings. The 3V TPLH series is designed to offer: higher energy density than current 2.7V products; exceptional life performance; and enhanced sealing to address high-temperature and humidity-rich applications. www.omnipro.net

Wafer shipments edge higher

Worldwide silicon wafer area shipments in the first quarter of 2022 surpassed the previous record high set in the third quarter of 2021, rising one per cent quarter-over-quarter to 3,679 million square inches, according to the SEMI Silicon Manufacturers Group in its quarterly analysis of the silicon wafer industry. www.semi.org

Trusted microelectronics manufacturing

Mercury Systems hosted a ribbon cutting ceremony in April 2022 at the company's custom microelectronics packaging center in Phoenix, Arizona to celebrate the expansion of its US trusted microelectronics manufacturing capabilities. The company was recently selected to provide secure packaging for the DoD's State-of-the-Art Heterogeneous Integrated Packaging (SHIP) program, which will also be performed at this facility. www.mrcy.com

EMS industry up 2.3 per cent

IPC's March 2022 findings from its North American Electronics Manufacturing Services Statistical Program show a book-to-bill ratio of 1.44. Total North American EMS shipments in March 2022 were up 2.3 per cent compared to the same month last year. Compared to the preceding month, March shipments rose 14.3 per cent. www.ipc.org

New distribution facility supports growing component demand

Galco Industrial Electronics has opened a new distribution center in Madison Heights, Mich. Galco president and CEO, Allison Sabia, said: "In 2021 Galco experienced massive growth while combatting continuous supply chain issues and delays. Our new warehouse will allow us to find solutions to these disruptions by stocking a broader selection of products and getting them to our customers more efficiently."

The facility will accommodate Galco's growing inventory, which includes more than 350 authorized product lines from more than 670 brands. The new facility will allow Galco to ship more than 1,000 orders each day.

Double the size of Galco's previous facility, the new product distribution center will offer shorter lead times, more workflow efficiency, a media area to share more details about each product, and additional storage space for large drives and motors.

Sabia added: "Having a larger distribution center will enable us to grow faster and continue to partner with the industrial automation market to support the future of technology."

galco.com

Enhanced overvoltage protection in stock

Newark is now stocking Bourns' IsoMOV protectors. Applications for these overvoltage protectors include electric vehicle charging systems; industrial power supplies; power line communications; high-speed information and communication technology (ICT) equipment.

The integrated GDT and MOV hybrid design provides a solution designed to solve MOV failure issues while delivering enhanced surge performance, operational life and reliability.

The company states users can tailor or upgrade surge protection without making performance, size, cost or redesign compromises, doing away with larger, generally lower-performing and often more expensive surge protection design alternatives.

Bourns' Circuit Protection Division vice president/general manager, Craig Shipley, said: "I commend the entire team that made IsoMOV protectors possible and for their success in remedying a complex circuit protection issue for designers. This efficient design gives designers a space-saving, higher performing and generally less expensive option. No longer will engineers have to make trade-offs in order to meet their protection needs."

www.newark.com

Global access to GaN HEMTs

Innoscence Technology has signed a global distribution agreement with WPG Holdings, giving customers access to Innoscence's high and low voltage normally-off GaN HEMTs.

Innoscence Europe's general manager, Dr Denis Marcon, said: "Our aim is to ensure that every power electronics designer—no matter where they are based—can benefit from the efficiency, power and size advantages that GaN technology brings. That is why we have invested in huge capacity, the largest in the world. Distribution is also a big part of our plans, and we are excited and honored to announce WPG—the world's largest semiconductor distributor—as our first global supply chain partner."

WPG EMEA's VP, Nigel Watts, added: "GaN is set for explosive growth as markets including consumer, communications, automotive and industrial, experience the leap forward in end-product performance they can achieve by switching from traditional silicon-based power devices to GaN."

"Innoscence is the world's largest 8in GaN-on-Si device manufacturer with a capacity of 10,000 8-inch wafers per month, which is set to grow to 70,000 WPM by 2025. Therefore, it is fitting that Innoscence have signed a global franchise deal with WPG."

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Beware these counterfeiting techniques

ECIA's Robin Gray explains how blanks, clones and remanufacturing introduce risk into purchasers' electronic component supply chains

When electronic component shortages prevent manufacturers from meeting their customers' needs, the temptation to buy components from unauthorized channels increases exponentially. We are currently in such a crisis. Furthermore, the component counterfeiting landscape has changed. Anti-counterfeiting efforts by ECIA, the industry, government and customers have forced counterfeiters and unauthorized sellers to grow ever more sophisticated in production and marketing. Clones, blanks and remanufacturing are some of the forgers' new tools. Counterfeiting is no longer the province of small-time operators that pry parts off of boards and remark them as new and/or upgraded.

When counterfeiting of electronic components first emerged, ECIA, SIA and other industry trade

associations responded with efforts to alert customers and government to the emerging dangers of fake parts. This effort eventually resulted in legislation, regulation and industry standards and guidelines. As the industry and customers changed, so did the counterfeiters. Counterfeiting evolved into sophisticated businesses using new techniques and manufacturing processes to circumvent laws and standards.

One of these techniques is manufacturing blanks. Blanks imitate genuine product in appearance and alleged functionality but have no identifying marks such as company trademarks or logos on the parts and packing material. Trademarks/logos are added after the part enters the country, thereby avoiding customs and the first line of defense.

A second emerging technique is manufacturing clones. Counterfeiters with sufficient resources can often make components that may appear to be genuine upon visual inspection and may even pass basic laboratory testing. Only very sophisticated testing is able to spot clones. Such testing may be beyond the means of buyers and testing labs. The problem is further compounded by counterfeit semiconductor components that may be tainted with malware.

There is also growing concern about the remanufacturing of genuine parts. In this instance, counterfeiters take a used part and remanufacture/restore/refurbish it. If this remanufacturing of a used component is disclosed to the buyer, then there is no problem from a legal perspective. However, if such disclosure is not made, the act of selling becomes fraud and not strictly



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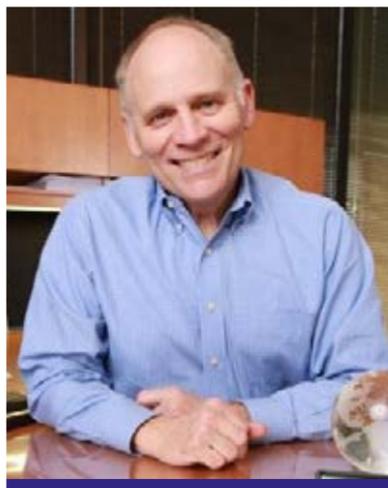
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SCAN HERE



ECIA's Robin Gray

counterfeiting. An interesting twist is that remanufacturers usually remove the original component manufacturer's marks/logos and replace with their own name/logos and, in some instances, even create their own distribution network. The used part is usually sold as a replacement part for a part made with the original component manufacturer (OCM) and with the claim that it meets the OCM's specifications. The big unknowns with these parts, whether legitimately made or not, are quality and performance. It is a used part, so it may be difficult or impossible to determine how much the component has been degraded by prior use. Or, in the case of semiconductor components, what programming may still be embedded.

Remanufacturing should not be confused with authorized aftermarket manufacturers. Authorized aftermarket manufacturers are those companies that have been authorized by the OCM to make their components. These legitimate manufacturers often acquire the OCM's excess inventory, manufacturing processes and equipment, product specifications, quality testing techniques and even intellectual property rights. Authorized aftermarket manufacturers either have the right to use the OCM's marks or make the parts under their own company names.

When sourcing from unauthorized sellers, customers may rely on testing labs to determine the authenticity of the components. The cost of testing, particularly detailed and sophisticated testing, is expensive. It drives up the cost of the purchasing process and is not a guarantee that all counterfeits will be detected. Thus, the level and frequency of testing often turns on the level of risk associated with the component and its use in the final product. To reduce

the risk, customers should not rely on in-house testing by unauthorized sellers, but rather select their own testing labs independent of the seller. One other factor to consider, is that labs, even the best of these facilities, are unlikely to have the OCM's product specifications with which to make comparisons.

The Federal government, specifically the Department of Defense (DoD) and NASA, has issued several regulations seeking to reduce the risk of counterfeit electronic components entering the supply chain. The key regulation (DFARS 2014-D005) requires the DoD to buy parts that are in production or currently available in stock from the original manufacturer, their authorized suppliers or from suppliers that obtain such parts exclusively from the original manufacturer of the parts or their authorized suppliers. Authorized supplier is defined as a supplier, distributor or an aftermarket manufacturer with a contractual arrangement with the original manufacturer. The regulation also sets forth when the DoD can buy from unauthorized sources and what criteria the seller must meet.

There is growing interest in block chain as another tool to avoid counterfeit components. The potential upside is that block chain may provide a secure chain of traceability back to the OCM. The downside is that this process may increase the credibility of unauthorized sellers if they can demonstrate the genuineness of the part. While block chain may solve the traceability problem, it does not show how the product was packaged, stored or handled or whether it has been tampered with in any way.

Block chain may also fill the huge loophole in the Department of Defense's regulation that permits contractors to buy from unauthorized sources that



When sourcing from unauthorized sellers, customers may rely on testing labs to determine the authenticity of the components

buy exclusively from authorized sources. This loophole would enable anyone to buy from an authorized source and resell to the DoD or DoD contractor and be treated for purposes of the law on the same level as the OCM and authorized distributors. ECIA has been opposed to this 'exclusively buy from' provision and continues to work for its elimination from the law.

While customers may find genuine parts from unauthorized sellers, there are still risks. These risks include product reliability

(was the part properly packaged, stored and handled); repeat buys (is this a one-and-done source or is it a reliable, on-going source for that component); and support (manufacturers rarely provide support and warranty coverage for parts bought from unauthorized sources). Buying electronic components from authorized sources is the best way for a customer to reduce the risk of obtaining counterfeit parts.

www.ecianow.org

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Understanding systems-based quality strategies

In this article, Smith uses its own experience to demonstrate how a systems-based approach to quality ensures people, products, and services meet the highest standards

Quality begins long before components enter Smith's facilities. Their supplier-screening process includes a review and audit of vendors' physical location, financial status, trade references, certifications, quality management systems, and more. Each supplier is formally selected, qualified, and continually evaluated to ensure its ability to provide product that conforms to customer requirements, in line with CCAP-101 and AS6081 certification standards. Smith's end-to-end quality process accounts for all details that affect the caliber of their products. Smith's comprehensive processes and procedures are mirrored across their three operational hubs in Houston, Hong Kong, and Amsterdam so that their customers receive the exact same product and service quality, regardless of locale. Each supplier receives a rating based on their evaluation results, from Preferred to No Trade. Preferred suppliers have long track records of high performance and favorable terms, while No Trade identifies sources that are prohibited from trading with Smith due to inferior

quality or poor performance issues. Additional ratings, such as Approved and Conditional, are given to proven suppliers with more limited terms and promising suppliers with good transactional and performance history but potentially limited traceability, respectively. Recently, Smith has added two new rating levels: Inactive and Initial. Inactive suppliers are those who have not had any purchasing transactions for more than one year, while Initial suppliers are newly created or unproven because minimal activity has not yet been met. Through this defined rating system, Smith's trading team can efficiently and methodically pursue products from suppliers that have demonstrated their quality and performance. On receipt, components pass through an inspection process, beginning with packaging. Each package is inspected, ensuring labels are correct and barcodes scan properly. The general packaging is examined (outside and in) to confirm labels are present/authentic and there are no signs of tampering. Smith's receiving team then verifies all documents and requirements from the purchase and sales orders. This helps ensure all

customer requirements are met, including packaging, date codes, and specialized testing requirements. All components then pass through the standard quality-control process. During visual inspection, Smith's CCCI-102 Level 1 and Level 2 quality inspectors examine components to verify that part dimensions, markings, leads, and other characteristics are consistent with manufacturer specifications. Smith's quality team uses tools such as digital microscopy and imagery and dimensional measurement to detect blacktopping, sanding, oxidation, and retinning and compare product to known-authentic samples. Smith tracks receiving history, product dimensions, pictures, and test results from previous orders of each component in its proprietary operational platform: WorksChain. The company also has one of the industry's largest libraries of golden samples. This wealth of historical data is constantly growing and is accessible to Smith's quality employees to review and reference throughout the inspection process. As needed or required, Smith offers more extensive and

customizable functionality and authenticity testing. In-house functionality test laboratories perform more than 50 different functional tests daily. Beyond visual inspection, Smith can also perform both nondestructive and destructive authenticity testing at its three hubs. Nondestructive testing can identify markings, voids, and other anomalies in or on components without affecting the parts' performance or reliability. Destructive testing, such as decapsulation and lead solderability, may be required to confirm legitimacy.

smithweb.com



As needed or required, Smith offers more extensive and customizable functionality and authenticity testing

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AI: the beginning of oversight



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 observes that as AI moves into the realms of policing, hiring, promotion and social services, the question of censorship and restriction is next to be addressed

AI • By John Denslinger

It was thirty years ago, the first speech recognition machine powered by algorithms came to market. The product was designed and produced by Dragon and named Dragon Dictate. State-of-the art at the time, this one-function offering may have ushered the age of AI. It demonstrated a machine, using algorithms, could convert sound into an electronic signal and back to intelligent sound again. It was an astonishing breakthrough in technology. It would be twenty years before Apple introduced Siri, the now infamous digital personal assistant for iPhones and Apple devices. In 2014, Amazon would release Echo, a voice-controlled digital personal assistant for home environments named Alexa. Apple and Amazon still dominate that voice-activated digital assistant space today.

The technology behind voice-based algorithms is but one facet of the AI evolution, yet nearly every AI solution since incorporates some form of voice capability. Language translation and speech understanding became obvious extensions of the original concept. Virtual assistants and smart robots designed to interface, communicate and protect humans emerged next. With the march towards smart homes and smart cities, the need for AI will only grow.

In late 2018, McKinsey & Company offered one of the best definitions of AI: the ability of a machine to perform cognitive functions associated with human minds, such as perceiving, reasoning and learning. The thought of machines mimicking human activity seemed distant then, but rapid advances in computational accelerators, memory, storage and networks has made AI ubiquitous now.

New markets for AI are everywhere. Cybersecurity seeks solutions to antivirus and antimalware intrusions. Data banks require secure access and fool-proof facial recognition systems that pass privacy concerns. Medical imaging and surgical tools need deep learning models and computer vision for life-critical decisions. Defense systems depend on smart drones and similar mechanisms for precision deployments and battlefield

advantage. But when assessing all the potential applications, it's the connected and autonomous vehicles that require the most advanced AI of all. Instantaneous decisions that rely on vast amounts of data gathered from connected devices, image recognition systems, deep learning and neural networks capable of unsupervised learning, unstructured data, and predictive analysis. Since the safety of individuals is at significant risk, systems must perform flawlessly under any operating condition.

Hi-tech applications aside, AI has long been deployed in the world of social media, advertising, financial services, insurance and more. The experience has been mixed often raising questions of fairness and bias. Perhaps that explains a recent call for regulation of AI, specifically 'the algorithms'. In fact, three cities New York, London and Barcelona are setting rules for AI use citing five best practices:

- 1: Fairness and non-discrimination
- 2: Transparency and openness
- 3: Safety and cybersecurity
- 4: Privacy protection
- 5: Sustainability

The main focus seems to target traffic management, policing, hiring, promotion and other social services within their current domain of responsibility. Not unexpectedly, facial recognition was the first to be censored, severely restricted or, in some cases, completely banned.

It's difficult to argue against these best practices and their potential benefit to society. Of course, the big question is who decides? Cities are political entities and bureaucratic. Not the ideal algorithmic decision maker. It might be okay for internal practices, but complex technology like smart cities and autonomous vehicles will dominate future daily life. Will their scope snare the hi-tech realm as well? Knowing governments, it's hard to fathom otherwise.

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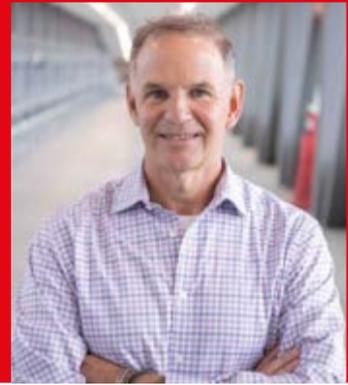
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Supply Chain Resiliency: Navigating the “New Normal”

David Stein, vice president of global supplier management, Digi-Key Electronics

Just over two years after the onset of the COVID-19 pandemic, the electronic components supply chain is settling into a “new normal” rhythm, coping with COVID-19 variants, high customer demand, shipping snarls and tight supply.

New disruptions like COVID lockdowns, extreme weather events and armed conflicts continue to cause global ripple effects, but as a whole, the supply chain has been incredibly resilient. Various stakeholders have been able to address these issues with practiced flexibility, increased investments and a sense of understanding.

So where are things today? In some areas, the picture looks pretty similar to how it’s been for the past couple years, but there have been meaningful shifts in other areas as the industry adapts to this “new normal” and prepares for the future.

Demand stretches lead times

Demand is still exceptionally high across all industries and verticals, so lead times are stretched in all product categories. Today, the reason for product shortages is primarily related to demand and manufacturing capacity rather than supply chain issues, however, it is important to continue to keep an eye on supply chain issues as these will continue to pop up in different regions of the world.

While keeping inventory in stock is still a challenge, Digi-Key’s inventory levels are growing month-over-month. This spring, we received record-breaking amounts of products, so we are making meaningful progress on continuously increasing our inventory.

Digital solutions enhance procurement

Because things change so quickly these days, it is critically important to leverage digital solutions that can provide real-time information. Digi-Key offers three major digital solutions: EDI, APIs and Punchouts, which are all designed to make a digital connection between Digi-Key’s system and your organization for streamlined quotes, detailed purchase orders, search, price and availability, and more. The easiest way to get started with digital solutions is by setting up an automated quoting process. A quoting process alone represents a major timesaver. For more information and to get started, visit www.digikey.com/digitalsolutions.

Communication remains the key

The Digi-Key team excels at staying in close contact with our supplier partners to give them as much visibility as possible into the products that are in highest demand, and in some cases, we’re already placing orders as far out as mid-to-late 2023 to ensure that our inventory is pipelined accordingly.

We’re also investing in technologies that help connect us more automatically and electronically with our suppliers, such as Advance Shipping Notifications which provide real-time, automated updates to the Digi-Key system about when product will be shipping. This provides the most up-to-date information from our supplier partners to our customers.

We will continue to meet new challenges with innovations and investments that enable our customers to meet the requirements of today while planning for a better tomorrow.

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Obsolescence is inherent

Fusion Worldwide explains how an intelligence-led, proactive approach to obsolescence management helps manufacturers shield themselves from supply chain challenges

Obsolescence is an inherent side effect of various supply chain challenges, with end-of-life and last-time-buy notices common across the electronic component space. Most recently, the pandemic put a magnifying glass on underlying acute and systemic root causes of component obsolescence. It also accelerated shortage effects. In these situations, manufacturers are in varying states of preparedness to defend against and work through the effects of obsolescence on their supply chain processes and their product lifecycles. Common causes that trigger component transitions include:

Reduced demand: Original contract manufacturers discontinue production of parts that have lower demand and cut into profit margins.

Mergers and acquisitions: An increased rate of mergers and acquisitions has led to more EoL notices following product line consolidation and technological upgrades.

Innovation: Component lifecycles are compressed as consumer demand for faster and better innovation increases.

Geopolitical events: Drawn-out trade conflicts, government sanctions and recurring economic shutdowns can unintentionally force product obsolescence.

Extreme weather: Extreme weather is circumstantial per region and has a domino effect across manufacturer

operations and logistics. Severe droughts, major earthquakes and flooding can lead to factory shutdowns, longer lead times, limited supply output and shipping delays.

Supply chain strain: Logistics pain points, such as material, workforce and chipmaking equipment shortages impact production timelines.

Regulation: Governments pass and enforce regulations that prematurely halt the planned production of parts containing certain substances, which leads to unanticipated EoL notices.

As inevitable as end-of-life and last-time-buy announcements are, obsolescence effects don't have to leave manufacturers vulnerable to volatile markets. As an independent distributor, Fusion Worldwide takes a consultative approach to partnering with manufacturers on component obsolescence transition plans. Fusion combines its industry expertise and proprietary service stack to collaborate with manufacturers to create smooth product lifecycle transitions, by leveraging:

Strategic Partnerships: Fusion Worldwide built its business on establishing strong partnerships with customers and suppliers. Fusion learns and assesses a customer's business/needs and works to customize component supply plans on an individual basis. Without such supplier relationships, a customer's component gap is at risk of widening.

Market intelligence: With a network of experts and market analysts across its 21 regional offices, Fusion Worldwide constantly monitors for obsolescence intel and component availability.

Real-time communication: Manufacturers who partner with Fusion can expect relevant and up-to-date market and component intel in real-time. With this information and communication approach, manufacturers can depend on Fusion Worldwide to expedite transition sourcing action plans for affected product lines.

Alternative parts: When a part becomes obsolete, Fusion will leverage its global relationships, resources and proprietary technologies to determine alternative and substitute part options to match a customer's specified build.

Logistics hubs: Each customer's business need is unique, which means every solution should be as well. Fusion provides inventory management support for last-time-buy and product lifecycle extension purposes.

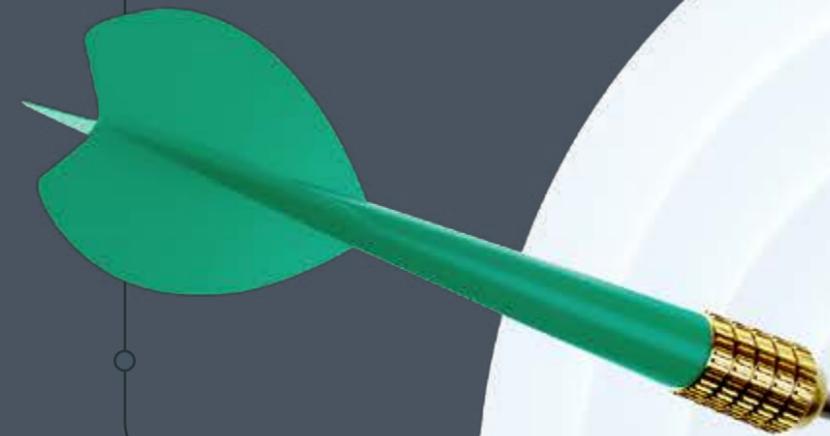
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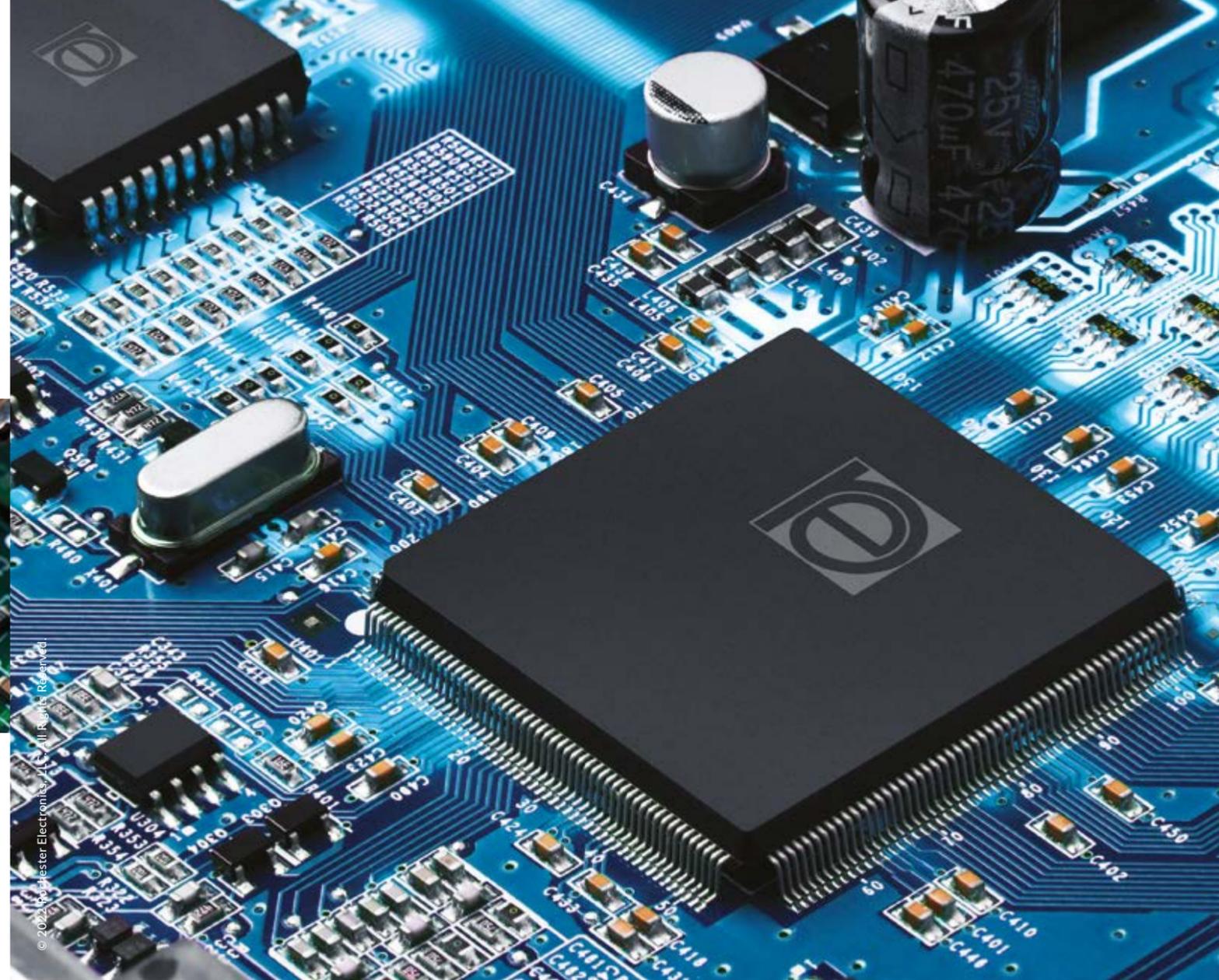
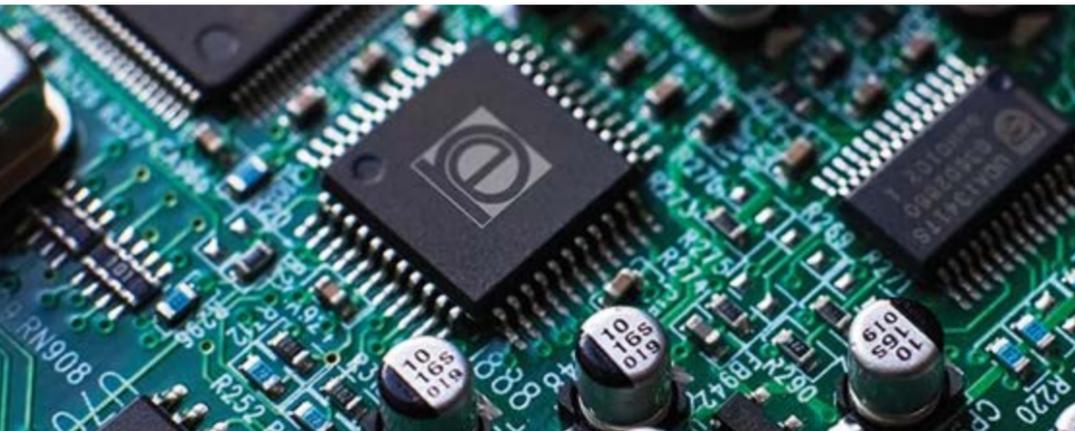
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Remain safe in turbulent markets

As Rochester Electronics explains, when sourcing elusive components it's important to understand the difference between AS6496 and AS6171/4 sources



Recent supply issues have undermined normal delivery certainties. Covid-related manufacturing problems, shipping disruptions and even natural disasters have led to supply chain uncertainty and lengthening lead times. Component discontinuation notices have risen by 15 per cent over the same period, as third-party fab priorities changed and the industry refocuses fab investments to address a lower power, battery dominated landscape. Current semiconductor market shortages are widespread.

Customers are under pressure to guarantee supply and typically gray market or unauthorized sources are seen as the only solution. The counterfeit business sells through these gray market channels to infiltrate end customers. When time is tight and products are not available, the risk of end customers becoming victims of counterfeit products increases significantly. Tests and checks can be done to ensure products are genuine but they take time,

are costly and in some cases, are not fully guaranteed.

The only way to ensure genuine product is to buy from an authorized source where devices have an absolutely guaranteed pedigree. Fully authorized distributors, like Rochester Electronics, identify themselves as compliant with the SAE Aerospace Standard, AS6496. Simply stated, they are authorized by the original component manufacturer (OCM) to provide traceable and guaranteed products with no quality or reliability testing required because the parts are sourced from the OCM.

Providers who are not, may market themselves as AS6171/4 compliant. This source, though better than no compliance at all, follows standardized inspections and test procedures with minimum training and certification requirements to detect suspicious or counterfeit components. This is an indication the parts are not sourced to the supplier from the OCM

but have passed testing to minimize, not eliminate risk.

The supply chain shortage is presenting difficulties in different ways. Multisource devices such as power management and power discrete devices are being overwhelmed by demand. These devices may be available from multiple sources or have close equivalents among different suppliers. However, because of their widespread use, the sheer demand on supply has been persistent and has challenged suppliers to keep up.

Logic devices face a similar issue. They are used across a broad range of applications, producing constant demand. To resolve this challenge, customers are re-examining their performance requirements and opening date-code restrictions to improve sourcing options.

Microcontrollers and microprocessors are also being affected. MCUs and MPUs face design restrictions that limit alternative options

and suppliers are faced with choosing the right product mix to manufacture. These devices are typically based on a particular CPU core, embedded memory and set of peripheral functions, resulting in specific package and pinout requirements, along with potential software and code impact. In general, the best option is within the same product families. Devices with larger memory, broader temperature range or higher performance may be available or an earlier revision that had previously been qualified is in stock and available as a drop-in solution. In more extreme cases, to keep a production line moving, customers may justify board re-spins to accommodate a different package.

In times of shortage and increased obsolescence, Rochester is positioned to provide support with its inventory of 100 per cent authorized components and range of semiconductor manufacturing services.

rocelec.com

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As an authorized distributor, Rochester Electronics provides the world's most extensive range of end-of-life (EOL) and broadest range of active semiconductors to keep the medical, defense, and infrastructure industries moving worldwide.



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Winning the fight against obsolescence

Flip Electronics' president, Bill Bradford, reveals how the company helped overcome an obsolescence problem, saving a subcontractor over \$3.2M and 14-months in redesigns

Obsolescence is an issue that plagues the semiconductor industry. It costs billions of dollars for companies worldwide as manufacturers routinely transition to new technologies and end the life of mature product families and devices. Solving for obsolescence is a growing problem for military, aerospace, medical, and industrial OEMs, faced with shorter component lifespans.

Flip Electronics bridges the gaps of obsolescence with an inventory of popular components no longer produced by manufacturers. Their authorized distribution is supported by data-driven experts who strategically acquire, stock, and support end-of-life (EOL), excess, aged, and discontinued parts. By doing so, they empower clients to make better sourcing decisions and avoid risks associated with the grey market.

Flip recently helped secure mission-critical components for the United States Armed Forces.

Multiple branches of the US military and its allies rely on an essential mobile ground-based defense system built by a major prime contractor. When this prime issued a purchase request to a subcontractor for an electronic module,

a critical element of a missile system, the subcontractor could not fulfill the order. The integrated circuit they requested was no longer available from any mainline authorized sources. Without this component, the prime's entire module could not be built, putting the project and defense system at risk.

The subcontractor learned Flip was an authorized distributor for the integrated circuit maker and that Flip focuses specifically on obsolescence. The subcontractor approached Flip and a partnership was formed. To move forward, however, Flip had to become an approved supplier, a typically lengthy process on an already tight schedule.

During the approval process, Flip was very attentive and

understood the intricate details necessary to move things forward. They submitted all required documentation swiftly and expedited their qualified status with the subcontractor.

Flip began to analyze the subcontractor's potential future demand so the solution would solve the immediate need and proactively ensure they could support the requirements. Once Flip analysts completed their demand planning, they found that the quantity necessary to fulfill the order was greater than available inventory – the subcontractor needed a solution.

Due to Flip's special relationship with the integrated circuit manufacturer, they were able to influence them to restart production on this device, even though it had been discontinued for years. They worked with the manufacturer, building new components from their residual die bank. Not only did the subcontractor complete the order, but they secured enough components to last for the next five years of production.

Flip's established relationship with this manufacturer saved this subcontractor over \$3.2M



Flip Electronics president, Bill Bradford

and 14 months in redesigns. The solution strengthened the subcontractor's relationship with their prime and the government entities, while bringing value back to the manufacturer.

Flip was able to supply the parts, which allowed the subcontractor to fulfill their order and satisfy the request of their most important prime contractor. That prime contractor, in turn, came through for the United States Armed Forces. The fight against obsolescence is crucial, and Flip has made it their mission.

www.flipselectronics.com



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Business remains robust for high-service distributors

However, slower overall economic growth, inflation and continuing shortages for some components could weaken sales growth later in the year



James Carbone

High-service distributors that focus on engineering say sales were strong in the first quarter of the year but are concerned that slower economic growth, continuing inflation, downward movement of the stock market and the war in Ukraine may impact business for the rest of the year.

Some high-service distributors experienced record sales in the first three months of this year. "We are one of the companies that had strong growth," said Chris Beeson, group senior vice president electronics for RS Electronics. "In the first three months of the year we were at a record level."

He noted the 60 per cent of the UK-based distributor's sales come from Europe, Middle East and Africa (EMEA), 25-30 per cent is in North America through its Allied business while the Asia-Pacific regions accounts for 15-20 per cent of sales.

"Asia-Pac is on the rise for us," said Beeson. "I would say we have focus on China but we're encouraged by the growth we are seeing outside of greater China as well as in Australia, the greater Singapore area and Taiwan. There's certainly a lot of upside there," he said

He said while growth has been strong, there are certain "variables that we can't control" that could impact business. Such variables include the situation with Ukraine, COVID-19 lockdowns in China, continuing

inflation, downward movement of the stock market and falling GDP in the first quarter.

Demand remains strong

Despite those variables, "overall we feel very good about the business," said Beeson. Component demand remains strong and in North America there has been reshoring which is resulting in more opportunities for the distributor, he said.

Beeson also noted RS has a "long tail of customers and is not subject to any customer making up a large percentage of our business." It focuses on design and supports high-mix, low-volume manufacturing as well as maintenance and service.

Beeson said there is "more stability in design" and does not have the volatility involved in supporting high-volume manufacturing. "We have consistency in our business model," he said.

Mouser Electronics has also seen strong growth in the first four months of the year. Year-to-date in April, Mouser's business was up 60 per cent in Europe, 46 per cent in Asia Pacific and 43 per cent in America, said Mark Burr-Lonnon, senior vice president global service and sales for Mouser.

"There's been no sign of any real weakening," he said. "There were couple days around Easter" when business slowed but now it continues to be strong, said Burr-Lonnon.



"We keep building inventory and inventory now is at all-time high"

Mark Burr-Lonnon, senior vice president global service and sales for Mouser

What has helped Mouser grow sales is inventory. "We keep building inventory and inventory now is at all-time high. It was up to \$923 million as of late April, he said. "We also have close to \$2 billion on order," said Burr-Lonnon.

More inventory needed

He said inventory is needed because "everybody wants to buy just about anything and everything." Business is strong across all customer segments including defense.

"Our military customers are buying a lot of parts," said Burr-Lonnon. The U.S. and other countries are supplying weapons systems to Ukraine and defense contractors need to

build new ones so component orders are increasing.

Burr-Lonnon said high inflation should not have a "big impact on high-service distribution" because companies are always designing new products and systems. "Design is the one thing that never stops. If the market goes bad, people have to redesign," he said. "If the market is good, people want to design faster and use new technology so we are in a sweet spot," said Burr-Lonnon.

Another high-service distributor with strong sales growth is Newark. "Newark's performance has been strong throughout 2021 and delivered record global sales numbers in the most recent

financial quarter," said Uma Pingali, business president for Newark, a subsidiary of Premier Farnell. "Overall results were driven by a strong performance from the Farnell business, with sales increasing 35.3 per cent year-over-year to \$441 million, to which the Newark business strongly contributed," he said.

Farnell's operating margin grew to 13.7 per cent in the second quarter of the company's fiscal year from 10.9 per cent in the first quarter and 8.3 per cent in the final quarter of fiscal 2021, said Pingali.

North American sales grew strongly with "excellent performance in passives, connectors and electromechanical devices and semiconductors," he said. "In addition, Newark's e-commerce sales nearly doubled, with e-commerce growth expected to continue in the coming quarters," said Pingali.

Growth was also strong in Europe with electrical, connectivity, and the contract manufacturing sector showing the most significant growth. In Asia, strong sales performance has been driven predominantly by market segments such as industrial automation, medical and electronics manufacturing services, said Pingali.

More demand from defense, EVs

In its overall business, Newark is seeing increasing demand from the defense, electric vehicles and industrial automation segments, "with the expected range of growth in these segments between 40-50 per cent year over year," he said. Demand is increasing in these market segments "due to growth in design, development and production. Additionally, component shortages are also contributing to demand," said Pingali.

While demand has been strong, there is uncertainty in the market because of Covid-19, inflation and the war in Ukraine. However, Newark is in a strong position to manage these challenges and continues to be a valuable distribution partner for our customers, according to Pingali.

Dave Doherty, president and COO of Digi-Key, says year-over-year bookings, billings and shipments are up more than 25 per cent. "We continue to see strong double-digit growth in all regions," said Doherty.

Digi-Key's inventory is also rising on a dollar basis but less so in units received because of constrained supply from component manufacturers.



"We continue to see strong double-digit growth in all regions"

Dave Doherty, president and COO of Digi-Key

"In some cases, we're already placing orders as far out as mid-to-late 2023 to ensure that our inventory is pipelined accordingly," said Doherty.

He said that so far, the war in Ukraine is not putting "any additional strain on our current supply chain issues." Digi-Key does not have any employees living in Russia or Ukraine and prior to the Russian attacks, Digi-Key did "very little business in Russia due to compliance policies," Doherty said.

Generally, Digi-Key is seeing demand from all customers, but some "hot areas we're seeing right now are in climate mitigation, automation & control, urbanization and IoT," said Doherty. Those areas "are heavily dependent on the parts that we stock," he said.

The problem is while some components have "normal" lead times, some semiconductor lead times are still long. "Microcontrollers, sensors, commodity linear, analog and discretes are still a struggle to obtain in full supply as lead times in many cases have continued to remain in the 40+ week area," said Doherty.

Supply will improve

Supply should begin to improve at the end of this year, he said. Over the past several years, manufacturers have been investing in new technologies to produce cutting-edge products and increase production, Doherty said.

"Semiconductor manufacturers in particular have made strong

investments into 12-inch wafer capacity over the past couple of years, and we are expecting to see that supply come online at the end of this year and into 2023," he said.

However, there has not been an equal level of investment into increasing output of some of the older technologies based on 6- or 8-inch wafer fabs, despite the fact that there are still many products that are based on those processes, such as automotive or industrial designs, according to Doherty. "Unfortunately, those products cannot be easily shifted over, so there will likely continue to be a pinch in this area for the next several years," he said.

It is hard to determine what the impact of Covid-19 may still be having on the supply chain. Doherty said at the height of the pandemic, lead times were affected fairly evenly by both supply chain issues and manufacturing capacity.

"Today, we estimate that only about 20 per cent of extended lead times are due to supply chain issues, while closer to 80 per cent of delays are due to lacking manufacturing capacity," he said.

Doherty added Digi-Key's is closely watching supply-chain issues as Covid cases increase again, and "conflicts continue to pop up ad hoc in different regions of the world such as Eastern Europe or China," he said.

What's behind the rising cost of power supplies?

Sager Electronics explains how long-term planning, good communication and partnerships with authorized distributors help when sourcing power supplies

AC/DC and DC/DC power supplies are complex and typically have hundreds of components on a BoM. Given their intricacies, sourcing power supplies has always had a degree of complexity but the current environment has made it more challenging. Three key factors have impacted the power supply market: lead times, transportation and pricing/inflation.

Pre-pandemic, standard manufacturing lead times for power supplies were typically 8 to 12-weeks. In the pandemic's early days, demand and production slowed and manufacturing lead times moderately increased to 15 to 20-weeks. At that time, customers and distributors operated on a just-in-time (JIT) basis, with customers ordering based on lead time or less, and distributors managing inventory based on customer forecasts. As the pandemic dragged on, material and production employee shortages continued to strain capacity and lead times jumped to 24, then 36-weeks and are now averaging >60-weeks. JIT is now a thing of the past, and while power supply manufacturers face ongoing difficulties finding critical components, pent-up customer demand has overwhelmed the supply chain.

Transportation lead times correlate with component lead times. Shortages in staff, changes in policy, rising fuel costs and other issues have impacted

transportation time and costs. For example, transporting a product from Southeast Asia to Long Beach, California would typically take four to six-weeks via ocean freight. Now, that has extended to >16-weeks in some cases. Pre-pandemic, it was fairly easy to authorize air shipments. Now, the cost of doing so has tripled and quadrupled. Power supplies can be heavy, large and bulky. With weight, size and price, it's a challenge to expedite freight shipments without paying a hefty price.

Trends including parts shortages, material costs, transportation, robust consumer spending, wages and uncertainty have sent prices through the roof. With inflation at a 40-year high and supply chains that can't catch a break, these issues are taking a toll. With most power supplies manufactured in China, customers are also dealing with tariffs. Geographic diversification is helping, but it takes time.

It is hard to predict the next six to twelve-months but Shanghai, Guangzhou and other vital manufacturing areas are still experiencing rolling lockdowns and forced closures. Regarding transportation and logistics, the International Longshore and Warehouse Union contract is set to expire on June 1, 2022. A short or long-term strike at the west coast ports would cause extreme disruptions.

What will likely happen first is transportation challenges will improve, fostering improvement in other areas, and over time, supply and demand fluctuations will smooth out.

What can buyers do to minimize the impact until then? Update lead times in purchasing systems and source longest lead time items first as power supply orders are already being placed for 2023 and 2024. Partner with an authorized distributor like Sager Electronics, which is receiving containers of power supplies weekly and has a technical sales team to help source in-stock power supplies. Sager can manage forecast and support bonded inventory for power supplies and other critical long lead time items.

www.sager.com



Sager Electronics' director of supplier marketing for power products, Paul Kopp



Trends including parts shortages, material costs, transportation, robust consumer spending, wages and uncertainty have sent prices through the roof

Eliminate heatsinks

The new HiperLCS-2 chipset brings Power Integrations' 600V FREDFETs and magneto-inductive FluxLink technology to the LLC topology. The company states the result is 98 per cent efficiency and a 40 per cent component-count reduction in LLC resonant power converters up to 250W, eliminating bulky heatsinks or unreliable optocouplers.

One half of the dual-chip solution is the HiperLCS2-HB half-bridge power device utilizing 600V FREDFETs with lossless current sensing and high and low-side drivers. The other half is the HiperLCS2-SR isolation device with a high-bandwidth LLC controller, synchronous rectification driver and FluxLink isolated control link.

Both devices are housed in low-profile InSOP-24 packages, enabling designs of compact adapters and open-frame power supplies for TVs, monitors with USB PD ports, all-in-one PCs, game consoles and battery chargers for power tools and e-bikes.

Power supply designs based on HiperLCS-2 can achieve no-load input power of less than 50mW at 400VDC input and provide a continuously regulated output, easily complying with the world's most stringent no-load and standby efficiency regulations.

power.com

Class-leading power density

Innoscience Technology's new ultra-high density 140W power supply demo uses the company's high and low-voltage GaN HEMT devices to achieve efficiencies of over 95 per cent (230VAC; 5V/28A). Measuring just 60 by 60 by 22mm the PSU has a power density of 1.76W/cm³.

General manager of Innoscience Europe and marketing manager for the USA and Europe, Dr Denis Marcon, said: "By using GaN switches for both the high and low-voltage functions on this design, we are maximizing efficiency rather than compromising it with lossy silicon devices. This is possible thanks to Innoscience's cost-effective and high-volume manufacturing processes and capabilities."

General manager of Innoscience America and Sr VP of product and engineering, Yi Sun, added: "This design, which targets USB PD3.1 notebooks and power tools, is a full two per cent more efficient than silicon designs. This proves what can be achieved if GaN FETs are used everywhere, even in a relatively simple design."

www.innoscience.com



Increased rating to 1,700W peak

Flex Power Modules has introduced an enhanced version of its BMR350 non-isolated quarter-brick DC/DC bus converter, the BMR350 x250/531. Continuous power rating has been increased from 860 to 1,300W, with a peak power capability of 1,700W.

The product maintains the same footprint (58.4 by 36.8 by 12mm) and has the same input range of 40 to 60VDC (80V/100ms). Output is set at nominal 12.12VDC, now rated at 108A continuous (170A peak) and is adjustable from 8 to 13.2V. The increased rating is enabled by an additional bottom side cooling plate along with doubling up of output connector pins.

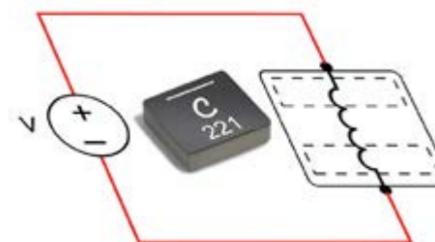
Flex Power Modules' director product management and marketing, Olle Hellgren, said: "We have nearly doubled the power rating of our BMR350 product in the same size for an even wider range of applications as a bus converter. With its innovative cost-saving technology, the product now represents even better dollar per watt value."

flexpowermodules.com



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Preparing for electrification of fleet vehicles

TTI's director of transportation business unit marketing, Gabe Osorio, analyzes transport electrification trends that manufacturers will want to follow throughout 2022



TTI's director of transportation business unit marketing, Gabe Osorio

In commercial trucks, cameras are used to monitor the cargo and ensure its delivery, or to monitor the quality of service from drivers for security and safety

About three per cent of US vehicles are part of a fleet but fleet technology trends can have an outsized impact on the entire transportation sector due to regulations and scale of operations, according to a 2021 Rocky Mountain Institute report. Over 80 per cent of fleet managers surveyed said they have already begun electrifying their fleets, and electric vehicles are expected to make up 10 to 15 per cent of commercial and passenger fleets by 2030, according to Duke Energy.

This trend was evident at *Work Truck Week 2022* Indianapolis, Indiana. The amount of electrification in fleet and work trucks was astounding. Many OEMs featured all-electric medium-sized commercial vehicles and last-mile delivery trucks.

New market entries include the Ford Lightning, the new all-electric Chevrolet Silverado and Xos, a manufacturer of fully-electric, zero-emission commercial vehicles used by FedEx.

Another trend is vehicle electrification. With the ongoing rollout of 5G internet and the increasing adoption of Industrial Internet of Things (IIoT) connectivity, more fleet and delivery vehicles are being equipped with technology that enables fleet tracking, autonomous driving and communication.

These connected vehicle technologies require many new electronic components and subsystems, plus the adoption of new technologies similar to those found in passenger vehicles. This includes advanced driver-assistance systems, safety capabilities, lidar detection and more.

Additionally, cameras are being added to vehicles in greater numbers. Instead of just one or two backup cameras, vehicles are being equipped with optical sensors, eye-tracking technology and safety checks for autonomous systems. In commercial trucks, cameras are used to monitor the cargo and ensure its delivery, or to monitor the quality of service from drivers for security and safety. Cameras are also increasingly aiding or replacing mirrors to provide wide-angle turn assistance and other benefits.

New trucks and fleet vehicles are increasingly being designed with digital vehicle dash clusters that display speedometers, mileage, gas levels and other instrumentation instead of traditional analog gauges. With the addition of lidar, additional fleet management technologies can be interfaced with via the dashboard cluster.

Connected vehicle technology also enables communication capabilities within a fleet to

track shipments in real time through GPS monitoring and data transfer. With electric vehicles, new sensors and intelligent systems can also track and monitor vehicle components such as battery health and maintenance status in real-time.

Now is an exciting time to see the next generation of transportation as it's being designed using these new ideas and incorporating cutting-edge technology—all of which increases the demand for electronic components.

To successfully adopt the next generation of connected vehicle technology, it's important for manufacturers to partner with a distributor who can help them understand the available components, new product instructions and the best way to maintain their supply chain as demand for these specialized electronic components increases.

tti.com

Supply chain challenges

In this article, Supplyframe highlights new analysis suggesting that commodity shortages and cost increases will persist into the first half of 2023

New data from Supplyframe paints a grim picture of current and expected conditions in the electronics supply chain, where commodity supply tightness and cost inflation are impacting most inputs across categories. Continuing category challenges at the beginning of this quarter suggest there will only be pockets of relief through the remainder of 2022 and into 2023 for many commodities.

This includes shortages of resin feedstocks and additives, increasing costs for fuels and metals and challenges related to the affordability and availability of labor and freight capacity.

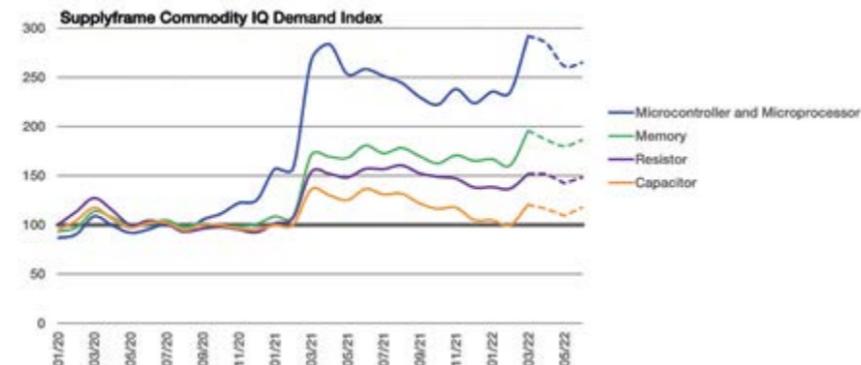
Supplyframe CEO and founder, Steve Flag, said: "Geopolitical uncertainty and wide-ranging impacts from the Russian invasion of Ukraine, persistent global inflation and recurring Covid-19 outbreaks continue to wreak havoc and test beleaguered industry supply chains."

The second quarter began with nearly half of all Supplyframe Commodity IQ dimensions worsening, while the number of pricing indicators in the red grew 16 per cent quarter-on-quarter. Things are not expected to improve as the quarter progresses. Commodity IQ expects 85 per cent of all pricing dimensions to increase and 83 per cent of all lead time dimensions to extend this quarter.

Supplyframe chief marketing officer and SaaS sales leader, Richard Barnett, added: "Sustained Covid-19 eruptions in two-thirds of Chinese provinces and elsewhere in Asia are prompting government-mandated shutdowns and strict containment protocols—creating further labor limitations, straining supply and introducing new supply chain disruptions."

The electronics supply chain can expect growing challenges into next year. Through the first quarter of 2023, more than 70 per cent of lead times are forecast to increase. During that time frame, analog, complex semiconductor (ASICs, MCUs, MPUs, PLDs), flash memory, non-ceramic capacitor, resistor and standard logic devices are forecast to rise in price with very limited exceptions. Most of the same devices will also remain at or exceed already elevated lead times.

supplyframe.com



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When will the shortage market end?

In this article, NewPower Worldwide explores the underlying problems causing the semiconductor shortage and estimates the market will remain constrained well into 2023

Did you know semiconductors are the world's fourth most-traded product, trailing only crude oil, motor vehicle parts and refined oil. As semiconductor demand soars and the most significant shortage of our lifetime unfolds, the biggest question in boardrooms worldwide is when will this end? Unfortunately, with the unpredictability of material availability, freight costs, labor scarcity, container shortages and more, many believe we're in for a long, painful recovery with the current conditions being the new normal well into 2023.

To better understand where the semiconductor shortage came from and why it's here to stay, we have to turn back the clock. In 2020 the semiconductor industry was recovering from a recession and was trending towards a recovery. When Covid-19 arrived, the automotive sector forecasted a downturn in demand. As feared, sales dropped significantly in 2020, and automotive leaders canceled larger orders with semiconductor manufacturers. Surprisingly, automobile demand began to increase, but manufacturing capacity was no longer available because production had been allocated to the consumer electronics industry, which saw a surge during the pandemic. Demand for smartphones, tablets, laptops and game consoles depleted

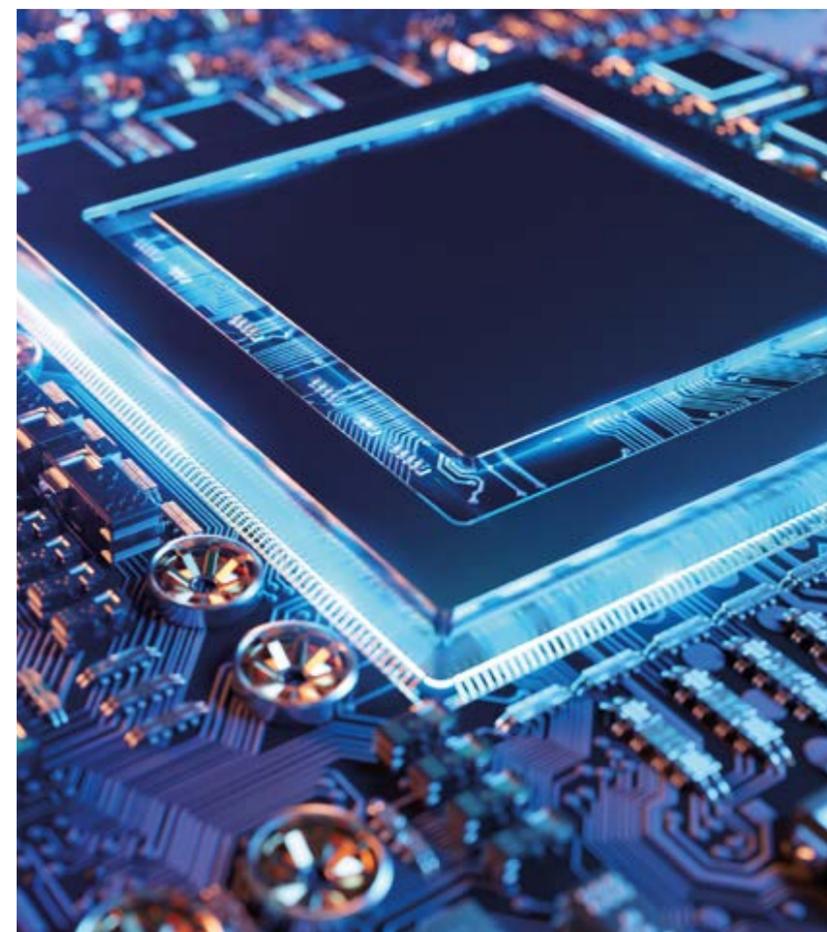
all relevant chip inventory and the semiconductor shortage was upon us.

Digging into the details, you'll learn the semiconductor sector has a range of variables that further complicate the problem. Manufacturing a semiconductor is incredibly capital intensive, requiring unstable raw materials management and the supervision of high-value sensitive items. All this involves implementing specialized and tightly aligned logistics services to support each component of the semiconductor value chain. Compounding the problem, the semiconductor logistics ecosystem must cover almost every continent and country, many times in remote regions of the globe. Unfortunately, the world's largest companies are learning the hard way they must adapt their existing supply chain process or be prepared to weather the financial repercussions of not doing so.

Lead times for many semiconductors are currently eclipsing one year. Automobile manufacturers worldwide have reduced output due to a lack of semiconductors, as reported widely in the news. Most have missed their 2021 goals and have hinted toward similar 2022 results. Unfortunately, the automobile industry is not

alone. The chip shortage affects the electronics, medical, technology and networking equipment industries. Anyone with a product reliant on the semiconductor sector should prepare to deal with a constrained market well into 2023.

www.newpowerww.com



Anyone with a product reliant on the semiconductor sector should prepare to deal with a constrained market well into 2023

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SEEKING SUPPLY: AEROSPACE COMPETES FOR RESOURCES AS DEMAND INCREASES

Securing electronic components became increasingly challenging in 2020 due to global lockdowns in response to the pandemic. While other industries felt the immediate impact across their supply chains, aerospace did not. The delayed impact to the aerospace industry could be credited to the buffer stock supply management method companies employed.

All three segments of the aerospace industry – consumer, commercial and defense – followed the buffer stock method.

However, this method did not accommodate for nearly three years of various pandemic-related disruptions and an influx in demand from other industries for electronic component supply. The incremental strain from additional industries drawing on the component market supply, which rapidly inflated demand, resulted in added difficulty to fill supply chain needs for every industry.

Just-in-Time (JIT) Wasn't Always on Time

Sectors like automotive and consumer electronics companies operated on short-term forecast timelines and used the JIT supply management method, which meant component orders were based on customer demand and did not require buffer stock surplus. Ultimately, JIT was only sustainable if supply could keep up with demand and a manufacturer had a strong supplier partnership. However, this left companies vulnerable when COVID-19, combined with additional supply chain challenges like extreme weather and unpredictable factory incidents, such as fires, adversely affected suppliers.

The Case for Buffer Stock

Aerospace manufacturing historically operated on long-term forecast timelines. Longer timelines meant fluctuations in short- and mid-term demand didn't have as large of an impact on supply for part builds. Additionally, because each project build was larger and took longer to complete, acquiring buffer stock of necessary electronic components had been proven over time to mitigate supply risk.

A typical airplane build would require chips for software systems, which did not need upgrades as frequently as a typical on-premise hardware build. Less frequent upgrade requirements translated into longer component lifecycles, and slowed down the need to transition to newer chip models to keep pace with demand. Despite this advantage amid initial pandemic shutdowns, the aerospace segments would inevitably require components to support future builds.

Aerospace Companies Get the Squeeze

While buffer stock protected aerospace manufacturers from early-term supply issues, the strategy did not prove to be effective through the extended supply strains yielded out of the pandemic. Stock began to deplete and supply chain challenges continued to impact logistics costs and timelines. As demand grew, companies like Airbus and Boeing struggled to navigate sourcing chip supply in a competitive market.

This competition existed both within and outside of the aerospace sector. Consumer and commercial air carriers would often contend against defense providers for allocations. The defense segment had the advantage of larger budgets, which remained stable throughout the pandemic.

Despite financial advantages, defense aerospace manufacturers still competed with other verticals for components, like gallium arsenide and gallium nitride-based chips, which are used for military communications and space capabilities, as well as 5G electronics.

Among the industries that were seeking high-demand components, automakers were prioritized because of the frequency and high volume of parts-per-order from suppliers. In automotive builds, a mid-range ground vehicle required up to one thousand chips per unit, while hybrid or electric vehicles required even more. In aerospace builds, that number drops to about a hundred components needed per build.

A Necessary Shift

Despite being an integral part of the supply chain as shipping and freight carriers, aerospace companies found that they themselves were not immune from having to navigate pandemic-induced supply chain challenges. Long-term timelines and buffer stock helped to delay the burden early on. However, ample elasticity within those reserves is vital. The best way to future proof supply for aerospace manufacturing will require a close reexamination of management methods and supplier partnerships. If aerospace companies can formulate a proactive versus reactive supply chain strategy, it will make disruptions easier to mitigate going forward.

www.fusionww.com

Navigating today's logistical challenges

Digi-Key Electronics' director of logistics, DeAnna Alby, looks at what's impacting logistics and how distributors are navigating the challenges to deliver components on time



Digi-Key Electronics' director of logistics, DeAnna Alby

As a distributor of millions of products to more than 600,000 customers in over 180 countries, global logistics is an important part of what Digi-Key does. The past few years have thrown curveballs from every direction, with a profound impact on global logistics. We navigated pandemic shutdowns, regulatory changes and capacity constraints, as well as port workforce shortages and lockdowns, creating backlogs for months.

In the past, capacity wasn't a challenge, but all that changed when the perfect storm hit over the past two years. Order volume increased due to people shifting to working from home and ordering online, there was less capacity with fewer passenger aircrafts flying (typically shipping packages too) and port congestion increased.

Diversity in carrier partners has become increasingly important to maximize capacity, maintain

shipping stability globally and provide options to customers to select which carrier they prefer. Digi-Key offers multiple carrier options—DHL, FedEx, UPS and USPS—and has built strong partnerships with them, including having them on site in the Product Distribution Center, loading and shipping out an average 27,000 packages a day to customers worldwide.

Over the past two years, many countries have made changes to their regulatory requirements that impact customs clearance, which vary from country-to-country. It's important for distributors to be proactive and stay ahead of changing requirements around regulations and documentation as early as possible to ensure shipments are cleared efficiently through customs. Digi-Key ensures its IT team is up-to-speed and in synch with regulatory changes to keep shipments moving through customs and to customers on time.

Visibility to real-time movements of both inbound and outbound shipments is critical to replenishing stock and ensuring customers receive orders on time. Visibility into costs is also becoming more important as shipping costs are increasing. If it's possible to pivot and find a less costly and faster way to ship, Digi-Key works to find it.

For procurement professionals, having flexibility with a variety of shipping options is also of growing importance. For example, Digi-Key provides options to place scheduled orders to take advantage of price breaks and save time placing the same order repeatedly, and multi-ship consolidation to ship all orders together even if they've been placed on different days.

Advances in technology and automation are helping to provide solutions for the skyrocketing growth in shipping demand. For example, last mile

delivery options include drones, smart lockers, drop boxes and automated guided vehicles.

Digi-Key is continuing to invest in technology and automation through its new Product Distribution Center expansion which will provide 2.2 million square feet of space—plenty of room to scale as order volume increases and more products become available. The new Center also provides room for carrier partners to grow and incorporate their own automation onsite that will allow for ongoing and improved delivery options to customers.

www.digikey.com





Sensor demand will remain strong and prices will rise

Despite slower economic growth and global geopolitical uncertainty, the sensor market will post double-digit growth this year



James Carbone

The worldwide sensors market will grow 17.2 percent to \$22.4 billion this year as demand increases from communications, automotive, and industrial segments and prices increase for the second straight year, according to World Semiconductor Trade Statistics (WSTS).

In 2021, tight supply and higher prices resulted in the sensors market growing 28 per cent to \$19.1 billion, WSTS said. In 2022 demand will remain strong but supply will improve so prices won't increase as much as in 2021 and the revenue growth rate will be a little less than last year, according to industry analysts.

Jim Feldhan, president of Semico Research, said prices in 2021 increased 27 per cent to \$0.41 rising from \$0.33 in 2020. He said prices increased because there wasn't enough capacity to meet demand and because of the continuing disruption in the supply chain.

"Certain materials were hard to get. There's a fair amount of sensors that are made in Asia and there have been shipping issues with container ships," said Feldhan. As a result, unit shipments of sensors only increased 1.2 per cent in 2021 over 2020, he said.

Sensor manufacturers have been adding capacity, so unit production could increase in 2022. For instance, Bosch, the leading producer of sensors, announced in February it would invest \$297 million to create additional production space at its Reutlingen, Germany fab for production of sensors and other chips.

However, supply increases were not felt in the first quarter of the year. "Sensors demand so far in 2022 has been healthy and strong," said Rob Lineback, senior market research analyst for IC Insights. Sensor manufacturers "can't keep up with demand yet," he said. In the second half of the year, supply of sensors should improve, he said.

Prices will rise

Even with some extra capacity coming online later in the year, prices will rise in 2022, but not as much as in 2021, said Feldhan. In 2021, the average price of a sensor was \$0.41. In 2022, the average price will increase to \$0.44.

Because sensor manufacturers are making capacity expansions, "we think in 2023 we are going to see a return to normal growth patterns for sensors," said Feldhan. "We have a 7.8 per cent growth in units in 2023 and a 9 per cent increase in dollars. Average selling prices still expected to rise, but just slightly from \$0.44 to \$0.45, he said.

Demand for sensors will rise in 2022 and for years after because more electronics equipment and systems are using them. In addition, demand from traditional electronics segments such as computers has increased.

"Communication is the biggest user of sensors," said Feldhan. About 1

billion cell phones ship each year and each cell phone has seven or more sensors. "The 5G phones rollout expansion is not over," said Feldhan. "We think that is going to last until through this year and next year." He noted 5G phones are more sophisticated and they have a few more sensors than 4G and other older phones.

"Automotive is probably the second largest user of sensors because there are just so many sensors in a car," he said. About 80 million cars are built each year and each vehicle has about 70 sensors.

Sensors in everything

Other equipment segments are using more sensors, including industrial, medical, consumer electronics. "Everything needs sensors," said Feldhan. "Portable devices and even white goods are using more electronics and using more sophisticated sensors for power management and temperature control," said Feldhan.

He said there is growing demand for energy-efficient appliances and the "only way to do that is through the use of more electronics, which typically includes sensors."

He noted that Internet of Things (IoT) applications require sensors and IoT is "in the growth stage of its maturity lifecycle," so it will contribute to sensors demand.

While demand is strong for all types of sensors, pressure sensor demand has been particularly robust, according to Lineback. Pressure sensors are used in many industrial applications to measure liquid levels in tanks, to monitor process flow, to identify gas or steam leaks and measure pumping pressures among other applications.

"Accelerometer sensors, used in mobile phones, navigation systems, laptops and machinery, have had double-digit growth rates but demand for them has not been as strong as pressure sensors. Accelerometers are used to detect positions of mobile phones, computers and to track vibrations in industrial machines position of mobile phones and computers and to display upright position of digital cameras, among other uses.

Demand for magnetic field sensors, used in a wide range of scientific measurement, navigation, and industrial applications, is growing

but at a slower rate than pressure or accelerometer sensors.

"There is so much automation and embedded sensing going into so much equipment," said Lineback. "That is why the sensor demand will remain strong going forward."

Marcellino Gemelli, general manager of automotive electronics for the Americas at Bosch, said for automotive applications, "we see high demand in all sensor segments, especially in the area of inertial sensors. The increasing demand for high-performance sensors for driver assistance systems or localization functions is noticeable," he said.

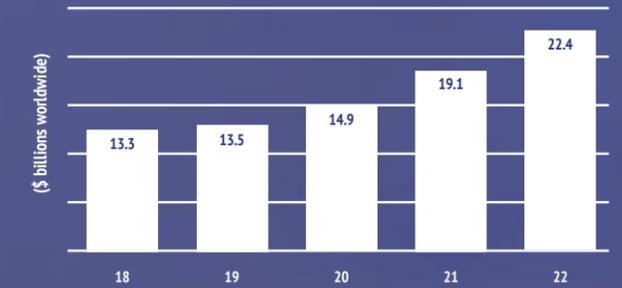
More VoC sensors wanted

He added there has also been an increase in demand VoC gas sensors for smart home/smart building applications. VoC gas sensors indicate the quality of the air and are used to control ventilation systems. "Providing fresh air is a proven means to prevent Covid-19 infections," he said.

Gemelli noted sensor demand also increased from notebook and media tablet segments over the past two years. Demand for notebooks and tablets had declined prior to 2020 but rebounded during the pandemic. "That had a positive impact on sensor use," said Gemelli.

The worldwide sensors market will reach \$22.4 billion in 2022. Source: World Semiconductor Trade Statistics

Sensors market pushes upward



Sensor demand is also increasing in the hearable/true wireless stereo earbuds segment, he said.

Feldhan noted that there is growing demand for sensors in servers used in data centers with cloud applications. "When you look at servers, there's a lot of temperature sensors that keep track of heat on the circuit board. Cloud applications are not going away," he said. "It's going to continue to grow."

In addition, the hybrid work model of people working from home and in the office is also not going to go away, said Feldhan. That means companies will continue to add equipment for security and connectivity and that will drive semiconductor demand including sensors.

Demand stays strong

Sensor demand is expected to be strong for several years. Lineback said despite the current tight sensor supply, leading sensor manufacturers such as Bosch, TDK, Honeywell and STMicroelectronics, should be able to meet future demand once more capacity is added and supply chain issues are resolved.

Of course, demand for sensors and other semiconductors could decline later in the year if global economic conditions deteriorate precipitously. In addition, the war in Ukraine could potentially

adversely impact economic growth resulting in less demand for many products, including semiconductors such as sensors.

Gemelli noted that at the beginning of 2022 sensor demand was strong in the mobile and consumer MEMS sensor segment and automotive. "The outlook for 2022 was looking good until recent events, i.e. the Russian invasion of Ukraine, serious Covid-19 lockdowns in Shanghai and growing inflation," made it impossible to say how business will be later in the year, he said.

However, some analysts say despite potential headwinds due to slower economic growth and the war in Ukraine and rising inflation, the sensors market should still post double-digit growth in 2022.

"The growth rate for sensors early in the year was fairly strong," said Lineback. "We're sticking with our 16 per cent growth forecast for this year. It looks like it's on that track."

IC Insights' forecast for the sensor market, not including actuators, says sensor revenue will grow from \$12.7 billion in 2021 to \$14.7 billion in 2022. Unit shipments will increase from 30.4 billion last year to 34.9 billion and the average price will rise 1 per cent.

By the Numbers

17.2%
The forecasted growth rate for the worldwide sensors market in 2022. Source: World Semiconductor Trade Statistics

\$22.4 billion
The forecasted size of the global sensors market in 2022. Source: World Semiconductor Trade Statistics

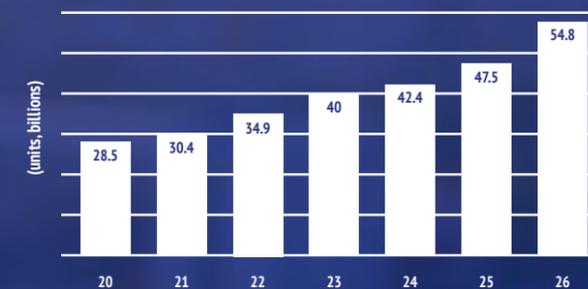
7.5%
The expected average price increase for a sensor in 2022. Source: Semico

\$0.44
The forecasted average price of a sensor in 2022. Source: Semico Research

15%
The forecasted growth rate for sensor unit shipments this year. Source: IC Insights

34.9 billion
The number of sensor units that are expected to ship in 2022. Source: IC Insights

Sensor unit shipments skyrocket



Unit shipments of sensors will post double-digit annual growth through 2026 when 54.8 billion sensors will ship. Source: IC Insights

Power module includes snap-in mounting

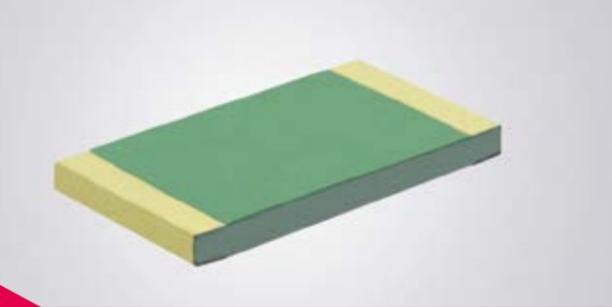


Schurter has expanded its EC12 series with a snap-in mounting version. The variant is designed to save panel space otherwise consumed by a mounting flange. It also provides quick and easy, well-secured installation.

The product has the same integrated features as the flange mount version: IEC C20 appliance inlet; high-performance single-stage filter; and power switch (with/without illumination). Alternatively, it features snap arms designed to ensure a tight fit as they mount to the panel simultaneously. This ensures a high quality electrical contact to the panel, which optimizes the filtering and shielding effect.

The EC12 filter series is available as a standard or medical M5/M80 version and is used in devices especially sensitive to interference. This includes IT or telecom systems according to IEC 92368-1 and medical equipment according to IEC 60601-1. Filter versions with increased surge withstand voltage capability are also available.

schurter.com



Reduced solder joint stress

Vishay Intertechnology has introduced a new high precision thin film wraparound chip resistor for industrial, military and aerospace applications. Vishay states the Sfernice PEP offers the widest resistance value range on the market and delivers higher power ratings in smaller case sizes than competing devices, which enables miniaturization and increases reliability by reducing the mechanical stress on solder joints.

The resistor is available in four case sizes from 0402 to 1206 and features a power rating to 1W in the 1206 case size (without cooling under the PCB). The PEP offers a resistance range from 39Ω to 900kΩ, with tolerances down to ± 0.05 per cent.

The PEP is optimized for precision applications requiring low noise and high stability over time and temperature. End products will include instrumentation, military/avionics guidance systems, automatic test equipment, industrial appliances and operational amplifiers for test and measurement equipment.

www.vishay.com



Smart design makes custom widths easy

Metcase's tough Unidesk aluminium enclosures suit desktop and wall-mount applications too challenging for plastic housings. These robust sloping-front enclosures are ideal for office systems, point-of-sale, medical devices, industrial/machine control, security, access control and many other types of electronics and electro-technical terminals.

Unidesk has a large front panel recessed to accommodate a membrane keypad. The flat rear panel can be machined to create apertures for connectors, switches and power inlets. The base has pre-punched PCB fixing points.

Unidesk can be supplied with or without an IP54 sealing gasket in three standard widths (7.87, 11.81 and 15.74in) creating three standard sizes from 7.87 by 7.87 by 4.01in to 15.74 by 7.87 by 4.01in. Custom widths are easy to manufacture thanks to Unidesk's smart design.

There are two standard colors: light gray (RAL 7035) and black (RAL 9005). Custom colors are also available.

www.metcaseusa.com



Increased power density

Diodes Incorporated's PowerDI 8080-5 is a high current, thermally efficient power package designed to meet the needs of electric vehicle (EV) applications. The first product in the package is the DMTH4M70SPGWQ, a 40V automotive-compliant MOSFET that features a typical RDS(ON) of 0.54mΩ at a gate drive of 10V, while its gate charge is 117nC. This performance helps designers of automotive high-power BLDC motor drives, DC-DC converters and charging systems maximize system efficiency while minimising power dissipation.

PCB footprint of 64mm², which is 40 per cent less than that occupied by the TO263 package format. Off-board profile is 1.7mm, which is 63 per cent lower than a TO263. The copper clip bonding between the die and terminals facilitates a low junction-to-case thermal resistance of 0.36°C/W. This lets the PowerDI 8080-5 handle currents up to 460A and deliver a power density eight times greater than a TO263 package.

www.diodes.com



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ACOUSTIC COMPONENTS											
BeStar Electronics Ind. Co. Ltd.	BeStar Technologies Inc.	520-439-9204	www.bestartech.com	Y	N/A	\$250,000	N/A	100.00%	50	900	Y
CABLE & WIRING											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23235	N/A	\$0	0.46	50	1,000+	Y
Alpha Wire	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,106	N/A	\$0	93.00%	50	1,000+	Y
Belden Wire & Cable	Mouser Electronics	800-346-6874	www.mouser.com	Y	5,863	N/A	\$0	97%	50	1,000+	Y
Molex	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CIRCUIT PROTECTION											
Bel Fuse	Bel Fuse	+1 201 432 0463	belfuse.com/circuit-protection	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	\$0	68.00%	50	1,000+	Y
Eaton	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,487	N/A	\$0	100%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	28,790	N/A	\$0	67%	50	1,000+	Y
Schurter	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	31,445	N/A	\$0	68%	50	1,000+	Y
DISPLAYS & LEDs											
BIVAR	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,390	N/A	\$0	99.00%	50	1,000+	Y
Dialight	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,179	N/A	\$0	84.00%	50	1,000+	Y
Displaytech	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Electronic Assembly	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kingbright Company, LLC	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	\$0	100.00%	50	1,000+	Y
Lumileds	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Newhaven Display	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,690	N/A	\$0	100.00%	50	1,000+	Y
VCC	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ELECTROMECHANICAL											
ALPS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Apem, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,326	N/A	\$0	83.00%	50	1,000+	Y
C&K Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	27,230	N/A	\$0	90.00%	50	1,000+	Y
E-Switch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Grayhill	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Keystone Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y

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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
METCASE Enclosures	OKW Enclosures, Inc. (800) 965-9872	www.metcaseusa.com			322	N/A	\$0	N/A	10	20	Y
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ROLEC Gehäuse-Systeme GmbH	ROLEC Enclosures Inc (888) 658-5774	www.rolec-usa.com			1,960	N/A	\$0	N/A	4	6	Y
FREQUENCY MANAGEMENT											
Abrakon Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,780	N/A	\$0	100%	50	1,000+	Y
CTS Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,889	N/A	\$0	100%	50	1,000+	Y
ECS Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,070	N/A	\$0	100%	50	1,000+	Y
Epson Toyocom	Mouser Electronics	800-346-6873	www.mouser.com	Y	178	N/A	\$0	100%	50	1,000+	Y
IQD Frequency Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kyocera	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Labs	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ICs & SEMICONDUCTORS											
Analog Devices, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,749	N/A	\$0	95%	50	1,000+	Y
Broadcom Limited	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor Corp.	Future Electronics	(800) 675-1619	www.futureelectronics.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Cree, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cypress Semiconductor Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	81.00%	50	1,000+	Y
Digi International	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Diodes Incorporated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FTDI	Mouser Electronics	800-346-6873	www.mouser.com	Y	94	N/A	\$0	100%	50	1,000+	Y
IDT (Integrated Device Technology)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Infineon	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,580	N/A	\$0	63%	50	1,000+	Y
Intel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ISSI	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lattice	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MACOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	\$0	100%	50	1,000+	Y
Microsemi	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Nexperia	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	\$0	100%	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	\$0	96%	50	1,000+	Y
Power Integrations	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Qorvo	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Renesas Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
SanDisk	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	\$0	100.00%	50	1,000+	Y
Skyworks	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	\$0	96.00%	50	1,000+	Y
Swissbit	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	\$0	94%	50	1,000+	Y
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	\$0	77%	50	1,000+	Y

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
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
Active (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	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mill-Max	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	\$0	89%	50	1,000+	Y
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	\$0	100%	50	1,000+	Y
NorComp	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	\$0	77.00%	50	1,000+	Y
Radiall	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	\$0	27%	50	1,000+	Y
Stewart Connector	Bel Fuse	+ 1 717 235 7512	belfuse.com/stewart-connector	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	\$0	55%	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	\$0	69%	50	1,000+	Y
OBSOLESCENCE / HARD TO FIND											
	Lansdale	602-438-0123	lansdale.com	Y							
	Lantek Corp.	973-579-8100	www.lantekcorp.com	M	186,000	\$22M	\$0	75.00%	5	62	Y
	Rochester Electronics	978-462-9332	www.rocelec.com	Y		N/A	\$250		10	400+	Y
OPTO ELECTRONICS											
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	582	N/A	\$0	99.00%	50	1,000+	Y
Finisar	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,927	N/A	\$0	99%	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PASSIVES											
ABRACON	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
AVX	Mouser Electronics	800-346-6873	www.mouser.com	Y	42,454	N/A	\$0	72%	50	1,000+	Y
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	38	N/A	\$0	78%	50	1,000+	Y
Cornell Dubilier	Mouser Electronics	800-346-6873	www.mouser.com	Y	24,145	N/A	\$0	71%	50	1,000+	Y
Coilcraft	M										

Buyers' Guide

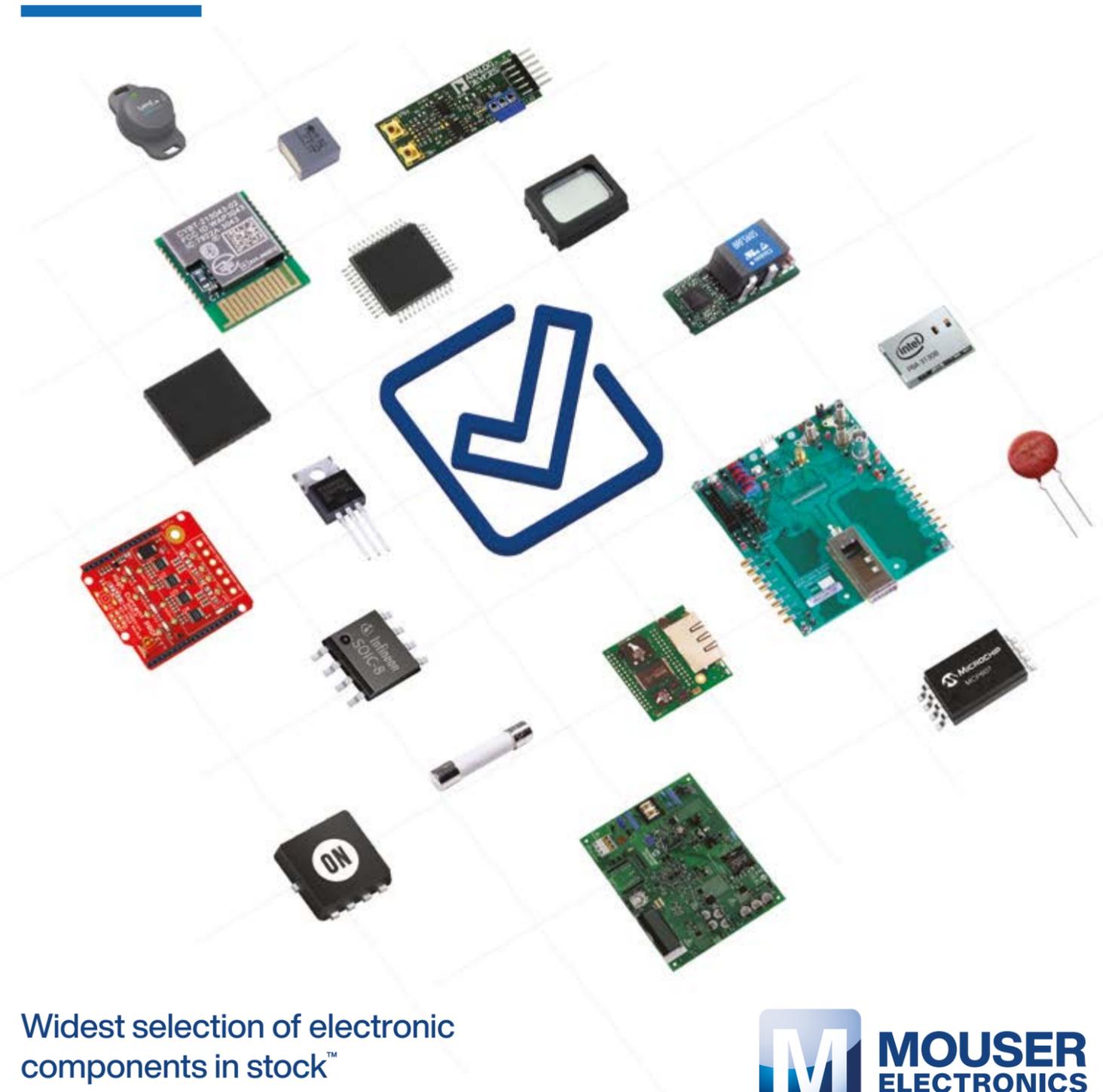
Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
PASSIVES (Continued)											
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	\$0	100.00%	50	1,000+	Y
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	\$0	64.00%	50	1,000+	Y
Würth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	\$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	\$0	100.00%	50	1,000+	Y
POWER & BATTERIES											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bel Power Solutions	Bel Fuse	Power & Batteries	belfuse.com/power-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mornsun	+1-978-567-9610/+1-978-293-3923	www.mornsunamerica.com			N/A	N/A	\$0	100%	N/A	2000+	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
TRACO Power	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
Lasca 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
THERMAL MANAGEMENT											
Materials Direct	Materials Direct	+44 (0)1908 222 211	www.materials-direct.com	N/A	N/A	£1,000,000	N/A	N/A	5	55	Y
Universal Science	Universal Science	+44 (0)1908 222 211	www.universal-science.com	N/A	N/A	£1,000,000	N/A	N/A	5	55	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BCA 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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[mouser.com/authentic-products](https://www.mouser.com/authentic-products)



DIVERSITY DRIVES OUR BUSINESS FORWARD

Diversity is key to our culture. Rutronik's unmatched product breadth ensures that our customers' needs are optimally covered. Our individually unique employees come together to form a team of dynamic solution providers. We are rapidly expanding in North America.

Diverse product portfolio. Diverse people.

#RUTRONIKfamily.

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Product Management: E-mech & Embedded
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Technical Field Sales
Minneapolis, MN | Tampa, FL | Phoenix, AR

Manufacturing Rep Strategy Manager
Remote



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