# ELECTRONICS
# sourcing

JANUARY 2024

NORTH AMERICA

# Why do supply chains fail?

## On the cover – January 2024

Why do supply chains fail?
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# Editor's Word

## Wake up, shake up

In March this year, for the first time in approximately 40-years, I started running. Given the sedentary nature of being a magazine editor—hours spent at a desk each day—it began as a life extension tactic but has now evolved into a wonderful pastime that I share with family and friends.

On the surface, the positive benefits are what anyone would expect: weight loss, improved heart and lung capacity, muscle tone etc. However, nine months in, I've realized there is much more going on under the surface.

According to my research, every time my foot hits the ground a force up to three times my weight permeates my body. Basically, every cell is getting 'shaken alive' from the inside out. I can feel organs, bones, ligaments and tendons getting a thorough workout, second-after-second. Each shock is a tiny, harmless reminder for my body to grow stronger and more resilient. During a 10k run, that's 10,000 opportunities for my body to learn.

The more I think about this—and there is plenty of time to think while running—the same logic applies to 'running' a business. Every day, every employee, department, process and supplier will face multiple challenges. No matter how small or frequent these challenges are, each one is an opportunity for a business to learn and improve.

Provided systems exist for employees to record these challenges, innovate solutions and deploy their findings, there is no doubt in my mind such businesses will be running ultra marathons in no time.

*Jon Barrett*

## Global connector stocking deal inked

CDM Electronics has entered into a global stocking distribution agreement with Positronic covering Positronic's full series of standard density, heavy duty and MIL-28748 rectangular connectors with removable contacts.

Optimized for direct current, low frequency analog and digital high-speed data applications, the connector series comprises Positronic's MIL-DTL-28748 heavy-duty rack and panel GMCT Series with removable contacts, plus GM Series parts with fixed solder contacts. Additionally included are rack and panel GAP and GAPL Series PCB connectors with straight solder or right-angle solder cup contacts, respectively. VMCT

together with VAPL Series interface connectors featuring crimp, solder cup, right angle PCB or press-fit terminations are also stocked.

CDM product manager, Danielle Richardson, said: "The addition of Positronic's comprehensive offering of MIL-Spec and heavy-duty rectangular connectors to our expanding ready-to-ship product portfolio further enables CDM to satisfy customers' demand for best-in-class delivery, pricing, as well as customer and engineering services."

*www.cdmelectronics.com*



## Wi-Fi 6/6E modules ready to ship

Mouser Electronics is now stocking Laird Connectivity's Sona IF573 Wi-Fi 6/6E modules. Designed for next-generation industrial IoT connectivity applications, these robust, rugged and compact modules provide easy integration and highly reliable connectivity, allowing access to both PCIE and SDIO interfaces in a pluggable card or SMT M.2 packaging.

Sona IF573 modules are engineered as high-performance, industrial-grade devices powered by Infineon Technologies' AIROC CYW55573 chipset, enabling Wi-Fi 6/6E beyond its standard requirements and enhancing the module's range, reliability and robustness in congested networks for IoT applications or lower latency in AI applications.

The modules support a tri-band 2x2 MIMO IEEE 802.11a/b/g/n/ac/ax WLAN with data rates up to MCS11 and dual-mode Bluetooth. The module's full digital MAC and baseband engines handle all 802.11 CCK/OFDM/OFDMA 2.4/5/6 GHz and Bluetooth 5.4 baseband and protocol processing capabilities.

Target applications include industrial IoT sensors and gateways, rugged handheld devices and medical equipment.

*www.mouser.com*



## Protecting high-speed differential lines

Rutronik is offering Diodes' D3V3Z1BD2CSP TVS diodes, an ESD protection component with an extremely low capacitance Cd of 0.3pF. They are designed to protect high-speed differential lines. Due to their high pulse peak current capability (10.5A, tP=8/20µs), these components can also be used to protect against electrical overload.

The 0.60 by 0.30 by 0.30mm DSN housing enables flexible protection for a single cable. Potential uses include automotive applications requiring specific change control: ie parts qualified to AEC-Q100/101/104/200, PPAP capable and manufactured in IATF 16949 certified facilities.

The diodes feature an extremely low terminal voltage (5V or 5.3V) to protect sensitive inputs and outputs and a low reverse current of 50nA max at a VR of 3.3V. They enable reliable, bidirectional ESD protection for a cable.

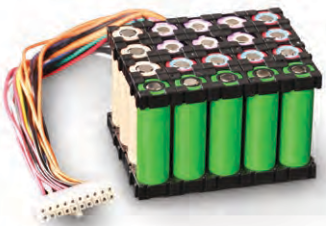The devices are RoHS-compliant and lead, halogen and antimony-free.

Application examples range from USB3.0 and Thunderbolt3 to 10G Ethernet and WiFi-6 AnT.

*www.rutronik24.com*

# N
## ES News

## In Brief

### Move underpins customer support
The US Leuze sales, production and development departments are locating in Duluth, Georgia. Leuze's VP operations and technology Americas, Ibrahim Zuva, said: "This decision is consistent with Leuze's long-term strategic growth targets. The new location also provides a more favorable environment for cooperation with our customers, distributors and partners."
*www.leuze.com*

### Chokes sample kit
TDK presents a sample kit for the B82559A*A033 series of shielded Epcos ERU 33 high-current chokes. The kit contains two pieces of each of six standard types. In addition to standard types, customized variants with other inductance values can be realized. These through-hole components cover inductance values from 3.2µH to 10µH.
*www.tdk-electronics.tdk.com*

### Engineers at turning point
Engineers are at a turning point regarding the design and supply chain disruptions of the last several years, according to Avnet. The 2023 survey found that, while there is a sense of optimism around acute issues such as components availability, many are now looking at what comes next—and that outlook remains uncertain.
*www.avnet.com*

### Semis set for recovery
SEMI's Q3 2023 Semiconductor Manufacturing Monitor Report states electronic sales are predicted to register a robust 22 per cent quarter-over-quarter increase in Q4 2023, adding to seven per cent growth posted in Q3 2023. IC sales are expected to rise four per cent sequentially after improving seven per cent in Q3 2023.
*www.semi.org*

## Integrated connector module range expands

Bel Fuse has expanded its single port, 10G, NBase-T, 60W and 100W power over Ethernet MagJack integrated connector modules. Customers can implement PoE while increasing their speed to 10G, ten times the standard Gigabit Ethernet (GbE). The new ICMs support high power requirements of network devices and Internet of Things. Applications include industrial controllers, video cameras, Wi-Fi access points and applications requiring a single port Ethernet connector.

The product family can send or receive 0 to 60W or 0 to 100W power per port over all four pairs within the Ethernet cable while maintaining the bandwidth of the NBASE-T compliant 10GbE signals, meeting the latest IEEE 802.3 electrical standard requirements and common mode parameters. Additionally, the products can carry 600 or 1,000mA of current and 37.0 - 57.0VDC continuously, operating in a temperature range of -40 to 85°C depending on model.

The ICMs are 100 per cent high-potential tested, lead-free, wave-solder compatible, RoHS 6/6 compliant, UL recognized and feature a RJ45 plug-tab up for ease of use.

*www.belfuse.com*

## New SMPS interconnects unveiled

Fairview Microwave has unveiled new SMPS interconnects. Focused on compactness and high frequency, the connectors cover frequencies up to 65GHz, while meeting the rigorous demands of military and aerospace applications.

Crafted as a miniature push-on connector, the interconnects offer quick assembly. Their broad frequency range—spanning DC to 65GHz—ensures versatility and adaptability for a range of applications.

Compliance with MIL-STD-202 ensures they stand up to stringent military standards. The connectors come with the added flexibility of bullets and adapters. They have been designed to withstand radial and axial misalignment, ensuring secure connections even in less-than-perfect scenarios. Another advantage is board stacking below 0.120in.

Fairview Microwave's product line manager, Tim Galla, said: "Our new SMPS interconnects exemplify Fairview's relentless pursuit of innovation and top-tier quality. They offer a smaller form factor than their SMPM counterparts, ensuring space-saving without a shred of compromise on performance."

The products are in stock and ready for immediate shipment with no minimum order quantity.

*www.fairviewmicrowave.com*

## Sourcing choice for cryogenic isolators

East Coast Microwave is stocking cryogenic isolators from DiTom Microwave. The three-port ferrite devices are designed to operate at cryogenic temperatures at or below 77K and provide high isolation in one direction and low loss in the other. Cryogenic isolators are ideal for use in laboratories, quantum computing and aerospace applications.

For example, the D3I4080Y cryogenic isolator operates from 4 to 8GHz. It can handle: an average forward input power of up to 30W; a peak input power of 50W; and a reverse input power of 2W. The component provides more than 16dB of isolation and has an insertion loss of less than 0.4dB. It is available in a module measuring 1.0 by 1.0 by 0.5in and features SMA (male/female) connectors.

*www.ecmstockroom.com*

# EMS shipments, supply chains, sentiment and more

*In this article, IPC presents statistics and thoughts on subjects including manufacturing services, Government support for supply chains and electronics sector sentiment*

IPC has announced the October 2023 findings from its North American Electronics Manufacturing Services Statistical Program. Book-to-bill ratio stands at 1.23.

Total North American EMS shipments in October 2023 were down 7.4 per cent compared to the same month last year. Compared to the preceding month, October shipments decreased 0.5 per cent. EMS bookings in October decreased 19.5 per cent year-over-year and decreased 4.8 per cent from the previous month.

IPC's chief economist, Shawn DuBravac, said: "EMS bookings were weak for the second consecutive month. The year-to-date trend for bookings declined to its lowest level of the year."

## Strengthening supply chains

In other news, IPC welcomes the actions outlined by the US Government 'to strengthen supply chains critical to America's economic and national security'.

Covid-era disruptions experienced by the US electronics manufacturing industry spotlight the extent to which the United States has outsourced its industrial base impacting everything from automobiles to aircraft to consumer products.

Investments being made under the CHIPS and Science Act, Defense Production Act and Inflation Reduction Act must cover more than just a few key products such as semiconductors—they also need to include the full electronics manufacturing system that enables semiconductor chips to function including printed circuit boards and integrated circuits substrates.

IPC is pleased to see actions complementing prior announcement of a National Advancing Packaging Strategy. In addition, IPC welcomes the creation of a Cabinet-level Council on Supply Chain Resilience and a new quadrennial review process to ensure a comprehensive approach to this vital issue. IPC applauds the actions to solidify the US defense industrial base and the emphasis on international cooperation.

## Materials costs improve

Finally, IPC has released its November Global Sentiment of the Electronics Supply Chain Report. Sentiment improved during November with demand sentiment also taking a solid step up over the last 30 days. Although materials costs continue to improve, labor costs remain a pain point. Some 62 per cent of electronics manufacturers say they are currently experiencing rising labor costs.

Shawn DuBravac continued: "In this month's survey, we asked a special question about PCB and EMS production growth. Electronics manufacturers believe the US should adopt strong goals for production growth."

For the PCB sector, roughly 85 per cent of respondents reported the five-year goal should be above current levels and the average suggested goal was 9.3 per cent of global production. For the EMS sector, roughly 70 per cent of respondents indicated a five-year goal above current levels. On average, respondents indicated the EMS industry should target 12.9 per cent of global production by 2028 and 17.4 per cent of production by 2033.

Additional survey data show: the New Order Index rose five points to 105 after hitting the lowest level for this index; the Materials Cost Index fell to another new low, dropping four points to 118; the Labor Costs Index rose one point to 130 after declining for two consecutive months; and shipments, orders, capacity utilization, backlogs and profit margins are expected to rise over the next six months, while all other key business indicators are expected to remain relatively stable.

**www.ipc.org**



**Trends in North American EMS Book-to-Bill Ratio**
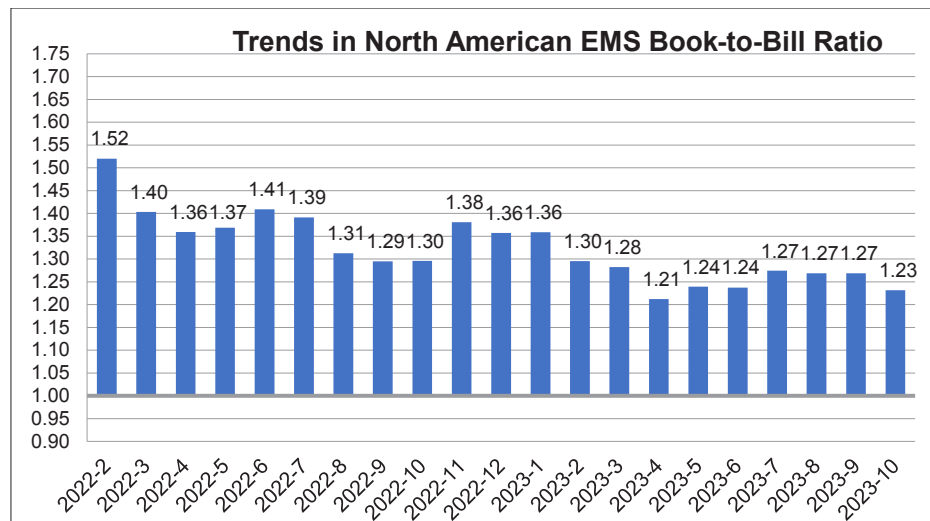
# Major memory milestone

*Renesas has introduced the third generation DDR5 registered clock driver (RCD), plus the first-generation client clock driver (CKD) for emerging DDR5 DRAM servers and client systems*

The ICs enable next generation DIMMs with speeds up to 6400 and 7200 mega transfers per second (MT/s) respectively, an increase from today's 5600 MT/s transfer speeds. The RCD is designed for registered DIMMs (RDIMMs), while the CKD supports speeds up to 7200 MT/s and is the first to interface with small-outline DIMMs (SODIMMs), unbuffered DIMMs (UDIMMs), high-performance gaming DIMMs and memory down applications for client platforms.

Renesas' corporate VP and GM of the advanced mixed signal and ASIC solutions division, Balaji Kanigicherla, said: "By playing an integral role in defining and implementing DDR5 interface specifications, Renesas continues to be an important partner for the world's leading SOC and DRAM players for DIMM and system-level bring up."

Intel's VP of memory and IO technologies, Dr Dimitrios Ziakas, added: "Intel Xeon-based platforms are designed to support memory intensive usages like predictive analytics that use deep learning and machine learning. Gen 3 RCD is a major milestone for the memory industry to help meet the bandwidth and scaling capacity needs of our datacenter customers.

"The client clock driver is a new industry initiative to further enhance the client DIMM.  Renesas and Intel have been collaborating with the industry to help ensure specification and implementations of the Gen 3 RCD and client clock driver to meet the market needs."

**www.renesas.com**

# Are you overthinking date codes?

*In this feature, Rochester Electronics, explains to purchasing professionals why general date code restrictions for components are becoming obsolete*

When semiconductor date codes were implemented back in the 1960s, the goal was to maintain parts traceability, based on manufacturing or seal dates, processes and bill-of-materials, as well as a two to three-year 'sell-by' date. Historically, it was believed components were no longer usable post their listed date codes. However, date codes are no longer a reliable indicator of component quality and may prevent the use of perfectly viable components.

Today's industry has changed substantially, as original component manufacturers (OCMs) move to shorter product lifecycles. Consumer applications drive demand for semiconductors but have short lifetimes as well. Still, some industries require longer semiconductor component lifecycles. Industrial, medical, aerospace and defense industries might need application lifetimes measured in decades. In these cases, maintaining ongoing component supply is critical to sustaining application lifecycles. Since vital components may be discontinued, a common solution is to store those components for an extended amount of time.

New cars, aircraft and industrial controllers will typically spend five years in design and qualification stages, have another five-to-seven in production and end with seven-to-10 requiring aftermarket support. Adding it all up, it isn't unknown to require up to 20-years of component supply. When looking at applications with extended lifetimes and for customers considering a long-term storage solution, having confidence that products maintain their quality and reliability is key. Yet, after so long, are those parts reliable? Are they of quality? What even is a safe shelf-life for semiconductor components?

Despite continued use of date codes by OCMs as a measure of quality, mounting evidence indicates this is not an accurate measure.

Tin whiskers—small structures that grow off tin component leads—can be a cause for concern for many end-users. These tiny structures have been known to grow up to 10mm and can result in electrical damage to components. Although commonly believed to be linked to the age of components, NASA has found no evidence to support this claim. Not content to only rest with this proof, Rochester Electronics' quality and reliability team investigated the effects of long-term storage on both mechanical integrity and electrical performance.

Rochester analyzed a range of components, each stored for up to 17 years. Working intensively on two studies, Rochester performed tests on

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# WHAT'S NEXT BECOMES NOW

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solderability, package integrity, joint quality, electric viability and assembly functionality. The results show that not only did the components not degrade, they can still be functionally assembled and are electrically viable for many years when properly stored.

Texas Instruments has conducted several white papers exploring the reliability and quality of components after extended periods of storage. One initial study revealed that semiconductor products that are properly stored in controlled environments can last beyond 15 years. Furthermore, a subsequent Texas Instruments paper discovered that components stored for up to 21 years showed no signs of failure mechanisms. It is important to note that these studies are based on components that have been stored in controlled environments.

The Electronics Components Industry Association (ECIA) is now recommending an end to general date code restrictions, stating: 'Forty years ago, there may have been some truth to this perception. However, the last four decades of process improvements by electronic component manufacturers have all but eliminated the causes of failure mechanisms related to component age concerns'.

In its June 2023 policy, ECIA stated the following:

"1) The ECIA member component manufacturers and their authorized distributors recommend that general date code restrictions be eliminated from purchase order requirements for electronic components.

2) ECIA members also recommend that customers purchase electronic components from electronic component manufacturers

and authorized distributors who will assure that:

• Packaging, packaging shelf-life and storage requirements are understood and complied with. Product warrantees will be supported.
• Product change notices are distributed and complied with— including product recalls, quality alerts and packaging changes.
• Reports of specific component issues by customers will be reported to manufacturers and suspect stock will be appropriately quarantined.
• Order management processes will provide for appropriate review, quoting and conformance to customer specified date code restrictions."

ECIA believes that: 'General date code restrictions

unnecessarily delay the order entry process and delay the order fulfillment process, resulting in delayed service to the customer. General date code restrictions result in further aging inventory in the supply chain by disrupting normal first-in first-out (FIFO) consumption'.

Multiple industry leaders have tackled the issue of how to maintain a source of long-lifecycle components. Through years of diligent research and testing, long-term storage has not only been found to be possible but an important option to consider. It is safe, available, controlled and ready. Purchasers no longer need to fear component 'expiration dates'. They can feel confident that properly stored components will not only be reliable in the field, but of high quality well past their date code.

**www.rocelec.com**

# What's new



## GaN ICs selected for wall sockets

Innoscience Technology has announced Legrand is using InnoGaN devices in its latest home power sockets to meet increased power demand from products such as fast-charging Type A+C and USB power adapters.

In China, the company's recently launched Yijing 27W and Yijing PLUS 45W wall sockets both use Innoscience GaN HEMTs to increase output power and reduce heat generation within the same size. GaN also lets the plug fit more closely to the wall, achieving better slimness.

Innoscience Europe's general manager, Dr Denis Marcon, said: "The 45W charging socket has the highest output power within the available size. Compared with silicon-based sockets, the power is increased by nearly 1.5 times. At the same time, the characteristics of GaN also reduce the temperature rise of the charging socket during use, making it safer and more energy-saving."

*www.innoscience.com*

## MLCC portfolio gets safety-certified solutions

Kyocera AVX has expanded its portfolio of commercial surface-mount MLCCs with its first safety-certified MLCCs, the new Class X1/Y2 KGK Series and Class X2 KGH Series. Class-X and Class-Y safety-certified capacitors are designed to protect against surges and transients and provide EMI filtering AC line filtering applications.

Class-X safety capacitors are placed between an AC line and neutral and designed to fail short, which will cause an overcurrent protective device like a fuse or circuit breaker to open and prevent any electrical shock hazards.

Class-Y safety capacitors are placed between the line and ground and are designed to fail open, which will allow noise and interference that the capacitor would typically filter but prevent any fatal electric shock hazards.

X1/Y2 safety capacitors like the new KGK Series can be used as an X1 capacitor in across-the-line applications or as a Y2 capacitor in line-to-ground applications. X2 safety capacitors like the new KGH Series are designed for direct connection across main voltages of 250VAC or more and reduce noise by reducing the device's input impedance.

*www.kyocera-avx.com*

## First 16:10, 5.2MP image sensor for laptops and IoT
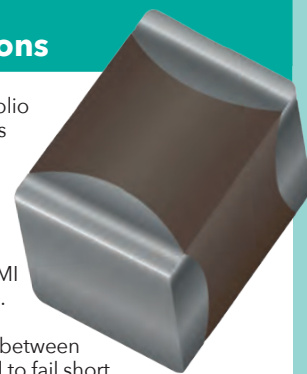


Omnivision has announced its 5.2-megapixel OV05C10 image sensor, the first product specially developed for 16:10 aspect ratio notebooks. The sensor has a staggered high dynamic range (HDR) and is suitable for mainstream and high-end laptops, tablets and IoT devices.

The sensor has ample pixels to support auto framing for video conferencing, which automatically adjusts the camera's field-of-view to keep the person speaking at the center of the image while cropping out distracting backgrounds. It also supports human presence detection (HPD), which increases the efficiency of artificial intelligence applications and extends battery life.

Omnivision's product marketing manager, Danny Liu, said: "Human/computer interaction that uses AI is becoming mainstream and our new OV05C10 can support a variety of AI features, including HPD. The higher resolution and unique aspect ratio are more suitable for use in video conferencing and the HDR function can effectively guarantee higher image quality during video calls."

*www.ovt.com*

# Recent revisions to AS6496

*TTI's VP of quality, Kevin Sink, explores updates and revisions to AS6496A, authorized distribution's standard for anticounterfeiting requirements*

The Society of Aerospace Engineers' (SAE) AS6496 is an anti-counterfeiting measure outlining requirements for mitigating counterfeit products in the authorized distribution supply chain by distributors performing authorized distribution.

SAE adopted this standard on August 20, 2014 with the official title of *Fraudulent/Counterfeit Electronic Parts: Avoidance, Detection, Mitigation and Disposition—Authorized/Franchised Distribution.* The standard is used by authorized distributors to reduce the risk of counterfeit electronic parts entering the aerospace supply chain but is a reliable anti-counterfeiting model for sales to any customer in any market.

SAE requires every standard be revisited every five years. That process has just been concluded and the revised version, AS6496A, is out for a vote now.

### Background on AS6496
The concern about counterfeit components becoming part of mil/aero equipment has been on the government's radar for several decades. One *Businessweek* article (Dangerous Fakes in October 2008) elevated the topic to mainstream consciousness. This resulted in a series of Defense Federal Acquisition Regulations (DFARs) that impacted the sale of components, prompting the SAE to publish AS5553 in 2009, which governed the OEM making products from these components. Since most counterfeit components were coming from independent distributors and component brokers, SAE commissioned a standard just for that sector of the supply chain: AS6081, which was published in 2012. It continues to be revised.

Since a standard designed for brokers includes measures not relevant to authorized distributors, another standard was clearly needed to avoid unnecessary time and expense in compliance. Robin Gray, then General Counsel of the Electronic Components Industry Association (ECIA) and I decided to convene another SAE committee to develop a standard that would apply to the authorized distribution channel. Companies that were part of this long and arduous process included Lockheed, BAE, Boeing, Rochester, TTI, Future, Arrow and others.

As these standards evolved, information was shared at industry conferences and through committee interactions that resulted in better counterfeit detection within the mil/aero manufacturing process. This created an arms race with counterfeiters. Other committees were formed to develop more advanced techniques, including AS6171, which forms the basis for laboratories (independent or in-house) to use when doing part authentication.

Work continues to develop better industry practices and improved detection techniques. Meanwhile, counterfeiters continue to get more sophisticated. Industry needs to constantly stay vigilant.

### What's changed in AS6496A
The first set of changes relates to the scope and

TTI's VP of quality, **Kevin Sink**

application of the standards. All the standards dropped the term 'fraudulent' in the rationale. Any deviation from the specification was considered fraudulent and the defense department included those in its definition of counterfeit. That was changed so the standard only applied to counterfeit parts.

Under 'scope' in the standard, the word 'products' was changed to EEE, narrowing the range of products considered to electrical, electro-mechanical and electronic. Originally the standard was designed for any product that an authorized distributor would sell, including solder, power supplies and so forth. The standard was revised to allow the distributor to include those products if they choose to do so, but the standard only applies to EEE. This aligned AS6496 with the rest of the SAE suite of anti-counterfeit standards.

Another set of changes relates to definitions. First, there is more nuance as far as what authorization means. Some distributors may choose to sell products for which they do not have an authorization agreement. When they do so, a disclosure requirement kicks in, so the customer understands that the distributor is not authorized for that transaction and that the manufacturer's warranty will not apply. For example, if a distributor is not authorized for a certain part in a certain geography, they must disclose that fact.

The definitions and implications of using commercial-off-the-shelf parts (COTS) were also refined to differentiate these from mil-spec components. Mil/aero customers focus on traceability paperwork, eg what is the date code, lot number and location where it was produced, and so forth. Mil-specs govern the provision of this information. Commercial customers, the

primary users of COTS, do not have such requirements. Because there is a cost to gather and administrate this, it is not typically provided with COTS components. The revision outlines the distinction between COTS and mil-spec parts.

Record-keeping requirements were extended from three years to 10-years in the standard. Most distributors were already saving records for five years and a survey conducted by ECIA determined that distributors agreed with extending that to 10-years to assist the customers in this critical industry.

Risk assessment related to return verification was revised. The return methodology must be 'risk-based'. The risk is if a customer returns a different component than what they were sold. The distributor must monitor that. If they have concerns about the customer—if the returned product is not in the same packaging and so forth, it is up to the company to decide what to do. They could take it back, they might have to test it, or even scrap it. But you cannot apply the same risk assessment as for a trusted customer.

The final change is in the reporting requirement. The language was changed from 'assure that all occurrences of suspect/counterfeit parts are reported' to 'assure that parts that show clear and convincing objective evidence of being counterfeit are reported'. This is because the authorized channel has the advantage over the independent distributor, or even the customer, in that they have access to the manufacturer to verify whether a component is theirs or not. So, for example, in situations where the component manufacturer has re-marked a part for a certain tolerance, and that gets identified as counterfeit, this revision acknowledges that

authorized distribution has access to the OCM and can better determine if the part is legitimate or counterfeit.

## Conclusion

Authorized distributors have been working on this issue for decades. The ECIA's Global Industry Practices Committee (GIPC) along with myself and many others have been doing reviews of customer and supplier practices, working on standards committees, presenting findings at conferences and developing and implementing processes to prevent counterfeit components from entering the supply chain. The simplest and most effective way for EMS and OEM customers to avoid counterfeits is to use the authorized component channel to purchase their BOM.

ECIA has built a portal for that purpose, called www.trustedparts.com. While other inventory aggregation sites may include data from sources that are not authorized by the manufacturer, ECIA works extensively on an ongoing basis to verify that price and availability data displayed on TrustedParts.com is only for products for which the distributors are authorized/franchised. That is why TrustedParts.com is the trusted source for searching the authorized channel for electronic components.

**www.trustedparts.com**

> **The simplest and most effective way for EMS and OEM customers to avoid counterfeits is to use the authorized component channel to purchase their BOM**

# Distribution awaits a recovery as correction cycle intensifies

*Components distributors expect the ongoing market softness will persist a while longer even as most of the electronics industry begins to climb out of the latest cyclical downturn*

The electronics components distribution market is going through another phase of its infamous cyclical swings. This one is marked by efforts to offload excess inventory only one year after the industry posted record revenues and profits. Now, the top market players are trudging through double-digit sales declines and hoping the ongoing market weakness will not be as severe as those that savaged the industry in previous years.

It is not that the entire electronics industry is still going through a downturn. The opposite is the case. A recovery is brewing in the semiconductor market and demand remains firm in many segments, a development that has convinced executives and analysts that the latest electronics industry cyclical downturn has ended. While torrid growth is not in the forecast for this year, a return to negative sales performance is not expected, either. "We upgraded our market outlook to growth as the semiconductor market returns to sustained growth," said Rudy Torrijos, research manager, Worldwide Semiconductor Supply Chain Technology Intelligence at IDC, in a research report. IDC said inventories remain high in the industry but noted that "visibility has clearly improved in the channel and with OEMs in key market segments. As a result, we expect capex to improve subsequently initiating a new investment cycle within the supply chain."

First, though, the market must wade through a pile of inventories and that's where the component distribution business is stuck. Distributors hold the bulk of the industry's inventory and are not often able to turn this over immediately after a recession, at least until customers begin to put in new orders, according to industry sources. While most of the unsold inventories may have been purchased on behalf of OEMs and electronics manufacturing services providers, they are still accounted for on distributors' balance sheet, creating the impression of overage. "The electronic components industry continues to stand on the brink of passing the breakeven point by the end of [2023] with the potential for return to broad-based growth at the beginning of 2024," said Dale Ford, chief analyst at the Electronics Components Industry Association (ECIA) in his monthly report.

"The electronic components industry continues to stand on the brink of passing the breakeven point by the end of 2023 with the potential for return to broad-based growth at the beginning of 2024"

Dale Ford,
chief analyst, ECIA

Inventories rose throughout the market again in the second half of 2023 despite ongoing efforts by OEMs and others to whittle down stocks. Distributors had built up inventories during the last bout of semiconductor shortages to service customers apprehensive about their future manufacturing requirements. The sudden end of the shortages left distributors holding the bag and facing the possibilities of having to clear out excess components over several quarters, industry executives said. "We're experiencing a cyclical correction in our global components business and a very mixed IT spending environment in our enterprise computing solutions business," said Sean Kerins, CEO of Arrow Electronics Inc., while presenting the company's third quarter results to analysts. "In our global components business, market conditions remain challenging, evident through softer demand across several verticals and

elevated inventory levels throughout the ecosystem."

**Burning the excess**
Determining exactly when the sales spigot will resume normal operations is complicated. It may take up to 3 quarters for distributors to clear out excess inventory once a new growth cycle starts, according to Arrow's Kerins. Current projections put this at the end of the second quarter. However, the actual period when the market would return to running inventory at a normal level depends on many factors, most of these being outside the control of distributors and their customers. Visibility into actual inventory situation across the channels is important to the effective management of the supply chain by distributors and their suppliers. It is believed that visibility is improving as companies refrain from reporting opaque figures or engaging in double-ordering that tends to mask actual demand requirements, observers said. "While inventory levels remain elevated with suppliers, visibility has clearly improved in the channel and with OEMs in key market segments," said Torrijos

at IDC. "We see revenue growth matching end user demand beginning in [first half 2024]. As a result, we expect capex to improve subsequently initiating a new investment cycle within the supply chain."

One major factor that distributors examine when assessing the likely depletion rates of component stocks is the state of the economy at local and international levels. Often, the burn rate of inventories can be influenced by national and international economic conditions and developments, which typically impact orders from customers, observers said. At Arrow Electronics, for example, inventories rose 14 percent in the September quarter to $5.8 billion, up from $5.1 billion, in the third quarter of 2022. The increased purchase of components on behalf of customers during the shortages lifted the tier-1 distributor's inventories to a record level, which it is now struggling to curb.

Arrow reduced inventories sequentially in the second quarter of 2023, but it shot up again in the third quarter as demand slowed. Now, the company is implementing

actions to slash inventories but this time in an environment marked by "softness in Asia and reduced shortage market activity in the Americas" as CFO Raj Agrawal puts it during the conference call. The company's order backlog has moderated too, coming "down from all-time highs but still at multiples of where we were pre-pandemic," according to Kerins. "The macro environment could obviously speed things up or slow things down. It's a little tricky to call that."

**Severe or moderate cycle?**
The primary concern for distribution currently is figuring out the severity of the ongoing market weakness, a softness that is not shared by every electronic product segment or region. As the production center of the global electronics market, demand for components in Asia today trails the levels being reported by companies in North America and Europe. American OEMs stockpiled inventories at a higher clip than competitors in the Far East, meaning it will now take far longer for them to clear the heap of parts. This will naturally impact the volume of their new orders to suppliers and distributors, observers said.

At the ECIA, Ford said the differences in experience, manufacturing requirements and supply chain management strategies between suppliers, OEMs and distributors have been seen in the industry association's monthly survey. Ford expected an improvement in market sentiment in November, adding that rising semiconductor demand was helping to push the ECIA sales projection upward. While semiconductor manufacturers' index score was forecast to top the "threshold indicating positive growth" in November, distribution's index remained lower because they see a

"much more challenging sales environment than their partners in the supply chain," Ford said.

That gap will persist through at least the first half of 2024 as distributors work through their inventory loads, Ford noted. "A stark difference in perspectives persists across the supply chain," he said. "The chasm in sales sentiment between manufacturers' representatives and manufacturers and distributors widened dramatically in the October survey. "A major disconnect began in April and widened in June and July before narrowing somewhat in August and September." The industry can expect a slow migration to a unified view of prospects for the future but not until the mountain of inventories piled up at distributors have been shaved down to a more normal level. "The severity of the shortage now indicates that the severity of the correction is probably somewhat equal to that," Arrow's Kerins observed. "So, the timing of how long it will take to play out is a little bit of an unknown."

> "We're experiencing a cyclical correction in our global components business and a very mixed IT spending environment in our enterprise computing solutions business"

Sean Kerins, president and CEO, Arrow Electronics

# Brace for renewed supply challenges in 2024

*Rand Technology's CEO, Andrea Klein, explains how the crossover of the artificial intelligence gold rush and EV rollout could trigger the next supply chain crisis*

As the world increasingly leans in on AI-driven solutions, demand for semiconductors is expected to skyrocket, creating a dynamic landscape for OEMs. Beneath the surface of progress lies a critical challenge—potential repercussions on component availability. While many may prognosticate about AI's impact on the supply chain, there is no frame of reference. Companies need to be prepared.

While EV adoption was thought to be the catalyst ushering in next generation technology and future component shortages, it's actually the expected early adoption of AI that will be 2024's driving force.

The explosion of AI begins with the buildout of the AI cloud infrastructure then will continue into on-premises AI infrastructure buildout and finally to the 'edge', otherwise known as on-device. This demand for new hardware and refresh of the edge product will drive demand for traditional components, advanced chips and a variety of board-level components, particularly power products.

Currently, foundries are pivoting to increase production of advanced nodes. However, this realignment takes time, is expensive and does not consider demand growth for standard components needed to support advanced chips. This is manageable now because the market is soft and many companies have an oversupply of components resulting from past long-term agreements. However, early adoption of AI could change the semiconductor digestion rate. To date, current infrastructure is insufficient to support next generation technology. Once again there will be semiconductor constraints, with companies competing for product.

To understand impending constraints, let's examine the intricacies of supply chains to identify the potential triggers. Supply chains can be visualized as a pyramid, with different layers. At the base are raw materials, which are vulnerable due to factors including global politics, mining rights and smaller foundries competing with TSMC for their fair share.

Moving up the pyramid, a mix of issues persist at the foundry, substrate and OSAT level, due to a lack of visibility into future needs, insufficient investment, labor shortages and de-risking of dependence on China.

The third layer involves the expansion of cloud infrastructure and networking capabilities, which are essential to support next generation products. Further, the crossover of AI and EV is anticipated to be problematic. It is unclear how quickly this will happen but it will lead to a massive need for electronic components, setting in motion a domino effect with each layer of the supply chain feeling pressure.

This should serve as a wake-up call to hardware technology company CEOs, chief procurement officers and those in R&D departments to prepare for this renaissance or revolution in hardware technology. Companies need to build as much flexibility as possible in their bills-of-materials, strengthen their company's muscles in commodity management and supply chain, heighten their supplier relationships and prepare for the future.

**www.randtech.com**

**Rand Technology's** CEO, **Andrea Klein**

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# Why do supply chains fail?

*In this article, NewPower explores some of the key reasons supply chains can fail, from external factors beyond a manufacturer's control to internal mistakes*

**Offshoring**

Offshoring has become increasingly popular but supply chain management can be challenging due to time zones, language barriers and cultural differences. Also, monitoring offshore activities requires skills and expertise that may not be readily available. Offshoring requires robust monitoring systems and regular communication to ensure successful supply chain management.

**Complexity**

Globalization and interconnectivity have led to increased complexity, with multiple suppliers, subcontractors and intermediaries involved. This complexity can create a lack of clarity and communication, leading to issues like delays and quality problems, ultimately causing complete breakdowns. To mitigate these challenges, effective supply chain management and coordination are necessary. Regular communication, sharing of information and collaboration are vital in ensuring all stakeholders understand their roles and responsibilities, setting clear expectations, quality control measures and effective monitoring systems. By promoting transparency and strong relationships, businesses can reduce complexity and foster more efficient and effective supply chains.

**Cost pressures**

Companies constantly face cost pressures that drive them to cut costs, but this may lead to compromised quality, damaging reputation and customer loyalty. Cutting corners in production, outsourcing to low-cost countries or using cheaper materials may result in substandard quality products that lead to customer complaints, recalls and increased cost of doing business. Lean production and efficient supply chain management can help identify and eliminate waste, inefficiencies and reduce inventory costs to achieve cost savings while maintaining quality standards. To ensure quality standards, companies can work closely with suppliers, choosing those with a good track record for quality, setting clear quality control parameters and providing adequate training. A balance between cost pressures and quality standards is necessary to protect customers' brand reputation and maximize profits in the long run.

**Geographic clustering**

Geographic clustering of companies within a specific area can be beneficial but also poses risks, such as vulnerability to localized disasters/conflicts. Natural disasters/regional conflicts can disrupt infrastructure, transportation and power supply, causing significant delays in production and delivery. Moreover, multiple companies in a supply chain within an affected

area could experience a domino effect leading to industry-wide disruptions. To mitigate this challenge, companies can implement proactive risk assessment and contingency planning, build supply chain redundancy by sourcing from multiple suppliers and strengthen ecosystem relationships with other manufacturers. Effective implementation of these measures can secure manufacturing processes, minimize disruptions and achieve higher levels of resiliency.

### Just-in-time production (JIT)

Just-in-time production is a popular manufacturing strategy that reduces inventory costs and waste by producing goods only when needed. JIT systems allow quick adjustments to production schedules in response to fluctuations in demand, aiding companies to recover faster from supply chain failures. By prioritizing available materials, JIT reduces waste and minimizes the need for inventory holding. However, to succeed with JIT, companies must establish strong relationships with suppliers to ensure materials are always available when needed and minimize the risk of supply chain disruptions. Strategic planning, good communication, cooperation and investment in robust infrastructure are key to success with JIT production methods.

### Dependence on multiple suppliers

Dependence on multiple suppliers is a strategy that seeks to reduce supply chain vulnerability by sourcing raw materials or components from different suppliers. However, it has its own set of challenges, such as an increase in the complexity of the supply chain, difficulty in maintaining consistency in quality and cost, and the creation of additional vulnerabilities. To mitigate these challenges, establishing clear criteria for selecting suppliers, agreeing on quality standards, monitoring supplier performance and maintaining strong relationships and effective communication with suppliers are suggested. A balanced approach is critical in reducing overall vulnerability while managing multiple suppliers.

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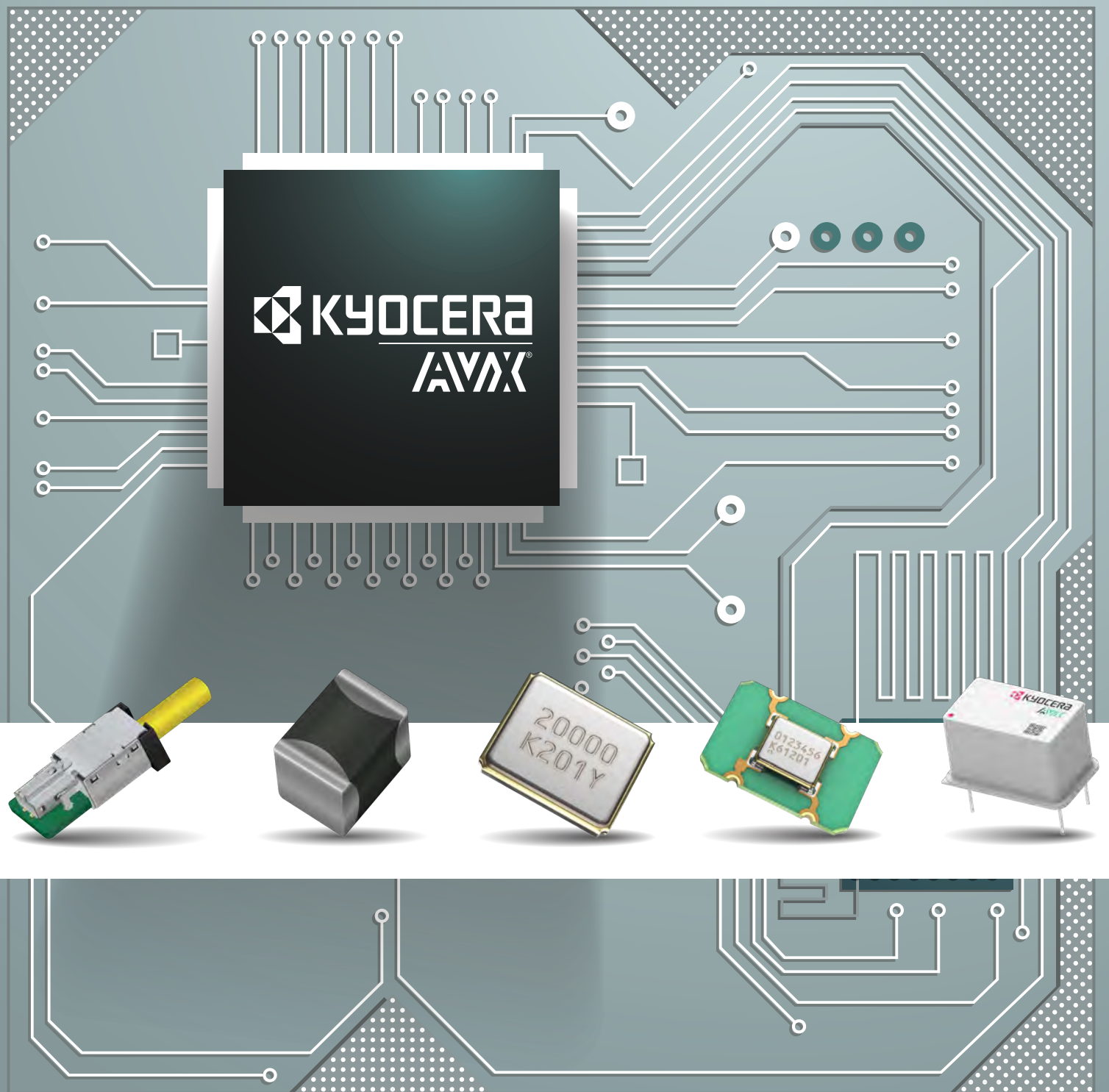
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# EV charging vs. chip supply

*A2 Global's CEO, Frank Cavallaro, explores how the global race for electric vehicle charging infrastructure stacks up against chip supply*

Most automotive semiconductors today rely on mature nodes—greater than 28nm. Some current charging infrastructure technology also requires mature nodes, creating a semiconductor supply and demand challenge across sectors.

Currently, supply can satisfy known demand. However, as charging infrastructure ramps up, it will prompt unforecasted demand for chips and could push this balance into a shortage environment. Although chips required for EVs may become more plentiful as consumer demand continues to soften, they will soon be consumed by future charging infrastructure.

In the face of market uncertainty, EV OEMs can prepare for unexpected supply chain disruptions, off-target projections and shortages for certain components by strengthening sourcing strategies.

On a global scale, EV sales have slowed because people can't reliably charge them. Lack of charging infrastructure and capabilities have hindered widespread adoption. According to an ongoing study by JD Power, inoperable and poorly maintained public charging stations increasingly frustrate drivers. Rising energy prices, high production costs and uncertain battery supply have also contributed to the recent decline in EV demand.

On the component production side, a number of factors are limiting manufacturers' ability to increase capacity. The first is profit potential. New fabrication plant investment is focused on growing more profitable markets like AI and hyper-scaler/cloud applications that require components smaller than 11nm. Companies are less willing to invest in the larger automotive sizes.

Secondly, design cycles for automobiles can be in excess of 60 months. In some cases, that is much longer than the life cycle of the chips going into the EVs, potentially causing a built-in EOL supply constraint.

We don't know when demand might pick back up and when charging infrastructure may consume chips required by EVs. EV OEMs must prepare for uncertainty to mitigate risks when sourcing required components.

Here are three strategies that EV OEMs can employ to insulate themselves:

**Build a supplier network:** Supply chains are more interconnected than ever before. When shortages hit, having a strong network of resilient suppliers gives EV manufacturers options. The network should include global and local suppliers to minimize the risk of disruption if an unexpected event occurs where most components are produced.

**Be proactive:** When supply chain disruptions happen, waiting to see how it affects your business can lead to significant losses. Opt for a proactive approach that identifies disruptions and adapts strategies immediately.

**Leverage advanced analytics:** Reliable, up-to-date sources for market forecast information help mitigate risk. Consulting with multiple players in the industry—partners, suppliers, customers and even competitors—helps OEMs develop a holistic, informed approach.

Staying ahead of the curve and developing sound sourcing strategies will help EV OEMs withstand supply and demand fluctuations until inventory can rebalance long-term.

**www.a2globalelectronics.com**

**A2 Global's** CEO, **Frank Cavallaro**
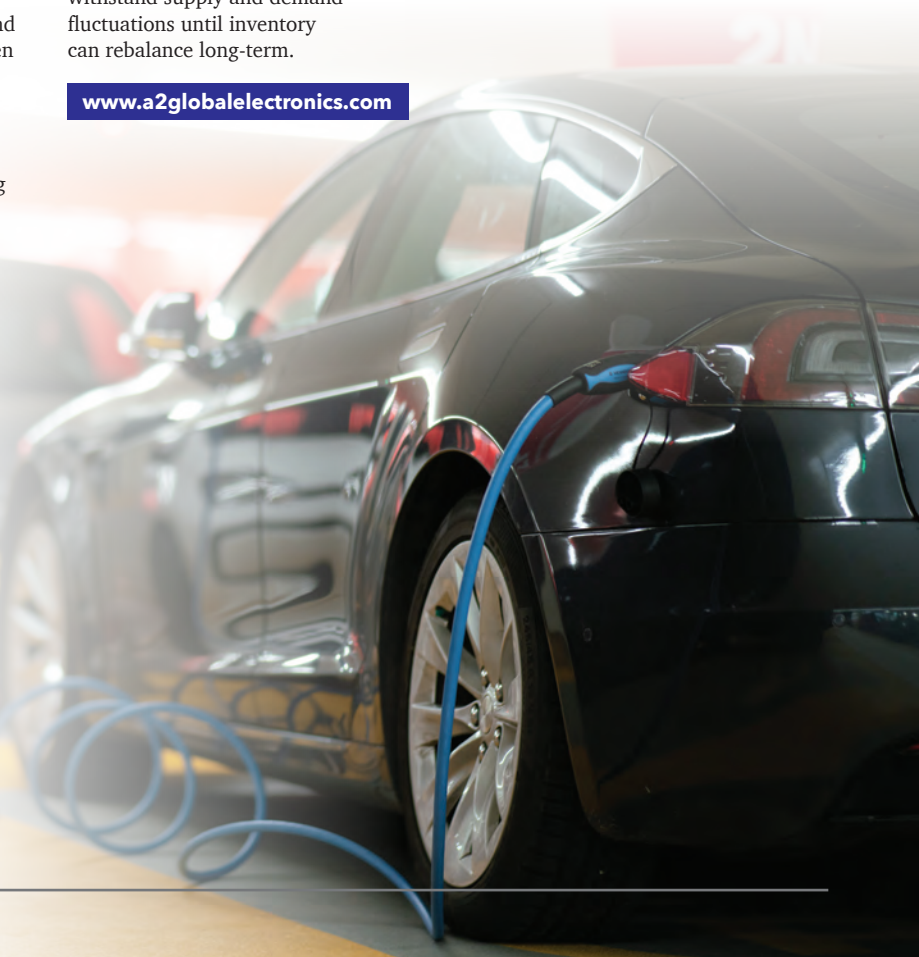
**Power** by John Denslinger

# Power grid **abyss**

*In this article, John Denslinger explores the scale of investment required to match the US' electrification goals and deadlines with the power transmission infrastructure itself*

**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

Achieving a clean energy economy won't be possible without major upgrades to the US power transmission infrastructure. That is the assessment of America's investor-owned electric utilities and the Department of Energy. Most of the electrical grid was built in the 1960s and 1970s and it's estimated that 70 per cent of the grid is at least 25-years old. The average large power transformer is more than 40-years old nearing its 50-year useful life. It's an old grid. It's a high maintenance grid. It's simply outdated for tomorrow's green energy demand.

The Federal government is driving an ambitious timeline of eliminating or offsetting carbon emissions in the power generation sector by 2035 and from the total economy by 2050. The electrification of America is well underway and the need for more power generation is bound to surge year-over-year. But can the grid keep up with increasing demand plus climate change and the apparent rash of severe weather patterns (wildfires, heat waves, snowstorms, floods, hurricanes)? Can the grid manage sophisticated cyber threats? Can the grid tolerate the complexities of state and federal regulators as many projects are slow-walked for years? Are consumers willing to tolerate power outages that have already plagued several states? Are they also willing to pay higher energy prices?

Building out the new grid is a sizeable undertaking considering there are more than 3,100 utilities in the US serving a patchwork of small geographic areas according to the Department of Energy. Criss-crossing transmission lines involve multiple municipalities, states and federal agencies. As one would expect, discussions are often politically motivated sacrificing both efficiency and optimization. Acquiring rights-of-way with landowners is another issue, as well as overcoming objections from environmental coalitions on many new installations. As troublesome as these issues seem, it's the sheer size of capital investment that staggers the mind. A 2020 study published by Princeton University estimates it will take a massive $2.4T (before inflation) to build-out a viable grid by 2050. For perspective, today's electric utilities collectively spend $25-30B a year on transmission infrastructure.

Marsh & McLennan Consultants identified 140,000 miles of US transmission lines that must be replaced by 2050. But that's only half the story. The location of existing transmission lines is also problematic. Our grid was built on fossil fuel, not green energy sources like solar and wind. Power plants are located near cities with oil, coal and natural gas delivered by railroads or pipelines thus shortening the transmission distance to users. Solar and wind can only generate electricity where environmental conditions yield maximum output. Its use point may be quite distant from the generating source necessitating miles and miles of new transmission lines.

Electrification of America is a national priority now, but there's no national strategy for the grid (the backbone of electrification). By the federal government's own admission, no one is in-charge of the grid. There is no comprehensive plan, no short term/long term schedule, no coordination of national interests, and no one clearly owning decisions at the Federal level. That's the abyss. With a mere $2.5B allocated to grid modernization so far, America is miles from the transformation it needs.

# Chipmakers turn attention to net-zero manufacturing goal

*Electronics companies are exploring ways to reduce the impact of semiconductor manufacturing processes on the environment as climate change becomes a major part of economic growth discussions*

Net-zero is not just a fancy phrase for many folks in the electronics industry. It has become a rallying call for action on how the industry relates to the environment. From design engineers to systems developers, supply chain managers and procurement specialists, figuring out how to leave a minimal imprint on the environment is now a prime objective throughout the industry. That is because the subject of climate change has made a grand and highly forceful entrance into the semiconductor industry. Advocacy efforts by some executives going back a couple of decades have in the past yielded minimal results but the intensity of recent actions has raised the stakes for the industry with the need to pay attention to environmental changes becoming a subject of accountability across the manufacturing economy.

"We need to reduce our carbon footprint," said Paul de Bot, general manager, EMEA, at Taiwan Semiconductor Manufacturing Co. Ltd. (TSMC), while speaking at the annual Semicon Europa conference held in Munich in November. "We are using renewable electricity as much as possible, and we are reducing our water consumption by recycling water. We are working towards

Net Zero and we will improve our environmental impact."

It is an objective shared by many across the technology world today. The semiconductor industry, through trade associations such as Semiconductor Equipment and Materials International (SEMI), is rolling out programs and campaigns that are aimed at raising awareness about the impact of chip production on the environment. The industry wants to develop solutions to reduce the negative effects of its manufacturing activities on the environment. Industry executives said they are eager to partner with players in other economic sectors to lower carbon emissions and start the process of reversing global warming. "These global challenges are so big that they cannot be resolved by any single CEO," said Ajit Manocha, president, and CEO of SEMI, in a presentation at the Semicon Europa exhibition. "The world is behind on reaching Net Zero, so it is important that we forge a sustainable path together."

Last September, SEMI's Semiconductor Climate Consortium (SCC) issued its first report on the chip industry's greenhouse gas emissions profile, which it described as "an in-depth analysis of the

semiconductor value chain's carbon footprint and priority-ranked carbon emission sources for the industry to address." Coordinated by the Boston Consulting Group, the report aimed to highlight areas where the industry could be effective and develop a set of actions that could be transmitted to members of the trade body for immediate implementation, according to SEMI's chief sustainability officer, Mosumi Bhat.

The objective of the trade association is to ensure efforts can be coordinated and synchronized for the greatest impact, Bhat noted, in a statement. "While the SCC's work on behalf of the industry is just getting started, its sustainability report clearly outlines where chip industry efforts initially should be focused and how we can make the greatest impact for SEMI members and the semiconductor value chain at large," Bhat noted. The sentiment has been echoed on various occasions by other industry executives, including Marijn Vervoorn, director of sustainability strategy at chip manufacturing equipment supplier ASML Holding N.V.

"For our industry to effectively accelerate climate action, it is crucial that we have a shared

view on our industry's baseline carbon footprint, expected trajectory of future emissions, and available improvement levers," said Vervoorn. "This report, including its clear view on data gaps and required data quality improvements, provides the foundation for an ambitious industry roadmap showing the tangible action required to achieve both short-term objectives and Net Zero emissions in 2050."

### Sustainability and $1 Trillion Goal

With semiconductors being designed into more equipment used by enterprises across all segments of the economy, revenues in the industry are set to soar over the next decade. Industry executives are convinced global semiconductor sales will reach $1 trillion by the end of the decade. To help drive the market towards this goal and ensure supply availability, semiconductor vendors are spending tens of billions of dollars on new fabs in Asia, North America, and Europe. Figures from SEMI indicate about 94 new fabs will be brought online between 2022 and 2026. The association believes up to 90 additional new fabrication facilities could be added between 2026 and 2030 as vendors race to meet demand surging from the

economy's ongoing "digital transformation and disruptions across markets that are driving electronics industry growth towards $1 trillion sales," according to SEMI's Manocha.

That is the good news. The negative news is that concerns have also surged across the industry about the impact of the production facilities on the environment. Some observers say semiconductor manufacturing has a dangerously high carbon footprint that will only increase as demand for the products increase and as innovations drive the industry's introduction of finer process nodes. "We will need a lot of electricity for these new fabs, which means we have to find a way to resolve the paradox of surging growth and climate change," said TSMC's de Bot. The challenge is only going to intensify in coming years, according to Luc Van den hove, president, and CEO at IMEC, the nanoelectronics and digital technology research firm that has been in the vanguard of semiconductor innovations in Europe. Van den hove told participants

at the Semicon Europa conference that "carbon dioxide emissions from semiconductor manufacturing could "double in 10 years," adding "the industry is approaching a pivotal moment."

SEMI's Manocha added that as the industry's revenue doubles within the next decade, so will its emissions, which implies the need to exert greater efforts towards curbing the use of environmentally sensitive chemicals, gases, and other materials. He noted that SEMI is working on finding solutions in collaboration with governments across the world to resolve the challenges facing the industry, including the knotty problem of global warming.

At IMEC, executives are working hard to help chipmakers reduce their carbon emissions and footprints. The company in November rolled out a free version of its virtual fab aimed at helping semiconductor manufacturers accelerate their move towards Net zero. The tools help chip manufacturers to gain critical insights into their operations and "offers a quantified view of the



**Luc Van den hove**, CEO, **IMEC**

environmental impact of IC manufacturing, providing valuable insights for academics, policy makers and designers," the company said. IMEC is aiming for an even broader audience, though, according to company executives who noted that the information generated by the virtual fab tools would help the industry map electrical energy and water consumption. "Our aim is to offer transparent and high-quality data on the environmental impact of IC manufacturing, beyond the semiconductor supply chain and our SSTS program," said Cédric Rolin, program manager at IMEC. "Surpassing current available literature, our tool provides value to product designers, environmental researchers, and policymakers seeking industry impact data."

Analysts warned that not everyone is onboard with the Net zero objectives, though. They observed that some companies are holding back because of the prohibitive costs needed to meet the industry's environmental objectives.

But they will be compelled eventually to get onboard, noted analysts at consulting firm McKinsey. "While some semiconductor companies have created ambitious targets for reducing their emissions and remaining on a 1.5°C pathway, many others have been less ambitious," the McKinsey analysts said, in a report. "The pressure to act may soon increase, however, since businesses across industries are now scrutinizing emissions along their entire supply chain — and in many cases, semiconductor companies will account for a substantial amount of them."

> "The world is behind on reaching Net Zero, so it is important that we forge a sustainable path together."



**Ajit Manocha**, CEO and President **SEMI**

**Authorized distributor**

MOUSER ELECTRONICS

# The **Future** of Automotive Technology

by **Matt Mielke,** applications engineer, **DigiKey**

Technology is changing so much in our daily lives – including how we get around. The electrification of vehicles, autonomous vehicles and connected systems within cities are no longer far-off dreams, these technologies and a more connected automotive eco-system are more of a reality than ever before.

So how do we ensure we're ready and what technology is on the horizon? That's what our team at DigiKey, along with our suppliers, are working to understand.

### Vehicles of the Future
There are many ways technology has improved how we get around, the efficiency in which we do so and the safety of our cars. I'm excited about these advancements and how they're changing and improving transportation for all of us.

**• Eliminating the need for a human driver** – To maintain a competitive edge, many companies are looking toward driverless vehicles to cut costs and increase efficiency. With autonomous capabilities, we will see material transport and rideshare services operating with nobody in the driver's seat.

**• Battery optimization** – Similar to how AI learns your phone use, patterns and behaviors and charges your phone accordingly to best utilize your battery and increase its longevity, I expect this to be possible with car batteries in the future. Batteries are expensive and an important factor that dictates the lifespan of a car, and these advancements will help keep EVs on the road for longer.

**• Predictive maintenance** – This is the ability to estimate, or predict, when maintenance should be performed on a vehicle. There are already sensors within cars and trucks, and I expect that we'll continue to see more and more of this, monitoring the different parts of a vehicle – like the engine, brakes and any other moving component. If problems can be detected early and repairs can be made, this avoids costlier, and often time-consuming, catastrophic failures down the line.

**• In-cabin assistance** – Technologies utilized on the outside of vehicles for environment perception, such as machine vision and mmWave radar sensors, may also be used inside the cabin to monitor the driver's heart rate, breath rate, head movements, eye movements, etc. to determine whether they are tired or unable to operate a vehicle safely.

**• IoT and cars** – When you bring your car to a mechanic, they will be able to connect to it via their phone, getting a full rundown of what's going on before ever opening the hood of the car. They can start diagnosing problems faster and more efficiently.

### How DigiKey is Supporting Automotive Technology
At DigiKey, we understand the importance of having the right products available to enable technology and innovation. We have a huge selection of automotive products, along with application details, articles and technical resources, that keep the smartest minds in the industry moving us forward.

With seemingly endless opportunities ahead, it's an exciting time to be in this space and help create a connected ecosystem and be a part of the future of the automotive industry.

For more information about procuring automotive products from DigiKey, visit **www.digikey.com.**

# Insight, inspiration and motivation

*The 2024 ERA Conference offers opportunities to learn from an all-star lineup of speakers and breakout sessions, while also connecting with fellow conference goers*

The annual ERA Conference—an educational and networking event for electronics components manufacturers' representatives, distributors and manufacturers—takes place at the AT&T Hotel & Conference Center in Austin, Texas, on Feb 25 to 27, 2024. The event brings together all segments of the industry in a collaborative and energetic environment, offering attendees a unique opportunity to learn, connect and grow.

The Conference theme for 2024 is 'All Systems Go—Energizing Our Customers' Experience'. The keynote, general and breakout sessions will focus and reflect on the industry's enthusiasm, drive and commitment to serving its customers. The general schedule for the event is:

- Sunday, Feb 25: Attendee registration; badge pick-up; welcome cocktail reception

- Monday, Feb 26: Breakfast workshops; keynote speaker session; two general sessions; various breakout sessions; and the Conference networking party off-site in the evening

- Tuesday, Feb 27: Breakfast workshops; two general sessions; various breakout sessions; and close of Conference at 5:30 pm

The educational sessions are planned by an enthusiastic, esteemed and experienced group of volunteers from around the industry. Here is what they have planned for the 2024 Conference:

- Keynote speaker Stacey Hanke, Hall of Fame speaker and author, will present: *Build Trust and Connection to Create Influence Monday To Monday*

- General session speaker Andrew Busch, political economist and author, will present: *Future Economy: Growth Opportunities*
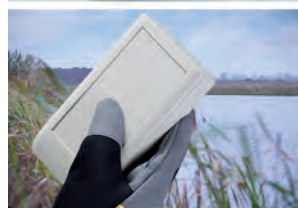
- General session speaker Cam Marston, speaker, author and workplace expert, will present: *Selling Across Generations*

- General session speaker Crystal Washington, technology futurist, will present; *Revolutionary Technology Trends*

- A fourth general session speaker who is, at press, still to be determined, will speak about customer service and sales.

The Conference planning committee aims to select keynote and general session speakers who will provide timely insight, inspiration and motivation.

Breakout sessions will cover timely and pertinent topics such as: the sales rep of the future; negotiating better sales rep contracts; bringing talent into the electronics industry; cybersecurity; AI; secure data sharing and collaboration; the evolution of field sales; personal branding; time management techniques; cutting-edge design tools; bringing value to engineers; digital marketing; and succession planning.

Breakout sessions are a fan favorite of the Conference due to timely topics presented and energetic participation.

The Conference has an estimated 130 sponsor companies and will host approximately 650 attendees. Several ERA Recognized Resource exhibitors will also be located in the exhibit hall to demonstrate how they can improve efficiency and bottom line for reps, manufacturers and distributors.

Walter Tobin, ERA CEO, will present an annual ERA update and lead an awards ceremony that honors industry members. This year's Lifetime Achievement Award will be presented to Dick Neumann, a 47-year industry veteran and former vice president at Grayhill.

**www.era.org/era-conference**
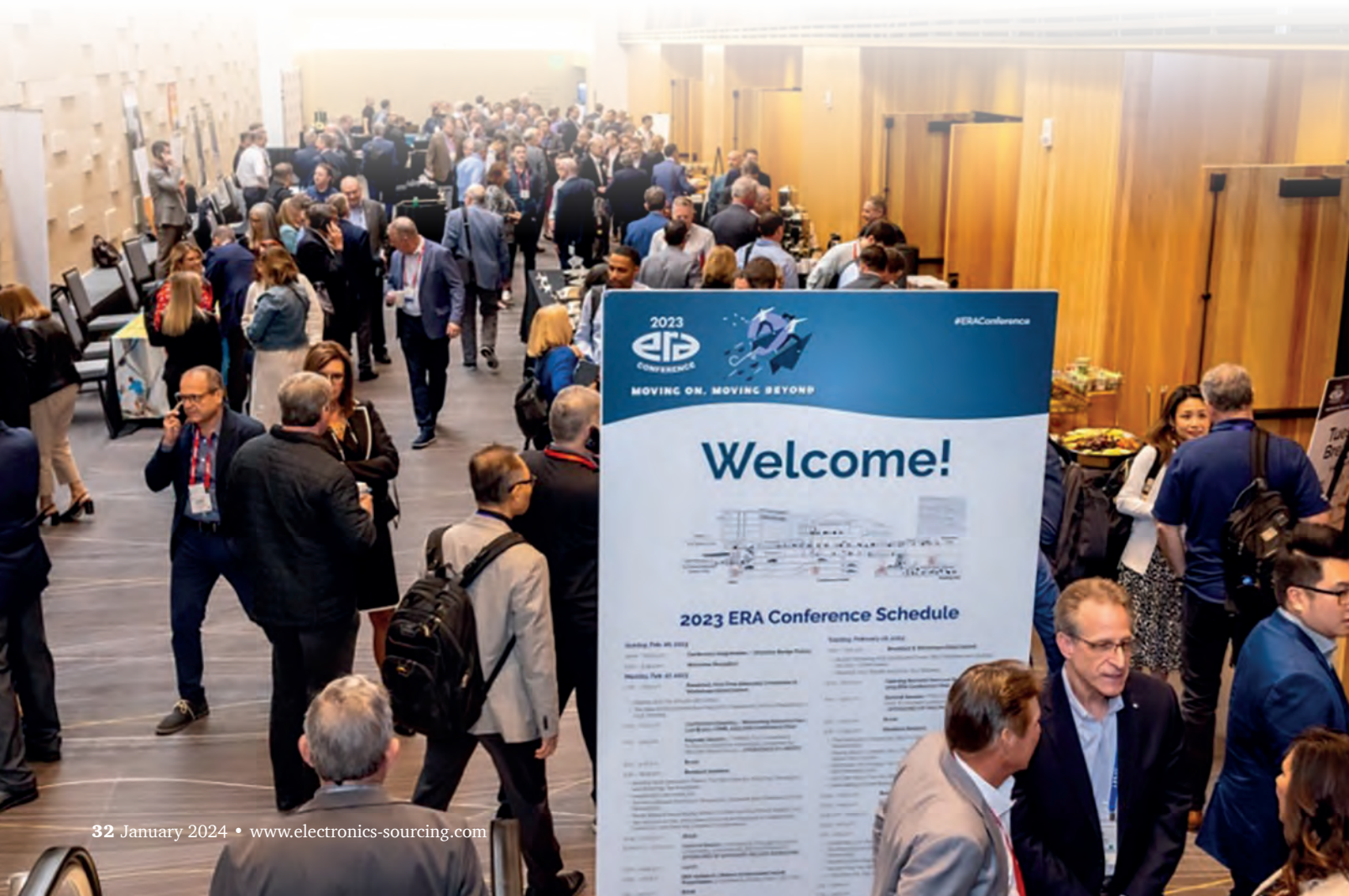
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## Global Component Distribution

# Chip1 Exchange:
# An Industry Leader in Global Electronic Components

*Chip 1 Exchange, an industry leader in the global electronic components distribution market, stands out as a hybrid Franchise/Full-Service Distributor. This unique hybrid model allows Chip 1 Exchange to offer a broad range of products and services, distinguishing it from traditional distributors.*

Established in 2001 through the merger of Fast Line Exchange and Chip 1 Technology by industry veterans Sasan Tabib, Damon Eisenhauer, and Volkan Sanverdi, Chip 1 Exchange has carved out a significant niche in the distribution of electronic components and peripherals. The company's product portfolio includes a diverse array of items such as power transistors, diodes, automotive connectors, cables, transformers, actuators, and power inductors, catering to a wide range of sectors including medical, automotive, industrial, mobile computing, and aerospace.

With its headquarters in Neu-Isenburg, Germany, the company has established a strong presence in the European market. Expanding across the Atlantic, Chip 1 Exchange has offices in Texas and California, positioning it strategically within the United States' technology hubs. Its Canadian office in Markham, Ontario, extends its reach into North America. Moving to Asia, China and the Hong Kong locations are pivotal in tapping into the fast-growing Asian markets, with

support from the teams in the Philippines, India, Indonesia, Thailand, and Vietnam. This global network facilitates efficient distribution and supply chain management. It underscores Chip 1 Exchange's role as a vital link in the global electronics industry, catering to automotive, aerospace, and mobile computing sectors with agility and expertise.

The impact of Chip 1 Exchange on the electronics supply chain is significant. The company plays a crucial role in supporting various industries' technological advancements and innovations by providing a wide array of components and peripherals; this is particularly critical in sectors like aerospace and automotive, where the reliability and quality of electronic components are paramount.

Furthermore, the company's business model and strategic partnerships have positioned it as a key player in addressing the challenges of supply chain disruptions and component shortages, which have become increasingly prevalent in recent years. Their ability to source and supply a vast range of components has made them a valuable partner

for businesses looking to mitigate the risks associated with supply chain volatility.

Chip 1 Exchange represents a dynamic and adaptable electronic component distribution industry player. Their hybrid distribution model, extensive product range, and strategic positioning enable them to effectively meet the evolving demands of diverse industries, making them a critical link in the global supply chain of electronic components. With a customer-centric approach, Chip 1 Exchange prides itself on its ability to provide tailored solutions and exceptional customer service, ensuring that we meet client needs with precision and efficiency. With a robust global presence and comprehensive product line, this commitment to customer satisfaction cements Chip 1 Exchange's reputation as a trusted and reliable partner in the ever-changing world of electronic component distribution. Their innovative approach to distribution and commitment to quality and reliability are integral to the success of their clients across various sectors.

**www.chip1.com**

**Damon Eisenhauer**
Chief Operating Officer

**Sasan Tabib**
Chief Executive Officer

**Volkan Sanverdi**
Chief Financial Officer

# 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CABLE & WIRING** | | | | | | | | | | | |
| 3M | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 23,235 | 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% | 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 | | +1 201 432 0463 | belfuse.com/circuit-protection | N/A | 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% | 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 |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.com | Y | N/A | N/A | $0 | N/A | 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 LED | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 12,390 | N/A | $0 | 99% | 50 | 1,000+ | Y |
| Dialight | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 6,179 | N/A | $0 | 84% | 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 |
| Hantronics | 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% | 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 |
| Luminus | 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 |
| ams OSRAM | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 1,690 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| Tianma | 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% | 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 |
| Keystone Electronics | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 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 |
| Nidec | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| NKK Switches | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 13,976 | N/A | $0 | 86% | 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 |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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% | 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 |
| New Age Enclosures | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| OKW Gehäusesysteme GmbH | OKW Enclosures, Inc. | (800) 965-9872 | www.okwenclosures.com | | 2,450 | N/A | $0 | N/A | 10 | 20 | Y |
| 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** | | | | | | | | | | | |
| Abracon Corporation | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 1,780 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| CTS Electronic Components | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 3,889 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| ECS Inc | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 2,070 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| Epson Toyocom | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 178 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| IQD Frequency Products | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| SiTime | 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 |
| 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 Chip | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 94 | N/A | $0 | 100% | 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 |
| Lattice | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 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 |
| 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 |
| 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 |
| onsemi | 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 |
| Silicon Laboratories Inc | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 1,141 | N/A | $0 | 100% | 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% | 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 |
| Wolfspeed | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 53,781 | N/A | $0 | 77% | 50 | 1,000+ | Y |
| **INTERCONNECTION** | | | | | | | | | | | |
| Bel | | +1 858 676 9650 | belfuse.com/magnetic-solutions | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| 3M | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 23,235 | N/A | $0 | 46M | 50 | 1,000+ | Y |
| Aero Conesys | ECCO | 773-767-2200 | www.eccoconnectors.com | Y | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Amphenol | ECCO | 773-767-2200 | www.eccoconnectors.com | Y | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Amphenol | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 165,853 | N/A | $0 | 31% | 50 | 1,000+ | Y |
| Anderson Power Products | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Aptive (Delphi) | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Bel Magnetic Solutions | | +1 858 676 9650 | belfuse.com/magnetic-solutions | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

# 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | +1 507 833 8822 | belfuse.com/cinch | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Eaton | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 10,744 | N/A | $0 | 27% | 50 | 1,000+ | Y |
| ERNI Electronics | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| 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% | 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 |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.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% | 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 |
| Samtec | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 123,613 | N/A | $0 | 69% | 50 | 1,000+ | Y |
| Stewart Connector | | + 1 717 235 7512 | belfuse.com/stewart-connector | N/A | 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 LED | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 582 | N/A | $0 | 99% | 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 |
| ams OSRAM | 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 |
| Bourns | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 38 | N/A | $0 | 78% | 50 | 1,000+ | Y |
| Cornell Dubilier | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 24,145 | N/A | $0 | 71% | 50 | 1,000+ | Y |
| Coilcraft | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| EPCOS | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 26,533 | N/A | $0 | 98% | 50 | 1,000+ | Y |
| Fair-Rite | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| KEMET | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 77,568 | N/A | $0 | 66% | 50 | 1,000+ | Y |
| KOA Speer | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 34,078 | N/A | $0 | 58% | 50 | 1,000+ | Y |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| Murata | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 33,780 | N/A | $0 | 99% | 50 | 1,000+ | Y |
| Nichicon | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 20,389 | N/A | $0 | 84% | 50 | 1,000+ | Y |
| Ohmite | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 14,293 | N/A | $0 | 55% | 50 | 1,000+ | Y |
| Panasonic Electronic Components | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 14,948 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| Signal Transformer | | +1 516 239 5777 | belfuse.com/signal | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Taiyo Yuden | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 4,620 | N/A | $0 | 98% | 50 | 1,000+ | Y |
| TE Connectivity | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 6,663 | N/A | $0 | 100% | 50 | 1,000+ | Y |
| TDK | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 6,663 | N/A | $0 | 100% | 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% | 50 | 1,000+ | Y |
| Wurth | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 934 | N/A | $0 | 99% | 50 | 1,000+ | Y |
| Yageo Corporation | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 18,246 | N/A | $0 | 100% | 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 |
| B&K Precision | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Bel Power Solutions | | +1 866 513 2839 | belfuse.com/power-solutions | N/A | N/A | N/A | N/A | N/A | N/A | N/A | N/A |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 |
| Murata | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Phihong | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Phoenix Contact | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| RECOM | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Schaffner | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| SL Power | 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% | 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 |
| XP Power | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| **SENSORS** | | | | | | | | | | | |
| ams OSRAM | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Amphenol | 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 | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 12,059 | N/A | $0 | 64% | 50 | 1,000+ | Y |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.com | Y | N/A | N/A | $0 | N/A | 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 |
| 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 |
| onsemi | 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% | 50 | 1,000+ | Y |
| Renesas | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 4,915 | N/A | $0 | 59% | 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% | 50 | 1,000+ | Y |
| Vishay | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 914 | N/A | $0 | 65% | 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% | 50 | 1,000+ | Y |
| Keysight | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Lascar Electronics | | 814-835-0621 | www.lascarelectronics.com | Y | 130 | $602,000 | $0 | 100% | 10 | 175 | Y |
| Tektronix | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50 | 1,000+ | Y |
| Teledyne LeCroy | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 194 | N/A | $0 | 96% | 50 | 1,000+ | Y |
| **THERMAL MANAGEMENT** | | | | | | | | | | | |
| Materials Direct | Materials Direct | 01908 222 211 | www.materials-direct.com | N/A | N/A | £1,000,000 | £0 | N/A | 5 | 55 | Y |
| ebm-papst | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 194 | N/A | $0 | 96% | 50 | 1,000+ | Y |
| Sanyo Denki | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 194 | N/A | $0 | 96% | 50 | 1,000+ | Y |
| CUI Devices | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | 194 | N/A | $0 | 96% | 50 | 1,000+ | Y |
| Universal Science | Universal Science | 01908 222 211 | www.universal-science.com | N/A | N/A | £1,000,000 | £0 | N/A | 5 | 55 | Y |
| **WIRELESS SOLUTIONS** | | | | | | | | | | | |
| KYOCERA AVX | Mouser Electronics | 800-346-6873 | www.mouser.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |
| KYOCERA AVX | Digi-Key | 800-344-4539 | www.digikey.com | Y | N/A | N/A | $0 | N/A | 50+ | 1,000+ | Y |

# Contract Manufacturers Buyers' Guide

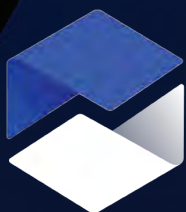| Manufacturer | Telephone | Website | Turnover | Location | Employees | Number of Surface Mount Lines | Approvals | BGA Capacity | Lead Free Manufacturer | Prototyping | Design Capability | Full Turnkey | Cables and Harnessing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alan Anderson Manufacturing Ltd | +44 (0) 333 322 7222 | www.aa-manufacturing.co.uk | £21m | Hertfordshire UK | 40 | 2 | ISO9001:2015 , IPC-A-610 | Y | Y | Y | Y | Y | Y |
| 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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