

ELECTRONICS

JANUARY 2022

sourcing

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NORTH AMERICA

**SHAZAM! STRONG
PARTNERSHIPS ARE
THE SECRET TO SUPPLY
CHAIN SUCCESS**

PAGE: 26

**Connect
to real-time
data with
Digi-Key APIs**



**LOOK
INSIDE ▶**

API SOLUTIONS

- Ordering
- Quoting
- Product Information
- Supply Chain
- Barcode Information



Download the free ebook
at www.digikey.com/API



On the cover – January 2022

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Editor's Word



2022's magnet for care

I feel sorry for the humble bill-of-materials. What is it other than a table full of semi-unintelligible information? Nothing could be further from the truth; a manufacturing company's portfolio of bills-of-materials actually represents its beating heart. Just like a human heart, the health and welfare of every BoM needs to be front and center.

It's easy to see why a BoM can get lost in the system. The problem is deciding who owns it: design, purchasing, manufacturing, accounts, QA? The answer is every BoM should be under joint ownership, all of the time.

If love, care and attention is lavished on a BoM throughout its life it can be allowed to evolve in a way that advances the role of every department. Naturally, there needs to be limits. I'm not encouraging mission creep or unnecessary change requests. In an ideal situation, regular care and attention hopefully results in no changes through a BoM's life provided it was well engineered in the first place.

However, if the past 2-years teaches us anything it's that the electronics industry is never in an ideal situation, it just swings from slightly to very unideal. Whether change comes in the form of the steady evolution of technology, moving customer expectations or the hammer blow of a global pandemic, every BoM is under pressure, all the time.

Make your BoMs your magnets of care for 2022. If you haven't already done so, build software applications that allow you to care for your BoMs without overburdening your existing processes. It's an upfront effort that fuels long term benefits for all.

Jon Barrett

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HDMI connectors target audio/video output

CUI Devices' Interconnect Group has added HDMI connectors to its product portfolio. Available in Type A and mini receptacle or plug versions, all products conform to the latest HDMI 2.1 standard. Ideal for audio or video output applications, models are available in surface mount, mid mount SMT, or through hole mounting styles with horizontal, vertical, or vertical/right-angle orientations.

Connectors feature voltage ratings of 40V DC, current ratings of 0.5A, and a rating of 10,000 mating cycles. Further specifications include a finish thickness of 4.5mm, operating temperature ranges from -25 up to 85°C, and UL94V-0 flammability ratings. Wave or reflow solder compatibility is also offered depending on the model.

CUI Devices' HDMI connectors are available immediately with prices starting at \$0.45 per unit at 500 pieces through distribution.

www.cuidevices.com



DC-DC converters available from stock

Sager Electronics is now stocking Recom Power's RPA300E DC-DC converter, said to be ideal for a variety of applications including demanding industrial power supplies, telecom, and PoE circuits.

The RPA300E is a low cost 300W DC-DC converter in industry standard 1/8th brick low profile format and pinning. The input range is 36 to 72V DC, while the output voltage is trimmable from 16 to 35V DC. Efficiency is described as exceptionally high, typically 94.8 per cent, facilitating full load operation from -40 up to 85°C with forced air cooling. Isolation voltage is 2.25kVDC/minute.

www.sager.com



Supplier cuts lead times for automotive memory

Alliance Memory has reduced lead times for its DRAM and Micron Technology NOR Flash memory devices with automotive temperature ratings. The company now holds 70 parts in finished goods stock, with lead times of just six weeks for its most popular automotive temperature range products.

A variety of CMOS SDRAMs are available, including DDR1, DDR2, DDR3/L, LPDDR4, and LPDDR4X devices, with automotive temperature ratings of -40 to 105°C.

Micron NOR Flash memory products include two, four, eight, and 16Mb 5V parallel NOR devices from the M29F series, and 32 and 64Mb serial NOR components from the N25Q series. Parts are offered with temperature ratings of -40 to 85°C and -40 to 125°C in a variety of package options.

Potential applications for these AEC-Q100-compliant products include advanced driving assistance systems; powertrain; automotive active safety and autonomous driving; in-vehicle-networking; customized in-car PCs; telematics; and infotainment systems.

www.alliancememory.com



1887

Emile Berliner receives the patent for the gramophone.

James Blyth builds the first electricity generating wind turbine.

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

Sager opens its first location in Boston, Massachusetts.



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

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

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

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

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www.sager.com | 1.800.724.8370

In Brief

Ongoing Siliconix support

All Tech Electronics has signed a distribution partnership with ES Components. This will provide access to the entire Siliconix/Vishay hermetic through-hole inventory, including Siliconix hermetic JFETs, MosFETs and analog switches, including JAN products, as well as DLA certified, Siliconix-fabricated die/wafers. The agreement will help address obsolescence in the military, aerospace and space industries. www.alltechelectronics.com

LoRaWAN-in-a-box solutions

Digi-Key Electronics has partnered with Seeed Studio and Machinechat to launch a private LoRaWAN-in-a-box solution for internet of things applications. The ready-to-use solution facilitates rapid IoT deployment with security features for control over device data. The first solution targets smart agriculture and precision farming projects, resulting in private LoRa IoT deployments in days versus weeks. www.digikey.com

Expanded power portfolio

Newark has strengthened its Power Integrations portfolio to include the InnoSwitch3 IC family, featuring PowiGaN technology. Products are said to achieve up to 95 per cent efficiency across the full load range and up to 100W output power in enclosed adapter implementations without a heatsink. Common applications include white goods, utility meters and industrial power supplies. www.newark.com

No stress e-waste recycling

TerraCycle Regulated Waste has launched a range of services to simplify eco-friendly disposal of unwanted electronics while ensuring proper data destruction. Global VP, Kevin Flynn, explained: "Since the pandemic and the work-from-home trend, companies require dependable data sanitization, managing data on old devices and recycling them appropriately. Our robust services streamline e-waste recycling and IT asset disposition." www.tcrvusa.com



Extensive battery choice

Rutronik is now offering Adam Tech's range of battery holders, battery snappers and mobile battery connectors. The series is manufactured in a range of connection variants, such as PCB leads with through-hole, SMT leads, wire leads and solder plugs.

The holders allow the attachment of various battery series and sizes including AAA, AA, C, D, 9V and lithium button cells from 12 to 24mm. Additional flexibility is provided by mounting at various heights.

Constructed from UL-94V0 or UL-94HB material with spring steel contacts, the holders are said to be efficient under both normal and demanding environmental conditions. Customised lead lengths and wire configurations are available.

www.rutronik24.com

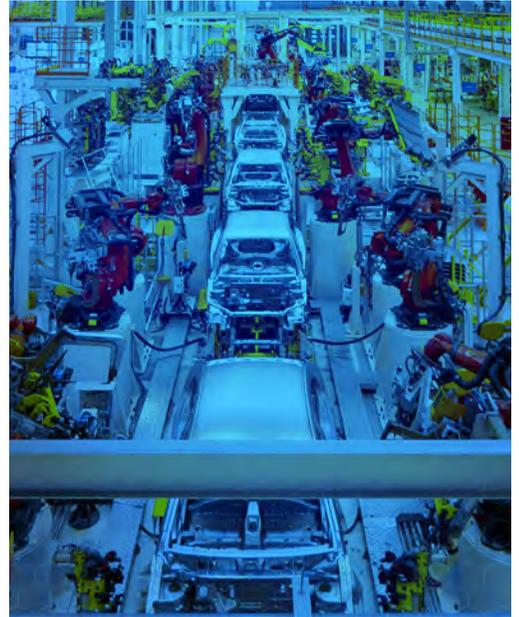
Pent-up demand will fuel growth in 2022

Supply chain disruption has resulted in unfilled pent-up demand that should help carry growth into the first half of 2022, according to the IPC's December Economic Outlook. Although it has lowered its forecast, it continues to predict that 2022 should be 'historically strong'.

There is capacity to buy among both consumers and businesses, the IPC states, but supply chain constraints have limited potential growth in spending and investment. Manufacturers report strong order growth, however this is offset by higher costs and as a result profit margins are declining.

In a further industry report covering the Sentiment of the Global Electronics Manufacturing Supply Chain, the IPC records material and labour costs as the two largest issues facing the electronics supply chain. Inventory and transportation constraints also continue as a major impediment to growth.

ipc.org



Find single pair Ethernet solutions online

Mouser Electronics has introduced a new solutions page dedicated to single pair Ethernet (SPE) technology. Developed in collaboration with Analog Devices, Würth Elektronik, and Harting, the site features valuable insights on how to deliver Ethernet connectivity to the edge.

Alongside content including a technical article, video, and webinar, the site also offers convenient product information for 10BASE-T1L SPE solutions from Analog Devices, Würth Elektronik, and Harting.

The new SPE solutions page has been developed in response to the growth of smart factories and the industrial internet of things, which has led to the need for robust connectivity on the factory floor. Ethernet is the leading architecture for large-scale industrial connectivity, with SPE technology delivering high-performance data and power transmission through a single-wire pair to field-level actuator devices and sensors.

To find out more about the technology and the solutions available from Mouser, visit the new SPE solutions page at <https://eng.info.mouser.com/adi-wurth-harting-single-pair-ethernet>.

www.mouser.com

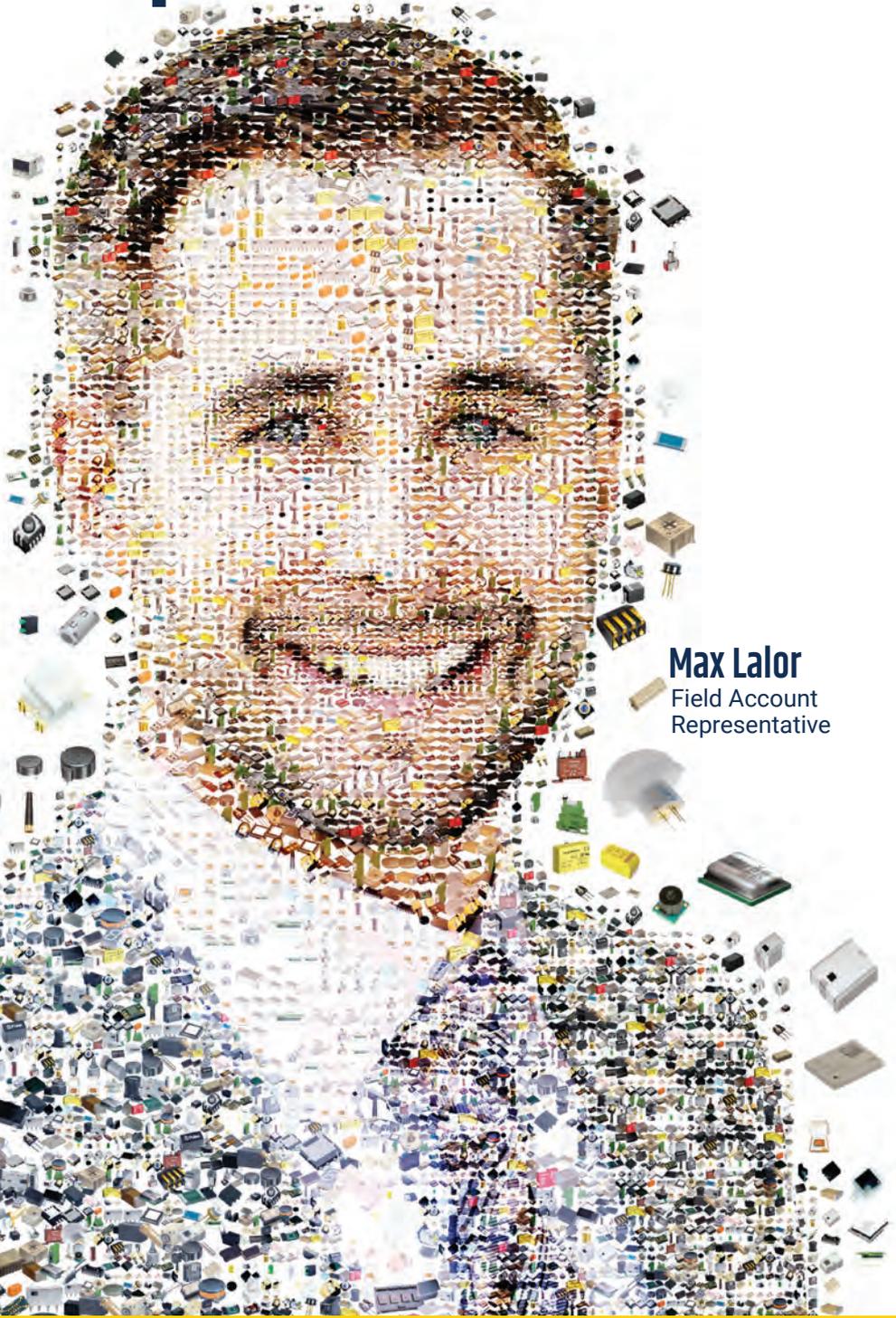
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Prepare for the future

Throughout 2021, Molex has undertaken several surveys covering 5G, health/pharma, Industry 4.0, mobile devices and vehicle electrification.

Consumers have always wanted choices. But never has consumer demand dominated how nearly every industry is driving product strategy—from design and planning to supply and production. Buyer attitudes have changed due to recent changes in the market, largely fueled by the pandemic, which has propelled technology and businesses to quickly develop new services and solutions for consumers, which better suit their individual needs.

From grocery pick-up and food delivery, to mobile experiences, virtual doctor visits, and work-from-home options, consumers have become even more accustomed to having more options to create their customized lifestyle. This desire to choose and pick ‘what works best for me’ is here to stay and technology will need to follow suit. Consumers’ desire for mass customization will propel technology innovation in 2022 and beyond.

As OEMs and suppliers race to keep up with their ever-demanding user base, this prompts a number of key movements, reactions and changes which should be understood and planned for: how is this desire for customization impacting their product development and go-to-market strategies; and what are they doing to react faster, pivot quickly and keep pace with demand?

www.molex.com



Quality confirmed

Rochester Electronics has earned a letter of conformance, confirming its quality management system complies with the requirements of IATF 16949:2016 for the design and manufacture of semiconductor components. This demonstrates Rochester’s commitment to providing customers with the highest standards of products and services within the automotive industry.

Use of semiconductor electronics in automotive applications has expanded rapidly over the last few decades and continues to be one of the fastest-growing segments. Consequently, the semiconductor supply chain has now become integral to a manufacturer’s product planning. With a range of semiconductor manufacturing capabilities, Rochester Electronics supports its customers with individual services through to full turnkey manufacturing.

Rochester Electronics’ VP manufacturing and engineering, Mike Dube, said: “We are extremely proud of our team for their work on achieving this milestone for the company. The requirements of the automotive electronics industry align well with our capabilities and this sector represents a key element of our strategy for growth.”

www.rocelec.com

Sensing current accurately

Aceinna has announced the high current $\pm 65A$ MCx1101 current sensor. Designed for wideband gap applications and available in 3.3 and 5V versions, this anisotropic magnetoresistive current sensor suits next generation power systems and applications.

Aceinna VP of marketing, Teoman Ustun, said: “Aceinna’s MCx1101 current sensors are fully integrated, bi-directional and provide much higher DC and AC accuracy and dynamic range compared with alternative solutions. For example, the new $\pm 65A$ versions have a typical accuracy of ± 3 per cent. This new current sensor utilizes an industry standard SOIC-16 package with a low impedance (0.9mohm) current path and are UL/IEC/EN60950-1 certified for isolated applications.”

The product’s fast response and high bandwidth suits fast switching SiC and GaN-based power stages and enables power system designers to make use of the higher speeds and smaller components enabled by wide band-gap switches. Output step response time is just 0.3 μ s.

www.aceinna.com



Supporting warehouse automation

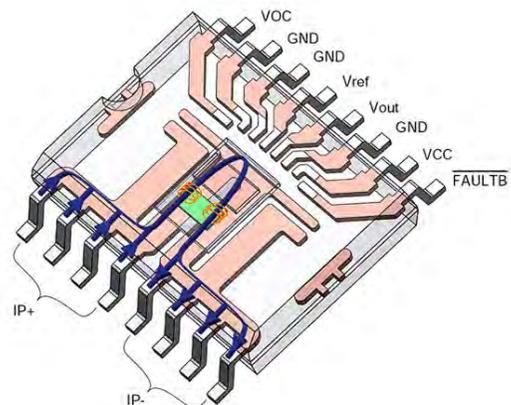
NAI has expanded its interconnect solutions for warehouse automation. The company custom designs and manufactures cable assemblies and harnesses for warehouse equipment OEMs and system integrators.

The company focuses on providing the interconnectivity solutions for digital warehouse automation and IIoT initiatives, including high-density warehouse storage, narrow-aisle equipment, high picking, high storage and other operational efficiency measures. Applications range from automated guided vehicles and tote handling to driverless forklifts and IIoT applications.

Recent product development allows NAI to expand its capabilities to include coax assemblies among their main portfolio which ranges from copper cable assemblies for power/data and ruggedized interconnect products to withstand harsh environments, to control panel/box builds and complex harnesses.

Autonomous vehicles, drones, sensors and wearables are enabling warehouses to create a more intelligent supply chain. Driverless autonomous vehicles improve visibility and increase productivity, while drones map the warehouse and update data on inventory and facility conditions.

nai-group.com





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Component sourcing: stay safe

In this article, ERAI's vice president, Kristal Snider, offers buyers best practice advice for reducing risk while sourcing components in a market plagued by shortages

The chip shortage has thrown buyers into an open market full of unfamiliar risk. Buyers are desperately seeking parts and believe they have no choice but to take risks they would not otherwise take. These two scenarios have created a feeding frenzy among the thieves that plague the chip trade. Read on for ERAI's top tips for navigating the environment safely.

Tip #1: Make sure employees are properly trained

The most important thing an organization can do to avoid financial risk and counterfeit parts is properly train its employees using its own internally designed training program that specifically addresses supplier selection, counterfeit screening and reporting. To fill in training gaps or if an organization does not have a training program, enroll employees in classes

such as InterCEPT. In 2017, ERAI launched InterCEPT, a web-based counterfeit and risk avoidance training program designed to provide affordable, comprehensive online training to reduce the risk of counterfeits entering a manufacturing environment and show buyers how to screen suppliers.

Tip #2: Align with reputable independent distributors

Inexperienced and desperate buyers are using Google and Internet-based part sourcing platforms to find parts instead of relying on trusted and verified independent distributors that specialize in navigating the open market. When a reputable independent distributor tells a buyer they can't find the parts they need, the buyer resorts to Google or other online trading platforms where suppliers are allowed to post inventory even though

they have not been screened. By using these high-risk sourcing platforms, the buyer often 'finds' the parts they need after only a few clicks. Untrained, overwhelmed buyers under pressure to keep manufacturing lines moving are an easy mark. They don't know how to tell if an inventory offering is legitimate part availabilities and/or OEM excess or black-market bait comprised of fraud, e-waste, counterfeit parts and ghost offerings that do not exist.

Tip #3: Properly qualify suppliers

In general, purchasing from component manufacturer and their authorized sources is the best way to avoid fraud and counterfeit electronic parts. However, in times like this where there is a global chip shortage, buying from authorized sources is not always possible. It is prudent

for manufacturers to align themselves with trusted independent distributors that have attained certifications to ISO 9001:2015, AS9120 and SAE AS6081: *Fraudulent/Counterfeit Electronic Parts; Avoidance, Detection, Mitigation, and Disposition - Distributors*. These independent distributors will have established best practices such as screening ERAI's database of high-risk suppliers as part of their procedure for selecting suppliers and inspecting and testing parts. Buyers need to be diligent and use all available sources of information to ensure they are receiving quality parts from reputable suppliers.

Tip #4: Access intelligence tools

ERAI members use ERAI's databases to mitigate risk. They are looking to see if a part they need has been



previously reported to ERAI. If it has, they are using our data to see what external and internal tests were performed to identify the part as suspect counterfeit or nonconforming. They are using our part sourcing tools to search for parts being offered by vetted independent distributors and are using our supplier risk tools to identify high risk and trusted suppliers. ERAI members can steer clear of suppliers that falsely claim accreditation to quality standards and provide fraudulent ISO and other quality certificates. If an organization does not have access to risk mitigation tools or have the right processes in place, it is playing Russian roulette with the company's money and brand.

Tip #5: Do not wire payment in advance to unknown suppliers

Sellers refusing any form of payment other than wire transfer in advance should be considered extremely high risk. These organizations likely either need the money to purchase parts on the buyer's behalf from an unknown source

or the buyer is about to be the victim of wire fraud. Request a more secure form of payment such as net terms, credit card, PayPal or escrow. Escrow protects the buyer and seller and can allow for parts to be inspected prior to payment being released to the supplier. I often hear from victims 'we didn't have time to do an escrow... we needed the parts the next day'. Well, the time saved wiring payment in advance did not result in a timelier delivery; it resulted in added delays and unnecessary financial loss. Don't fall for a supplier creating a heightened sense of urgency. Legitimate independent distributors may need a quick response to lock inventory down, but they can do that with a purchase order and before funds are wired. If someone is pressuring for money, stop and start asking questions.

Tip #6: Verify parts purchased from non-traceable sources are authentic

Regarding components themselves, typically, products purchased from

the direct/authorized channel with factory traceability will be accepted and used in production with no additional testing or counterfeit screening. However, products procured from the open market should undergo full counterfeit screening to industry standards such as SAE AS6171: *Test Methods Standard; General Requirements, Suspect/Counterfeit, Electrical, Electronic, and Electromechanical Parts*, including related slash sheets for test methods or IDEA-STD-1010.

Tip #7: Still want to source alone? Do some digging

Organizations need to ensure companies under consideration are established and can fulfill the requirements. Request and validate their business license, tax ID number, Dun & Bradstreet number, VAT number, Cage Code number, etc. For foreign entities, verify the organization is licensed in the state, region or country in which they claim to be located. Companies should be able to show they have a



The chip shortage has thrown buyers into an open market full of unfamiliar risk. Buyers are desperately seeking parts and believe they have no choice but to take risks they would not otherwise take



business license and are legally operating in the country in which they are located. Many countries and most US states have listings of registered companies and their corporate documentation. Additionally, request copies of quality certificates and, once received, verify the information is correct and validate the document with the issuing body.

Perform a Google search on the company name. Check if there are, or have been, indications of financial issues or other negative comments. Organizations should have an established web presence and should generally appear in several search results. If there are no search results, the company should be considered high risk.

Facility and warehouse locations can be a 'red flag' easily uncovered using publicly available data. All potential suppliers' addresses and business registrations should be verified prior to adding a company to an organization's approved vendor list (AVL). If unable to physically inspect facilities or have a third party do it, use Google and Google Maps to find the location: does the address

exist; is it an industrial area, residential area, etc? If located in an office building, call building management or security and ask about the company. Alternately, contact another tenant and ask if there is a door sign, people entering/exiting and if the company receives regular mail/deliveries. Organizations not operating from a verifiable, brick and mortar location where it can be audited on site should be treated as a higher risk.

Testimonials and references from customers and contactable references are key. After receiving references, contact them and ensure the references are from genuine companies. Do not accept references from generic email addresses (Gmail, Yahoo, 126.com, etc.). If they cannot be reached or are unwilling to provide information, this raises a red flag. Ask the references about prior successful and unsuccessful sales.

Check ERAI.com for complaints. Organizations can receive a one-time free report. If an ERAI subscription isn't an option, save the free report for a large/high-risk order and ERAI will help qualify the supplier.

When pressed for information, scammers will tell desperate buyers they have another buyer that isn't asking questions or is ready to wire the funds. Scammers want to create that sense of urgency to push buyers to move forward quickly. Stop. Pushy suppliers that encourage buyers to bypass best practices is a significant risk indicator.

Tip #8: Report and reach out

If a buyer encounters a suspicious company or has been defrauded or has received faulty/suspect counterfeit parts, report these incidents to ERAI. *'ERAI Information Sharing—Report a Company'* or *'ERAI Information Sharing—Report a Part'* reporting is free and anonymous. ERAI will work with organizations to verify their loss and, when a report is generated, the victim's identity is kept confidential. We have a responsibility to look out for one another. Failing to report only benefits scammers. Reach out to ksnider@eraí.com.

www.eraí.com



In general, purchasing from component manufacturer and their authorized sources is the best way to avoid fraud and counterfeit electronic parts

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North American distribution sales growth will slow in 2022

However, while component demand won't be as strong as 2021, distributors say high single-digit to double-digit growth is possible



James Carbone

Some distributors reported more than 40 per cent sales growth in North America in 2021 because of surging component demand, higher prices and double-ordering of some parts by buyers fearful that their companies production lines would shut down because of a lack of components.

Distributors expect sales growth will continue in 2022 but acknowledge that growth will not be as robust as last year. Some predict mid-to-high single-digit growth, while others say double-digit growth is possible because durable demand and tighter-than-normal supply conditions will continue in 2022.

The good news for buyers who purchase parts through distributors is that while it will not be a buyer's market, supply conditions will likely improve as more capacity comes online and demand weakens especially in the second half of the year. However, some distributors say tight supply will last through most of 2022 and may not loosen until 2023.

Avnet CEO Phil Gallagher expects component demand to remain strong in 2022. "We anticipate growth to continue into the first half of 2022 and likely through the year," he said. "We expect both industrial and consumer segments to continue to drive robust demand, especially as

the automotive and aerospace markets recover."

Gallagher added while it is difficult to forecast how long strong component demand will continue, "most in the market see this strength continuing throughout 2022" and some are projecting that it'll continue into 2023. Robust demand may not level off until 2024.

Double-digit growth forecast
Mark Burr-Lonnon, senior vice president global service and sales for Mouser Electronics, said the high-service distributor is budgeting for 15 per cent sales growth in North America in 2022. Mouser's sales would likely end up growing 46 per cent in 2021, Burr-Lonnon said in late November. "There's a chance we could do more than 15 per cent in 2021," he said.

One reason is tight component supply will continue to at least the second quarter of 2022, he said. In the second half, the capacity that some of the "manufacturers are bringing on board will have more of an impact" and the market will start to change, he said. However, semiconductor manufacturers say they are already sold out of the capacity that they have, according to Burr-Lonnon. That means supply could remain tight and prices could be stable or increase.



Avnet CEO Phil Gallagher

"We anticipate growth to continue into the first half of 2022 and likely through the year"

Another distributor that posted strong sales growth in 2021 was Digi-Key. Its North American sales grew 55 per cent, while its global sales rose 65 per cent, according to Dave Doherty, president and chief operating officer. However, sales growth in 2022 may cool off to the 5-8 per cent range, said Doherty. "I believe orders will start to return to more realistic levels in 2022 as customers find more breathing room," Doherty said.

While distributors' sales may not grow as strongly in 2022 as they did last year, some distributors are expecting higher-than-normal growth rates because of strong

demand from traditional customer segments such as industrial, defense and aerospace, transportation, and medical. In addition, there is growing demand for semiconductors and other components from not-so-traditional segments such as the agriculture, dairy, and beverage industries, among others because of the need for sensing and connectivity.

"For example, in the dairy industry, companies are using semiconductors to help track livestock," said Gallagher. "In the beer distribution industry, they are tracking use and consumption on taps."



Dave Doherty, president and chief operating officer for **Digi-Key**



“We view IoT as a key industry trend that has driven significant growth that will continue to do so in 2022”

He noted that more electronics are being used in agricultural equipment. “More produce than you might expect goes bad before it gets to the market. Companies are using sensors to control temperature, measure ethylene output, etc.,” said Gallagher. More sensors and other chips are also being used in water treatment applications.

Component demand grows in industrial

In more traditional segments such as industrial there are subsegments that are using more electronics. “Industrial is one of our largest segments and is very diverse,” said Gallagher. “There’s explosive growth in power tools that are more portable and in smaller form factors,” he said. “Even in those traditional segments, creating smaller and more energy efficient products is the priority.” Such products and capabilities require more chips and other components.

“We continue to see the need for sensing and connectivity across many applications,” said Gallagher. Industrial IoT such as factory automation is an area of opportunity, he said.

Another key segment is automotive. “Automotive is consistently evolving,” said Gallagher. It is also unique in that the demand for components in that industry is rising regardless of the pandemic due to increased consumer demand for electric

vehicles and other advanced systems, he said.

“There are more components in an automobile than ever before for driving systems, computer systems, LiDAR, etc.,” he said. He added that commercial aerospace is experiencing spikes in demand that parallel the automotive industry due to demand for infotainment, energy efficiency and small form factors.

Distributors say while demand will remain strong in 2022, macro trends such as 5G, Internet of things (IoT), artificial intelligence and electric vehicles will result in strong component demand for years. Doherty said wireless connectivity, industrial automation and electrification of vehicles will help drive innovation in North America beyond 2022.

“We view IoT as a key industry trend that has driven significant growth that will continue to do so in 2022,” he said. Demand from nearly every industry vertical continues to drive significant interest and investment in IoT development and implementation, according to Doherty. He noted over the last year, there was a surge in new product introductions in every industry from automotive to medical, industrial automation to consumer devices and everything in between, driving business across the board.

5G, IoT, AI to drive growth

The growth rates for “5G, IoT, AI, and electric vehicles are all up into the right,” said Burr-Lonnon. Such technologies will continue to result in more products and applications that will need electronic components. Burr-Lonnon said while 5G has been talked about for years, it is still in its infancy and will grow over the next several years. “It is still nowhere near where it is going to be,” he said. The same is true with IoT and artificial intelligence.

Once those trends fully develop, it will result in more components because of the need for sensing and conductivity in equipment used by those segments.

Because of continuing strong demand, supply conditions will likely remain tight in the first half of 2022 and may continue longer. “All indications are supply conditions will be “tough for the buying community all the way through 2022,” said Burr-Lonnon. “If buyers get relief next year, it could be in the September timeframe.”

Doherty said he was “hopeful” that in 2022 “we will see an uptick in supply and trust that our partners are doing

everything in their power to ensure they can meet demand.” Digi-Key works closely with its suppliers to ensure the availability of inventory “throughout this high level of demand,” he said.

Michael Long, chairman, president and CEO of Arrow Electronics, said market intelligence makes it “increasingly clear that supply will remain short of demand through the better part of 2022.” He noted severe supply chain bottlenecks have increased, “leading to widely reported production slowdowns in certain industries.”

At the same time there has been “robust demand from sectors such as transportation, industrial, communications, computing and data networking”, he said.

Buyers will likely face higher prices. “There is no more year-over-year cost reduction on parts like there used to be,” said Long. He noted that costs for raw materials, transportation, handling and labor are up. “These costs are real. These costs are permanent and these costs will be charged for.”

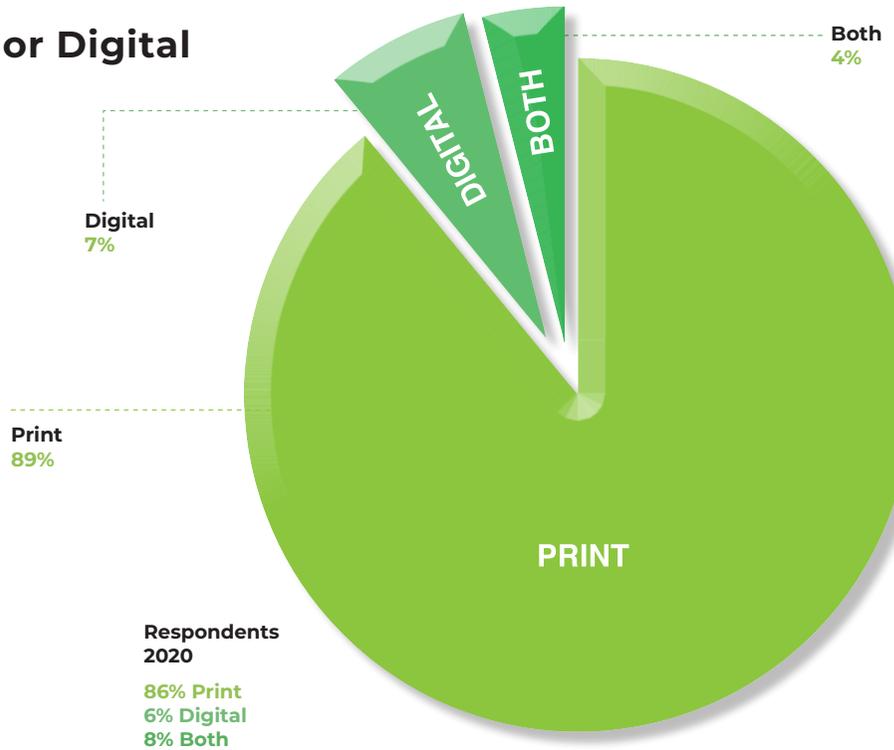
Reading into the reader

Electronics Sourcing's special projects editor, Thomas Smart, examines industry trends revealed in the magazine's latest annual reader survey

Print still preferred

Last year saw readers support for print increase, with 89 per cent preferring the printed publication. Only seven per cent preferring the digital edition. Readers stated key benefits of print were bookmarking stories for future reference, the back catalogue of information, easy access to our *North American Distributors Report* and the ability to compare manufacturers and distributors in the *Buyers' Guide* section.

Print or Digital



Working with design teams

Another emerging trend is purchasers' deepening relationship with design teams, with purchasers offering more input at early stages of the design process. This early involvement: helps prevent hard to find components reaching the bill-of-materials; reduces lead times; ensures preferred component manufacturers and distributors are used. On average, readers work with their design team on 8.3 projects per year.



Production life cycle

Per annum, how many projects do you work alongside the design engineering team to bring a product from design to production?

Survey average = 8.3 projects per annum

Moving away from brokers

The survey highlighted a continual move away from brokers. Readers are placing seven per cent of their business through brokers, compared with 21 per cent in 2020, 25 per cent in 2018 and 27 per cent in 2017. Stated reasons for this decline included: diminished stock traceability; increased risk of counterfeit components entering the supply chain; and substandard, used or refurbished components.

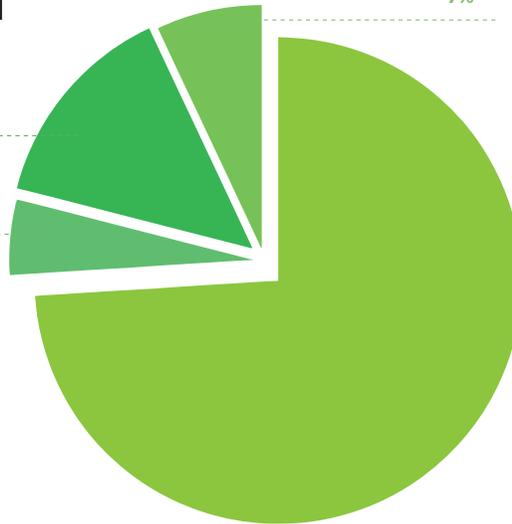
Business placed

Principal component manufacturer
14%

Non-franchised
5%

Broker
7%

Franchised
74%



Biggest industry concerns

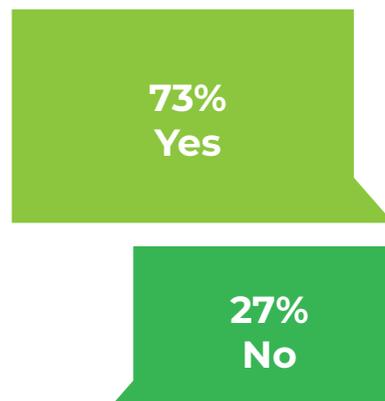
Availability, price and lead times remain the three biggest purchasing concerns. An unforeseen issue which added to these concerns was the emergence of COVID-19, adding additional strain to the system as component manufacturing slowed. Other concerns included: unreliable supply chains; obsolescence; finding alternative components, lack of stock on hand; EOL mitigation; counterfeits; disruptions in the supply chain; and factory moves.



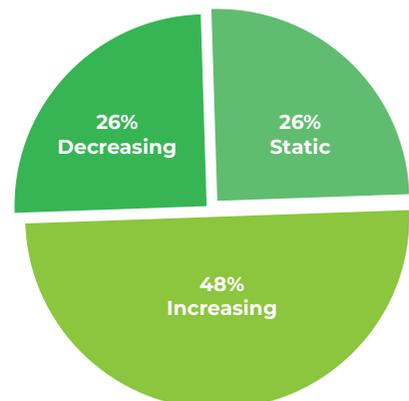
Purchasers expand preferred suppliers

Purchasers are sticking with preferred suppliers when sourcing for new projects, with 73 per cent confirming they use a preferred supplier list. Also, 48 per cent of those saying they use preferred suppliers are seeing their lists expand, while 26 per cent see it remain static and 26 per cent are seeing it decrease.

Do you have a preferred supplier list?



If yes, is the list increasing, decreasing or static?



Dedicated to counterfeit avoidance

Electronics Sourcing North America asked CTG's senior director quality compliance, Kevin Patel, to step readers through the company's anticounterfeiting procedures

Q When buyers are sourcing components for government, defense and aviation applications what accreditations and standards are required and what process underpins these?

A: CTG's sourcing, quality and counterfeit surveillance certifications include AC7402-CAAP, ISO9001, AS9100, AS9120, AS6081, AS5553, CCAP-101 and ANSI/ESD-S20.20. These certifications are evidence that the company's quality management system (QMS) processes are battle-tested by outside auditing agencies and top aerospace and defense customers.

Q What counterfeit procedures does CTG take to ensure components entering the supply chain are 100 percent genuine?

A: CTG applies a multi-layer risk mitigation process which includes applicable standards (AS6081, AC7402, IDEA-STD-1010, CCAP-101, AS6171/AS6174) and CTG's ability to source

reliable parts from validated procurement sources within the supply chain. With a robust procurement process working hand-in-hand with risk application and Counterfeit Prevention laboratory, CTG has the ability to provide 100 percent authentic parts.

Q When purchasing professionals are confirming component authenticity, what are the three most asked questions?

Does the product have reliable trace? CTG only procures from reliable industry sources, to satisfy customers' requirements and reduce the risk of product nonconformance. CTG implements full testing and inspection (above industry and customer requirements) to ensure 100 percent authenticity.

How does CTG authenticate products? By following all industry standards applicable for the specified commodity type, CTG applies multi-testing standards and test practices which meet and exceed industry testing

requirements. Risk models are implemented based on procurement source to ensure additional verification/validation points are necessary and correct sampling, testing protocols are subject to the commodity to completely reduce risks.

Does CTG have qualified personnel? CTG employs industry engineers, including inspectors and technicians who are all certified. All technicians and inspectors are IDEA-ICE-3000 Inspectors and CQI (Certified Quality Inspector) certified. All inspectors and technicians are also IPC-610 certified.

www.ctgnow.com



CTG's senior director quality compliance, **Kevin Patel**



CTG's sourcing, quality and counterfeit surveillance certifications include AC7402-CAAP, ISO9001, AS9100, AS9120, AS6081, AS5553, CCAP-101 and ANSI/ESD-S20.20

ELECTRONIC COMPONENTS SHORTAGE?

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- CTG Leads the Industry in Certifications

COUNTERFEIT PREVENTION



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MEMBERSHIPS



Myths and methods to uncover counterfeiting

Rochester Electronics discusses why authorization is the ultimate tool in the fight against counterfeits

In times of supply shortage, or where component obsolescence limits availability, counterfeit devices are more prevalent. Counterfeiters have moved beyond incorrect logos and packages with no die inside caught by simple visual inspection used by those following AS6081. Counterfeiters now have more sophisticated operations.

Customers whose normal supply chain proves insufficient may assume unauthorized or gray market sources are the only solution and that 'testing' can eliminate risks. Nothing could be further from the truth.

What is a counterfeit semiconductor?

- Non-functional or scrap product which is re-marked as good and re-sold
- Functional, yet sub-standard product purchased by the counterfeiter remarked and re-sold as full grade product at an increased price
- Recycled and recovered components sold as new

The process of removing parts from boards and altering logos can cause long-term damage not seen on first power-up. Chemical residues from the cleaning process can slowly enter the device, causing bond-pad or bond-wire failures in-service. Heat/mechanical damage during removal can result in long-term reliability issues. Exposure to humidity, water and salt air atmosphere is often routine in

used part recovery. This process can produce an authentic used product that has questionable reliability. Authenticity does not ensure reliability.

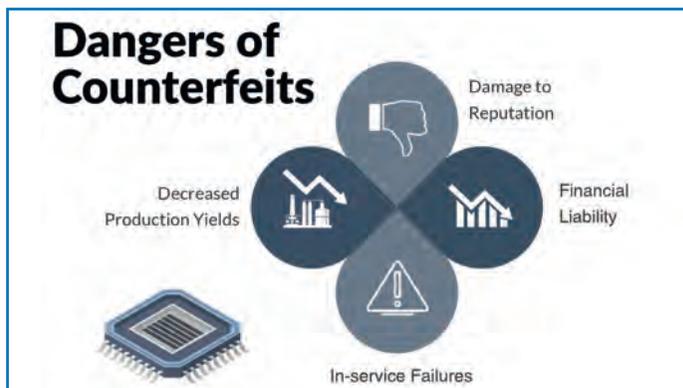
Identifiable surplus stock and traceability provide no guarantee regarding storage conditions encountered during a component's complete shelf-life.

The consequences of allowing sub-standard product to enter the supply chain may include:

- Reduced production yields and increased rework
- Increased in-service failures and reduced reliability
- Heightened risks and financial liability associated with catastrophic system failure
- Cost of reputational damage

What does '100 per cent tested' really mean? Customers may incorrectly assume 'testing' provides a 100 per cent genuine guarantee. At its most basic, 3rd party testing comprises one or some of the following:

- Paperwork and visual inspection: Unlikely to identify professional counterfeit devices. Traceability documents and certificates are also regularly forged to support the overall deception
- X-ray inspection: Unlikely to identify fraudulently up-screened, well-marked recovered and re-used, or recovered failed-test devices



- Basic continuity or functional testing: Will not identify the fraudulently up screened or well-marked recovered and re-used devices
- Full functional testing: The datasheet only provides a subset of the characteristics tested by the original chip manufacturer (OCM). Test houses do not have the original manufacturer's test program

Effective test requires high fault coverage and accurate fault modeling. AS6171 calls out far greater testing for parts bought through independent distribution yet is rarely followed.

The only way to offer a 100 per cent guarantee that a device operates to its specification, is to test it using the original component manufacturer's test processes. However, even the most basic MCU test, as carried out by the OCM, comprises many 100,000s of man-hours in development.

Third-party test houses cannot hope to replicate these complex test processes, often only partial electrical and/or functional testing is carried out.

Authorized after-market suppliers and manufacturers, such as Rochester Electronics, provide the only 100 per cent guaranteed and counterfeit-free source for active-shortage and obsolete semiconductors. Finished devices stored and supplied by authorized sources are guaranteed to come only from the OCM and to have been stored in-line with the OCM's recommendations. These products offer a 100 per cent conformance guarantee.

As a licensed manufacturer, Rochester is also able to offer ongoing production of obsolete devices. Built from known-good-die, these products are tested using the OCM test procedures and, in many cases, the original test equipment: guaranteed 100 per cent compliant to the original specification.

www.rocelec.com



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Programmable oscillators save the day

In this article, Dove's management team explains how programmable oscillators can save the day when dealing with material shortages and extended lead times

Crystal and oscillator specialist, Dove Electronic Components, offers an extensive range of frequency control products and services. The company's in-house programming center features four mass production machines with full laser marking and tape and reel capability.

Most programmable orders start as a customer request for a fixed frequency oscillator. Requests range

from a prototype to support of an existing design. Programmable oscillators have saved the day when dealing with material shortages and extended lead times. Customers faced with line down situations or delivery dates inside current lead times have found programmable oscillators a perfect fit.

For example, customers looking for a specific oscillator have often exhausted all other stock avenues. Faced

with having to wait months, a quick-turn, programmable oscillator offers a potential solution. Assuming the specifications fall within the available footprint, stability, temp range, jitter spec, etc, Dove's team will offer a programmable oscillator from one of several manufacturers Dove is authorized to perform in-house programming for.

We'll send the buyer a formal quote and soft copy of the datasheet to share with their component engineer. Once the customer approves the specification, we can send samples to test (if requested), usually within one to two-days, so the customer can confirm the programmable solution works before committing to a production order. However, the datasheet is often all they need before placing an order.

Production starts with allocating the blank (unprogrammed) oscillators to the customer's order. This is electronically transmitted to the in-house Programming Center and automatically scheduled against the customer's dock date(s).

Many customers are incorporating programmable options into their products, designs



Dove's manager it/web/programming, **Jason Silva**



Dove's director of sales and business development, **Mark Mardjani**



Dove's operations & finance manager, **Crishana Runge**

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and supply due to their reliability and availability. Dove has revived orders that were facing a >30-week lead time and is ready to help more customers explore this solution.

Dove operates a cohesive process between the sales team and programming department. Strong communication between departments lets the programming manager provide immediate explanations to the salesperson handling a standard or special order.

As inquiries for programmable oscillators come in, the sales team coordinates availability and scheduling with the programming department: first ensuring the specifications can be met, then confirming a firm ship date. Once an order is in place and on the department schedule, Dove's programming manager prepares the materials and device kit.

The job is setup on a programmable oscillator automation handler, accounting for package size, laser marking and packing requirements. Setup includes hardware removal and installation, hardware alignment, software setup and packaging preparation.

Using a combination of supplier provided software and proprietary equipment, specifications are entered and the devices are ready for programming. All program results are saved for reference, with precise and accurate device output frequencies logged.

Devices are laser marked per supplier standards, with some customers requesting custom marking which Dove provides at no additional cost. The laser marking system is constantly monitored for accuracy and etching consistency.

A strict traceability program is followed, tracking lot numbers and date codes through the programming process, ensuring programmable oscillator shipments are traceable to the manufacturing date and facility.

The order is then prepared for shipping. Before parts are shipped the order is processed through a series of quality check points with trained warehouse personnel cross checking customer requirements, date codes and lots against prepared paperwork/ labels to ensure the order is shipped complete and precise.

www.doveonline.com



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What's ahead for electronics distributors in 2022

Dave Doherty is president at Digi-Key Electronics. Digi-Key is both the leader and continuous innovator in the high service distribution of electronic components and automation products worldwide, providing more than 12.6 million components from over 2,000 quality name-brand manufacturers



2021 has been a whirlwind of a year, bringing both new challenges and opportunities to the high service distribution industry. Here's a look at what made this year one for the history books, how the industry addressed 2021's challenges, and what may be around the corner in 2022.

Supply & Demand Upheaval

The past year brought many challenges to the electronic components industry. While there may still be some challenging times ahead, orders will likely begin to return to more realistic levels in late 2022 as customers find more breathing room.

Even throughout these unpredictable market conditions, distributors like Digi-Key have weathered the ups and downs by continuing to invest in strategic initiatives to expand warehouse capacity, localize the customer experience both digitally and from a support standpoint, scale digital offerings and web services and expand into new markets, in order to continue serving customers around the globe with the best possible purchasing experience.

Rising to the Occasion

Suppliers in every niche of the market deserve recognition for their performance over the past year. In 2021, suppliers have gone above and beyond, identifying new, innovative ways to increase their supply and provide customers with the parts they need.

We are proud to work with suppliers who truly understand the importance of their products to the engineers and makers around the world who are creating innovative projects every day.

Digi-Key believes in a digital-first approach, and is always developing new ways to make it easier for our customers to engage digitally from anywhere around the globe, including localizing their experience in markets around the world with local language, currency and support hours, as well as fast shipping times.

Today, Digi-Key supports 26 local currencies and does business in 21 local languages – something that will continue to grow along with the business.

Looking Ahead

In many ways, the industry is cyclical – the demand and challenges from this year will likely come back around again in new forms in the future, so the key is to be better prepared with the new building blocks that were put in place over the past year.

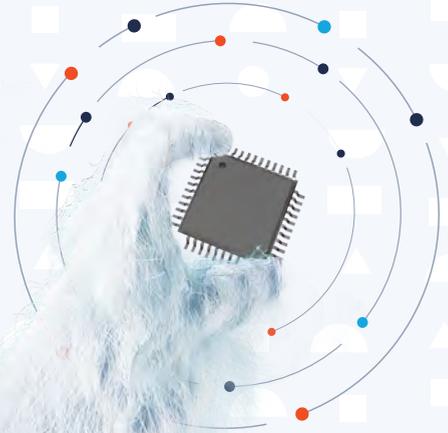
Digi-Key has increased its investments in infrastructure and other innovations to scale capacity to keep up with skyrocketing demand, including the new Product Distribution Center expansion in Thief River Falls, Minnesota, more robust and predictive web search functionality, Digi-Key Marketplace, higher inventory levels and increased automation in the Digi-Key warehouse, which all benefit customers by providing an easy and efficient research, shopping and delivery experience.

These investments have helped Digi-Key, its suppliers and customers weather the storm of 2021, and leaves all parties well positioned for 2022. We are looking forward to the innovation of our customers that will come in 2022, and are excited to enable the world's ideas.



Digi-Key's new Product Distribution Center expansion in Thief River Falls, Minn.

**Electronic components
feeling harder to find
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Two critical supply chain success factors for 2022

TTI's SVP supply chain and sales enablement, Tom Vanderheyden, discusses why manufacturers who cultivate strong partnerships now will be better positioned for success

A chain is only as strong as its weakest link and for electronics manufacturing supply chains during these challenging times, inventory (or lack of) often is an element of weakness. That is why my colleague Michael Knight, in his 2022 industry outlook for this magazine, wrote that the common qualifier for all performance forecasts in the year ahead will be: 'If we can get parts'.

With demand for electronics remaining strong, this will be a year when the benefits of true distribution partnerships will be obvious and abundant to manufacturers. A distributor with a clear and competitive inventory strategy, and that demonstrates dependability and reliability, will help manufacturing operations succeed by supporting agile strategies that enhance profitability and efficiency.

In mid-2021, IHS Markit's *Materials Pricing Index* reached its highest point since 2014, and while analysts were hopeful in December that cost pressures would lessen during the first half of the year, there has been continued concern over inflationary pressures after the US dollar saw the highest inflation rate in 40 years. [1]

Those concerns were reflected in a survey by

the Institute of Supply Management, released in December. Almost half of manufacturers (48 per cent) anticipated supply problems would grow worse in the first half of this year, while nearly all (47 per cent) of the remaining respondents expected those challenges to remain about the same as in 2021. [2]

Given present market conditions and an uncertain future, the primary factor in a strong, successful distributor partnership is a solid inventory strategy, independent of market conditions. The challenge for some other distributors will be maintaining a long-term, strategic view in the face of external pressures that may impact their position on inventory levels and turns.

TTI has been working closely with its supplier partners to understand their industry concerns, capacity and investments. This provides a level of data-driven insights and industry intelligence necessary to enable critical inventory management activities. As a specialist distributor, we've built deep-rooted, personal supplier partnerships that allow us to help manufacturers leverage this industry knowledge.

This leads to my second key factor, communication.

Without openness and rapid sharing of information, a distributor may be able to provide parts, but cannot truly be a partner. Good communication means visibility, transparency, candor and timeliness of information. These qualities are essential whether the news that's being shared is positive or challenging.

Along with delivering insights on market conditions, inventory availability, obsolescence and changes in market trends, your distributor partner should also provide rapid digital communication tools to fit your technology stack. For TTI, that means supporting a range of approaches, from EDI to API integration for parts search, quotes, lead times and order placement. Your distributor should be a trusted advisor that helps you find ways to become more efficient and profitable, while also balancing the need for risk mitigation.

Now is the time to make sure that your supply chain is well-forged. Choose the right partner to help you overcome logistical and supply challenges and stay abreast of market changes throughout 2022 and beyond.

tti.com



TTI's SVP supply chain and sales enablement, Tom Vanderheyden



TTI has been working closely with its supplier partners to understand their industry concerns

References:

[1] Michael Dall. 'Weekly Pricing Pulse: Commodity prices rebound amid market volatility'. IHS Markit, 14 Dec 2021. ihsmarkit.com/research-analysis/weekly-pricing-pulse-commodity-prices-rebound-amid-market-vola.html

[2] Barbara Jorgensen. 'Manufacturers' Capex & Revenue to Expand in 2022'. EPSNews, 13 Dec 2021. epsnews.com/2021/12/13/manufacturers-capex-revenue-to-expand-in-2022/



Chip LAN transformer meets automotive demand

Bourns has released an automotive grade chip LAN transformer said to be ideal for EMI suppression and Ethernet-based applications.

The new 10/100/1000 Base-T transformer is configured for maximum PCB layout flexibility, with a low-profile discrete design. Model SM453229A-381N7Y is also AEC-Q200 compliant with an expanded temperature range of 40 to 105°C. Devices are capable of Hi-Pot isolation of 1,500V AC/60 sec and can withstand pulse voltages of up to 2,400V, 1.2/50µs.

These features make the SM453229A-381N7Y ideal for 10/100/1000 Base-T Ethernet networks, industrial single pair Ethernet and IEEE 802.3 Ethernet-based applications, as well as pairing common mode chip inductors for EMI suppression. Products are available now and are RoHS compliant and halogen free.

www.bourns.com



Handheld enclosures target smart factory growth

Rolec's tough handCASE enclosure is now available with a choice of lid designs. This diecast enclosure is designed to be light and comfortable to hold for long periods yet robust enough to withstand challenging working conditions. These characteristics make it ideal for smart factory automation, robotics, machine control, and agricultural equipment and vehicles.

Purchasers can specify two base versions: one designed for an external power supply; the other with a battery compartment. Each base can be specified with a choice of two lids, both of which are recessed to accommodate a membrane keypad or product label.

Lid version R has a narrow edge, while version S has an ergonomic bevel. Inside, there are threaded screw bosses for PCBs and mounting plates. All enclosures are rated IP 66 as standard, with models available in three sizes.

www.rolec-usa.com



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Improving the classic model

Sourceability's founder and CEO, Jens Gamperl, discusses supply chain instability, current market conditions and how digitalization can help

Holidays and Covid-19 have only exacerbated supply chain instability, while demand for technology products triggered by working from home, lockdown and a shift to ecommerce has continued to cause a unique and extreme shortage that isn't stopping anytime soon. As demand increases and supply dips, the industry needs to find alternative ways to enhance the supply chain.

Digitalization can improve the current market situation and—although expensive—

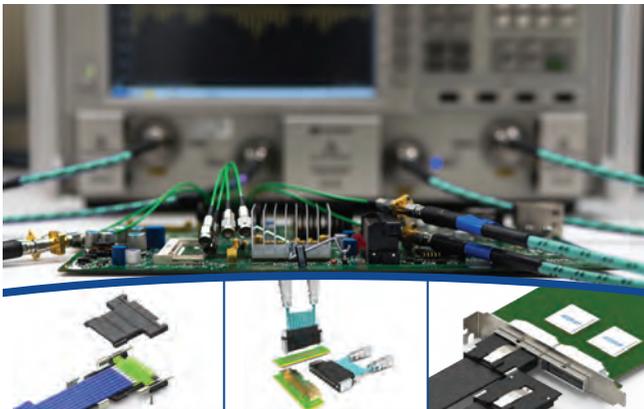
continuing with business as usual isn't an option any longer. Digitalization, which includes utilizing AI, ecommerce marketplaces and automation, can alleviate the shortage crisis by developing a 360deg view of the supply chain, market and potential disruptions. Specifically, marketplaces will create more informed buyers with broader market views. Deploying AI and automation will help predict customer and supplier behavior, while optimizing inventory and procurement.

By combining these technologies hand-in-hand with the traditional model, we can address extreme shortages like the ones we're experiencing now. There is still and always will be value in expert negotiators, relationships with purchasers and vendors, and those who live and know the market, but we need to improve the classic model with emerging technology to avoid future disruptions.

www.sourceability.com



Sourceability's founder and CEO, Jens Gamperl



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What's new



Custom cables simplify installation

Manufacturer of cable and wire products, Remeo Wire and Cable, partnered with Acenes, a security designer and integrator, to design a series of access control cables for a major online retailer. The new cable designs have streamlined installation of the retailer's access control doors by dramatically reducing the number of cables required and minimizing installation errors.

To solve the problems that the variety and number of cables were causing, Acenes worked with Remeo to aggregate five component cables per door, under one jacket. This reduced the average number of cables pulled from 250 to just 50, which lowered the overall installation cost. In addition, the component cables and the outer jacket were all color-coded to simplify identification and improve proper termination.

There were three basic door types used in the warehouse and therefore three colors used for the composite cable's outer jackets. Each of these different composite cables includes component cables, each with a specific AWG and color and designed to operate specific access control functions.

Remeo was also able to minimize the outside diameter of the component cables to reduce weight and save shipping costs.

www.remeo.com

Forecast and procurement's 2022 Bucket List



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

John Denslinger future gazes into 2022 and prepares a Bucket List for procurement professionals to help them handle the wave of demand about to reach shore

2022 Bucket List • By John Denslinger

From a business perspective, it all starts with a forecast and one key baseline is global GDP. According to its world economic outlook released October 2021, IMF projects global GDP at +4.9 per cent for 2022, down slightly from 2021's post-pandemic rebound of +5.9 per cent. Lingering supply chain and capacity issues are expected and will likely hamper growth throughout the first half. Not factored are the consequences of Covid variants which could derail recovery efforts. Nevertheless, 2022 should be a banner year for industry.

Demand is the second key baseline and 2022 will see tidal waves of new technology driving global markets. Most significant is the 5G roll-out, digitalization of commerce and the electrification of just about everything else, most notably EV. Beneath that layer is a booming sector expansion: 5G smart phones, smart homes, servers, computers, gaming, Industry 4.0 and a huge government infrastructure stimulant. The demand is very real and at times may overwhelm supply capability.

Drilling down to the component level, semiconductors tend to be the perennial bellwether. WSTS forecasts 10.1 per cent growth in 2022 on the heels of a sensational 25 per cent increase in 2021. Other forecasters seem to agree: *IC Insight* sees 13 per cent and *Semi Intelligence* reports 15 per cent growth in 2022. With respect to passives and electromechanical, the technology explosion mentioned above has a content multiplier effect further escalating total demand for these components. It would not surprise me to see passive growth exceeding 15 per cent in 2022.

Goals! We dutifully set them every new year. While 2022 is no different, setting achievable goals in procurement might be a challenge, especially when it comes to sourcing vital components. With so many out-of-the-ordinary influences hindering supply, procurement's bucket list might be oversized and overwhelming. In fairness, some factors are beyond their control: pandemic

variants, trade wars, labor scarcity, regulatory interventions, etc, but the expectation remains: minimize the negative impact. That still leaves purchasing owning plenty of actionable items. So here it is, procurement's Top 10 Bucket List for 2022:

- A manageable growth forecast
- No line downs in the factory/end of daily briefings/fewer emergency meetings with senior management
- Plentiful inventory in the channel/scheduling flexibility
- Price stability/price reductions/favorable PPVs
- Normalizing of lead times to pre-pandemic levels
- Confirmation that capacity investments are producing results up-and-down the supply chain
- Inclusion of distributor partnerships in all future supply plans
- Resumption of functioning JITs
- Clear pathways via supplier initiatives to achieve sustainability and green energy goals
- Return of face-to-face advanced technology sessions

If I were to add #11, it would be 'recognition'. You likely spent hours, day and night, on the phone expediting supply and coordinating delivery schedules with production. You kept lines running and factories open. Goods shipped to customers and demand was satisfied. Given the rosy forecast, let's hope procurement's bucket list is the reality for 2022.

Day in the life of a value-added connector order

ECCO Connectors offers readers a behind-the-scenes tour of a circular connector's birth including demand, order, build, shipping and delivery in just a few days

Circular connectors are a unique commodity, often required last minute with delivery ASAP. The following story focusses on a 5015 series mil spec style connector.

The process starts with the end customer AGS, an aircraft test and measure OEM which supports aircraft maintenance operations and often lacks visibility regarding their customer's demand for tools and equipment. Given recent and continuing increases in freight and commercial air travel, AGS needs to replenish its products in the field at much faster rates. It looks online to find material available at authorized distributors and identifies two sources for the exact SKU it needs.

After choosing its desired source, the company places an order for the

required quantity of an MS3102E22-19P. The order is transmitted to the distributor via email and confirmed. With a quick turn requested, the distributor's system breaks out the top-level assembly into its various sub-components where a pick ticket and production order are generated. The required material is then picked and delivered to the operator's workstation where it is cleaned and inspected. If all components pass first level inspection the operator follows the work instructions.

The assembly process begins with applying adhesive to the contacts, outer shells and insulators/inserts, which are allowed to air dry. Several sub-tasks follow, including insulator insertion into the outer shell (pneumatic press) and insertion of contacts

into the insulator (arbor press). These insert/shell subassemblies are then oven cured for a specific duration, at a calibrated temperature.

Once cured, the parts are moved to QC for inspection and pressure tested to ensure/confirm resilience to fluid penetration. After passing inspection and testing requirements, they are moved to marking to add the finished part number, date code, manufacturer and mint mark to each part produced. The parts are oven cured again to ensure marking permanence.

These subassemblies are then combined with the remaining components to produce the 'top level assembly'. The finished connectors are sent to secondary QC where a separate operator inspects the finished parts



Shipping packaging area



Part marking



The assembly process begins with applying adhesive to the contacts, outer shells and insulators/inserts



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regarding assembly and marking. Once completed and stamped with final QC inspection, the parts head to packaging, along with the certificate of compliance and associated shipping documents.

Finally, the connectors are boxed and shipped to AGS Next Day Air given the customer's immediate need. An invoice is generated on shipment and its corresponding tracking number is automatically sent via email to the buyer. This entire process, from start to finish, has taken less than two-days.

Because of their high reliability, circular connectors are used in aerospace, transportation, medical and harsh industrial applications. They come in different sizes and pin configurations that make it difficult to stock all possible variations: thus, the need and benefit for partnering with qualified, authorized, value added connector specialists who can stock the various components, take an order and quickly assemble them into a specific finished good.

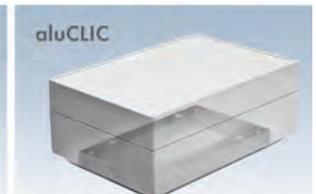
ECCO's warehouse acts like a big puzzle box with thousands of puzzle pieces to be put together at a moment's notice to solve customers' quick delivery material demands. In this case AGS got what it needed fast, assembled by a high-quality staff with good jobs right here in the USA.

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Chip market growth will slow in 2022

Demand for integrated circuits and discretes will weaken in 2022 resulting in more stable pricing and slower revenue growth



James Carbone

The global semiconductor market will grow 8.8 per cent to \$601 billion in 2022 after rising more than 25 per cent in 2021, according to World Semiconductor Trade Statistics.

Despite supply chain challenges caused by the Covid-19 pandemic, worldwide chip sales were expected to end 2021 increasing to \$552.9 billion after growing 6.8 per cent in 2020. The 2021 growth rate was the strongest growth rate for the semiconductor industry since 2010 when revenue increased 31.8 per cent, according to WSTS.

Strong demand for consumer electronic products, including computers, tablets and smart phones among other devices, drove all semiconductor categories to double-digit growth rates, except optoelectronics in 2021. Memory ICs, including DRAM and flash memory, had the strongest growth rate. Memory chip sales rose 34.6 per cent

to \$158 billion. Analog chip sales increased 30.9 per cent to \$72.8 billion and logic revenue rose with 27.3 percent to \$150.7 billion, WSTS said.

Chip sales in the Americas were expected to end 2021 growing 24.6 per cent, while sales in Asia would increase 26.7 per cent and chip revenue in Europe would rise 25.6 per cent, according to WSTS.

The bad news for chipmakers is semiconductor demand and revenue will cool in 2022 and price increases will lessen, according to industry analysts. More capacity is coming online which will help alleviate long lead times for some semiconductors and help stabilize prices. Overall, integrated circuit prices will increase 1 per cent in 2022 after increasing 3 per cent on average in 2021, according to IC Insights.

Move towards balance
Brian Matas, vice president

of market research for IC Insights, said semiconductor supply and demand will move toward being in balance next year at least for chips used in certain applications. "Maybe by the middle of the year, the supply/demand balance is going to even out in several applications," he said. However, demand will remain strong and supply tight for chips used in automotive systems.

There may be a "little bit of easing in chip supply for automotive toward the end of the year but for most of the year, there will be shortages," said Matas.

But there should be less demand for semiconductors from computer and consumer electronics equipment manufacturers. Matas noted there was "big demand" for chips by those segments in 2020 and 2021 because many people worked and were schooled at home and many families purchased

new computers, tablets and other electronics gear. In addition, data centers also invested in new systems and semiconductor demand increased sharply.

Computer sales won't be as strong in 2022 "which will reduce growth for a lot of the chips that are used in computing," he said.

Consumer spending on electronics will not be as robust in 2022 as it was over the previous two years. "There's a little concern about consumer buying power," said Matas. Next year, with no more stimulus checks being sent by the government and with rising inflation, consumers may be a "bit more diligent about spending on some electronic products," said Matas.

"There's a lot of concern for the consumer segment in general and how much consumers will be active in the market in 2022," he said.

By the Numbers



\$1.29

The average price of an integrated circuit in 2021. Source IC Insights



17%

The forecasted increase in 200mm wafer production from 2020-2024. Source: SEMI



\$552.9 billion

The size of the worldwide semiconductor market in 2021. Source: World Semiconductor Trade Statistics



\$601.4 billion

The projected size of global semiconductor market in 2022.



8.8%

The expected growth of the worldwide semiconductor industry in 2022. World Semiconductor Trade Statistics.



11%

The projected growth rate of semiconductor revenue and units in 2022. Source IC Insights



More capacity coming

While chip demand may slow in 2022, more semiconductor capacity will be coming online because of increases in capital spending by chipmakers in 2020 and 2021.

Semiconductor capital spending in 2021 was expected to rise 34 per cent to \$152 billion according to IC Insights. "The last time we saw a number that big was in 2017 when DRAM and NAND flash memory manufacturers were investing a lot because of the transition to 3D NAND," said Matas.

Samsung, TSMC, GlobalFoundries and Intel are making large investments in capacity. Samsung and TSMC will spend \$30 billion each on capacity expansion, according to Matas. Much of the investment will be for NAND flash and DRAM and Intel's spending will be for microprocessor capacity.

The bad news for a lot of buyers is that the capacity investment is occurring for high-end semiconductors that use the latest process technologies on 300mm wafers and not on standard, lower priced standard chips. More mature chips, such as power semiconductors, analog, standard logic and

microcontrollers, are made on 200mm or smaller size wafers and use more mature process technologies.

"I really don't think you see a big expansion industry-wide for some of the more common devices that are used across many applications," said Matas. However, there is some investment in 200mm capacity. Trade association SEMI says semiconductor manufacturers will increase 200mm fab capacity by 17 per cent from 2020 through 2024 when total 200mm wafer production will reach 6.6 million wafers per month.

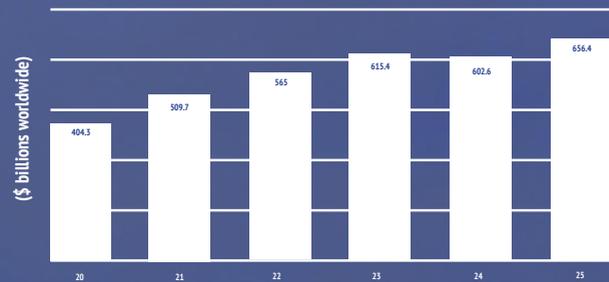
Equipment spending rises

Spending on 200mm fab equipment was expected to rise from \$3 billion in 2020 to \$4 billion in 2021. By 2024 wafer manufacturers will add 22 new 200mm fabs "to help meet growing demand for 5G, automotive and Internet of Things (IoT) devices that rely on analog, power management and display driver integrated circuits (ICs), MOSFETs, microcontroller units (MCUs) and sensors," said Ajit Manocha, SEMI president and CEO.

There is some investment by chipmakers to make analog and other standard chips on 300mm wafers. Onsemi purchased a foundry in East

The worldwide market for integrated circuits will post a 10 per cent compound annual growth rate through 2025 when sales will total \$656 billion. *Source: IC Insights*

Integrated circuit market sales rise



Fishkill, N.Y., and has started the company's first 300mm wafer production. The fab will be able to produce 20 per cent of the company's chips.

In addition, in November Texas Instruments announced it would build a 300mm fab in Sherman, Texas. Construction was expected to begin in 2022 and the fab will produce analog chips for the automotive and industrial markets. TI's future analog and embedded processing 300-mm fabs are part of the company's long-term capacity planning to continue to strengthen its manufacturing capabilities to support customer demand "in the coming decades," said Rich Templeton, TI's chairman, president and CEO.

Production from the first new fab is expected in 2025. With the option to include up to four fabs, total investment potential at the site could reach approximately \$30 billion.

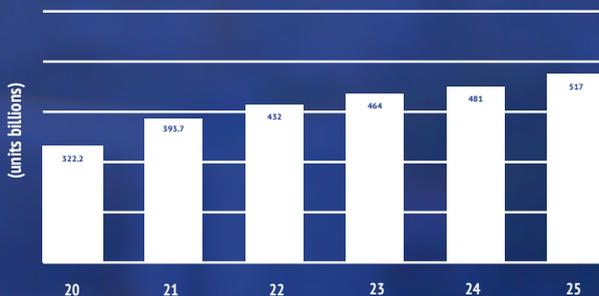
Alan Priestley, vice president analyst at researcher Gartner, said there is actually minimal investment occurring with 200mm production capacity.

"Our belief is 200mm capacity was maxed out before this all started.

It was close to maximum capacity before the pandemic," he said. While some new 300mm fabs are being built for analog and other standard chips, it is not viable for all chipmakers to convert their 200mm existing fabs to 300 mm wafer production to boost capacity, he said. The cost of doing that is prohibitive because of the high cost of equipment and mask sets for 300mm wafer production.

Chipmakers who want to increase 200mm capacity face another problem. It is difficult to find the tools needed tools to build semiconductors on 200mm wafers. "We know that the secondhand market for 200 mil tools is tight," said Priestley. "You can make a fortune for that equipment these days. In China the secondhand tool market, you are paying 10x the price of tools compared to 10 years ago," he said.

IC unit shipments push upward



Unit shipments of integrated circuits will surpass the 517 billion mark by 2025. *Source: IC Insights*



EMC filter engineered for LED lighting

Schaffner has extended its range of filters for LED lighting applications with the new FN2560 range. Designed for attenuation requirements in the lighting industry, filter performance starts at frequencies as low as 9kHz. The filter comes in a compact package and has single strand, solid wire terminations.

Typical applications include LED equipment, LED driver and displays, streetlamps and signage, industrial and architectural lighting, fluorescent lamp ballasts or any other application requiring high differential mode performance. The Schaffner FN2560 has an operating temperature range of -40 to 100°C.

A choice of three different performance levels are available at common mode attenuation performance, providing three different leakage ratings. All new Schaffner filters are designed for a maximum continuous operating voltage of 300V AC, 50 / 60Hz and for nominal currents up to 10A. They have worldwide approvals in accordance with ENEC, CQC, UL, UKCA and CSA and meet the requirements for RoHS and REACH regulation.

www.schaffner.com

Hi-rel chip beads withstand automotive environments overheating

TDK has developed a new series of high-reliability chip beads compatible with high-durability solder in 150°C environments. The new MMZ1608-HE series is specifically designed for automotive applications associated with engine control modules, anti-lock brake systems, electric power steering, electric and hybrid electric vehicles, inverters and LED headlights.

In high-temperature automotive environments, high-durability solder is increasingly used to prevent solder cracks in the bonds between chip components and the mounting substrate. Since high-durability solders do not stretch easily, they place a large load on chip components and do not meet the reliability requirements of existing chip beads. With improvements to the terminal electrode material and plating process, the MMZ1608-HE series improves the bonding strength between the terminal electrode and plating, making it ideal for use with high-durability solder in 150°C environments.

The four products in the series have a rated current maximum ranging from 200 to 300 at 150°C, DC resistance maximum between 0.15 and 0.5, and impedance from 120 to 1000, respectively.

www.tdk.com



Schurter has introduced a reflowable thermal switch designed to trip at >175°C, in addition to the existing version set to trip at >210°C. These compact thermal SMD fuses protect power semiconductors by reliably interrupting a circuit at a pre-defined temperature. They can be used in dense circuits to reduce the risk of overheating and thermal runaway.

The new RTS sustains operating currents up to 130A at rated voltages of up to 60V DC. Breaking capacity is up to 400A at 24V DC. Mounted using conventional reflow solder processes with a temperature profile up to 260°C, the device is then mechanically armed by depressing the top. The status of the RTS is clearly visible to the installer.

Users can specify the RTS with or without added shunt functionality in the same package dimensions. All devices meet AEC-Q200 and MIL-STD requirements.

www.schurter.com

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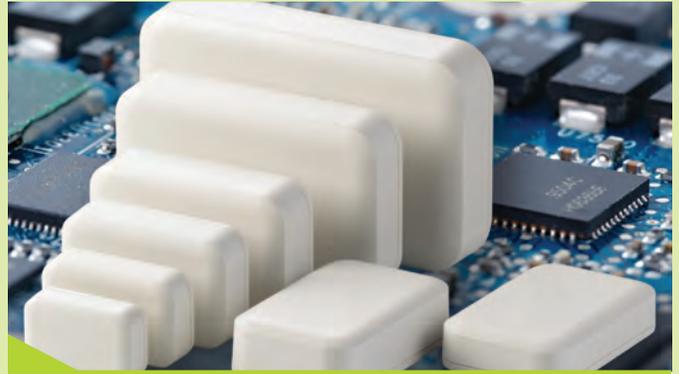
Modular connectors offer networking choice

CUI Devices' Interconnect Group has added modular connectors to its portfolio. Available in RJ10, RJ11, RJ12, RJ13, and RJ45 types, these CRJ series connectors offer a variety of position and contact options including 4P4C, 6P2C, 6P4C, 6P6C, 8P8C, and 8P10C. Ideal for networking or telecommunication equipment, CUI offers a variety of port options, vertical or horizontal orientations, and surface mount, panel mount, and through hole mounting styles.

Additional features include shielding, mounting flanges or spring tabs, high temperature plastic, LED indicators, and reflow solder compatibility, depending on the model.

Select RJ45 connectors also carry integrated magnetics for improved EMI shielding and simplified integration, along with speeds of 10/100 or 10/100/1000 BaseT. Several of the RJ45 magnetic jack models comply with the IEEE 802.3af Power over Ethernet (PoE) standard supporting up to 15.4W of power per port.

www.cuidevices.com



New size for tough enclosures

OKW has added a new 125 size to its Evotec range of table-top plastic enclosures. Described as tough but soft-contoured, Evotec is ideal for applications such as measurement and control, IT, IoT/IloT, gateways, medical, laboratory and environmental technology.

The new 125 size has a smooth top. This two-part enclosure features a robust tongue-and-groove design. It can be specified with IP 65 ingress protection and is assembled with tamperproof Torx stainless steel screws, which is a key requirement for medical devices. PCBs can be mounted on screw pillars in the top and base. Rubber feet ensure stable positioning on flat surfaces.

The new Evotec 125 is available in two heights: 4.92 by 3.07 by 1.18/1.45in with all units molded from off-white UV-stable ASA+PC-FR as standard.

www.okwenclosures.com



Display clarity targets industrial applications

Easily readable from all directions, Display Visions' small control units boast an integrated, high-quality display, said to offer brilliant colors. Units also feature integrated I/O, a graphics controller and touch panel, ensuring stand-alone applications can be developed rapidly. Potential uses include industrial, home automation or kitchen appliances.

The uniTFT range transforms every switch into an intelligent tablet in mini format without additional hardware. Acoustic outputs are also possible. Numerous I/Os as well as interfaces for PWM, SPI, I²C, RS-232 and USB allow the connection of any sensors and connection to external microcontrollers.

For ease of programming, the devices can count, calculate, compare, store and also enable user-friendly input of parameters. Images, fonts, menus, audio files and log files are stored in the integrated flash memory.

uniTFTs are offered in graduated screen sizes from 2.0 to 4.3in and larger. With a typical brightness of 1,000 cd/m², the display is clearly visible even in bright lighting.

www.arkco-sales.com



Low-PIM coax assemblies in-stock

Pasternack has expanded its line of low-PIM coaxial cable assemblies ideal for use in indoor wireless systems, wireless infrastructure, multi-carrier communication systems, WISP networks, small cell installations and PIM testing applications. These new cables are available in standard and custom lengths with same-day delivery and no minimum order quantity.

The expanded offering consists of over 400 unique configurations that boast PIM levels of less than -160dBc. Cable options include SPP plenum-rated, ¼ inch SuperFlex, SPF fire-rated, SPO outdoor-rated, and flexible TFT-402 and TFT-402-LF options.

Assemblies are offered with the following connector types: 2.2-5, 4.1/9.5, 4.3-10, 7/16 DIN, Type-N, NEX10 and SMA, including right-angle connector options.

Product line manager, Amar Ganwani, commented: "As we continue to expand our line, we make it easier for customers to find the exact cable they need off-the-shelf and with same-day shipping. By offering so many products as in-stock items we can ensure customers' meet their deadlines and avoid line down situations."

www.pasternack.com

2022 Show Diary

January	5-8 CES – www.ces.tech CES is organized by the Consumer Technology Association, the event typically hosts presentations of new products and technologies in the consumer electronics industry.	Las Vegas Convention Center Winchester, NV 89109	
January	25-27 IPC APEX EXPO – www.ipc.org IPC APEX EXPO 2022 will be packed with far-reaching ideas and insights. Join your peers and colleagues to share knowledge and push the boundaries of technology.	San Diego Convention Center San Diego, CA 92101	
February	15-17 Wafer-Level Packaging Symposium – www.smta.org The development of Advanced Package Technology is undergoing a massive change because Electrical System Architects are directly driving package performance requirements.	DoubleTree by Hilton San Jose, CA 95110	
February	27-1 ERA Conference – era.org This do-not-miss event provides an unparalleled opportunity to bring together manufacturers' representatives, distributors and manufacturers in a collaborative and energetic environment.	AT&T Executive Education and Conference Center Austin, TX 78705	
March	20-24 Applied Power Electronics Conference – apec-conf.org The Applied Power Electronics Conference (APEC) focuses on the practical and applied aspects of the power electronics business. This is not just a designer's conference; of interest for anyone involved in power electronics.	George R. Brown Convention Center Austin, TX 77010	
May	4-5 Del Mar Electronics & Manufacturing Show – manufacturing.show The Del Mar Electronic & Manufacturing Show is an event focusing on the consumer products and services in the field of home decor and electronics as well as technology based products.	Del Mar Fairgrounds San Diego, CA 92014	
May	10-13 Electronics Distribution Show – www.edssummit.com EDS is an important gathering of the movers, shakers and brightest minds that electronic component manufacturers, distributors and representatives have to offer.	Mirage Hotel & Resort Las Vegas, NV 89109	
June	27-29 Sensors Expo & Conference – sensorsconverge.com Join the sensors and electronics community June 27-29 at the one in-person and virtual event covering the biggest design engineering trends.	McEnery Convention Centre San Jose, CA 95113	
July	11-14 SEMICON West – www.semiconwest.org North America's premier microelectronics exhibition and conference that unites players across the entire electronics manufacturing and design supply chain.	Moscone Center San Francisco, CA 94103	
October	4-7 PCB West – www.pcbwest.com More than 2,500 designers, fabricators, assemblers and engineers register and more than 100 companies exhibit each year at the four-day technical conference and one-day sold-out exhibition.	Santa Clara Convention Center Santa Clara, CA 95054	
October	23-25 ECIA Executive Conference – www.ecianow.org Bringing together senior management teams from the electronics industry's leading companies - representing the entire supply chain - to understand and address cross-enterprise challenges.	Loews Chicago O'Hare Hotel Chicago O'hare, IL 60018	
November	15-18 Electronica – www.electronica.de Exhibitors from nearly every sub-sector of the electronics industry from at least 50 countries around the world with a comprehensive range of exhibits, all at a single location.	Messe München Munich, Germany 81829	

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ACOUSTIC COMPONENTS											
BeStar Electronics Ind. Co. Ltd.	BeStar Technologies Inc.	520-439-9204	www.bestartech.com	Y	N/A	\$250,000	N/A	100.00%	50	900	Y
CABLE & WIRING											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23235	N/A	\$0	0.46	50	1,000+	Y
Alpha Wire	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,106	N/A	\$0	93.00%	50	1,000+	Y
Belden Wire & Cable	Mouser Electronics	800-346-6874	www.mouser.com	Y	5,863	N/A	\$0	97%	50	1,000+	Y
Molex	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CIRCUIT PROTECTION											
Bel Fuse	Bel Fuse	+1 201 432 0463	belfuse.com/circuit-protection	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	\$0	68.00%	50	1,000+	Y
Eaton	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,487	N/A	\$0	100%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	28,790	N/A	\$0	67%	50	1,000+	Y
Schurter	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	31,445	N/A	\$0	68%	50	1,000+	Y
DISPLAYS & LEDs											
BIVAR	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,390	N/A	\$0	99.00%	50	1,000+	Y
Dialight	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,179	N/A	\$0	84.00%	50	1,000+	Y
Displaytech	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Electronic Assembly	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kingbright Company, LLC	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	\$0	100.00%	50	1,000+	Y
Lumileds	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Newhaven Display	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,690	N/A	\$0	100.00%	50	1,000+	Y
VCC	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ELECTROMECHANICAL											
ALPS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Apem, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,326	N/A	\$0	83.00%	50	1,000+	Y
C&K Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	27,230	N/A	\$0	90.00%	50	1,000+	Y
E-Switch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Grayhill	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Keystone Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ELECTROMECHANICAL (Continued)											
NKK Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	13,976	N/A	\$0	86.00%	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Panasonic	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PUI Audio	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schneider Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Sensata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne Relays	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ENCLOSURES											
Bud	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bud Industries	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	80.00%	50	1,000+	Y
Hammond Manufacturing	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,839	N/A	\$0	82%	50	1,000+	Y
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	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Labs	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ICs & SEMICONDUCTORS											
Analog Devices, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,749	N/A	\$0	95%	50	1,000+	Y
Broadcom Limited	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor Corp.	Future Electronics	(800) 675-1619	www.futureelectronics.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Cree, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cypress Semiconductor Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	81.00%	50	1,000+	Y
Digi International	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Diodes Incorporated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FTDI	Mouser Electronics	800-346-6873	www.mouser.com	Y	94	N/A	\$0	100%	50	1,000+	Y
IDT (Integrated Device Technology)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Infineon	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,580	N/A	\$0	63%	50	1,000+	Y
Intel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ISSI	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lattice	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MACOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	\$0	100%	50	1,000+	Y
Microsemi	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Nexperia	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	\$0	100%	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	\$0	96%	50	1,000+	Y
Power Integrations	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Qorvo	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Renesas Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
SanDisk	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	\$0	100.00%	50	1,000+	Y
Skyworks	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	\$0	96.00%	50	1,000+	Y
Swissbit	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	\$0	94%	50	1,000+	Y
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	\$0	77%	50	1,000+	Y

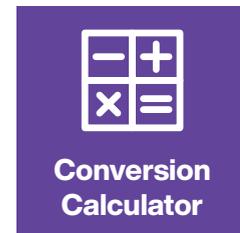
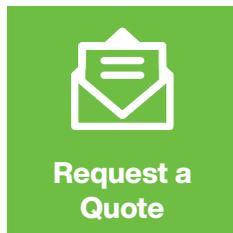
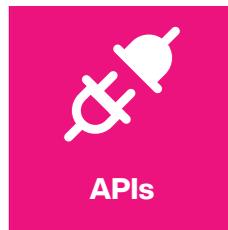
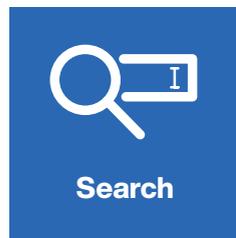
Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
INTERCONNECTION											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23,235	N/A	\$0	46.00%	50	1,000+	Y
Aero Conesys	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	Mouser Electronics	800-346-6873	www.mouser.com	Y	165,853	N/A	\$0	31%	50	1,000+	Y
Anderson Power Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Aptive (Delphi)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bel Magnetic Solutions	Bel Fuse	+1 858 676 9650	belfuse.com/magnetic-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cinch	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cinch Connectivity/Bel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cinch Connectivity Solutions	Bel Fuse	+1 507 833 8822	+1 507 833 8822	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ERNI Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FCI	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,394	N/A	\$0	73.00%	50	1,000+	Y
Glenair	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Harting	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,160	N/A	\$0	51.00%	50	1,000+	Y
Harwin	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Hirose Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ITT Cannon	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ITT Cannon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
JAE Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,02	N/A	\$0	100%	N/A	N/A	Y
JST	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
LEMO	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mill-Max	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	\$0	89%	50	1,000+	Y
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	\$0	100%	50	1,000+	Y
NorComp	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	\$0	77.00%	50	1,000+	Y
Radiall	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	\$0	27%	50	1,000+	Y
Stewart Connector	Bel Fuse	+ 1 717 235 7512	belfuse.com/stewart-connector	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	\$0	55%	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	\$0	69%	50	1,000+	Y
OBSCULENCE / HARD TO FIND											
	Lansdale	602-438-0123	lansdale.com	Y							
	Lantek Corp.	973-579-8100	www.lantekcorp.com	M	186,000	\$22M	\$0	75.00%	5	62	Y
	Rochester Electronics	978-462-9332	www.rocelec.com	Y		N/A	\$250		10	400+	Y
OPTO ELECTRONICS											
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	582	N/A	\$0	99.00%	50	1,000+	Y
Finisar	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,927	N/A	\$0	99%	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PASSIVES											
ABRACON	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
AVX	Mouser Electronics	800-346-6873	www.mouser.com	Y	42,454	N/A	\$0	72%	50	1,000+	Y
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	38	N/A	\$0	78%	50	1,000+	Y
Cornell Dubilier	Mouser Electronics	800-346-6873	www.mouser.com	Y	24,145	N/A	\$0	71%	50	1,000+	Y
Coilcraft	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	26,533	N/A	\$0	98.00%	50	1,000+	Y
Fair-Rite	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kemet	Mouser Electronics	800-346-6873	www.mouser.com	Y	77,568	N/A	\$0	66%	50	1,000+	Y
KOA Speer	Mouser Electronics	800-346-6873	www.mouser.com	Y	34,078	N/A	\$0	58%	50	1,000+	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	33,780	N/A	\$0	99%	50	1,000+	Y
Nichicon	Mouser Electronics	800-346-6873	www.mouser.com	Y	20,389	N/A	\$0	84.00%	50	1,000+	Y
Ohmite	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,293	N/A	\$0	55.00%	50	1,000+	Y
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,948	N/A	\$0	100.00%	50	1,000+	Y
Signal Transformer	Bel Fuse	+1 516 239 5777	belfuse.com/signal	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	\$0	98.00%	50	1,000+	Y

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
PASSIVES (Continued)											
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	\$0	100.00%	50	1,000+	Y
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	\$0	64.00%	50	1,000+	Y
Würth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	\$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	\$0	100.00%	50	1,000+	Y
POWER & BATTERIES											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bel Power Solutions	Bel Fuse	Power & Batteries	belfuse.com/power-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mornsun	+1-978-567-9610/+1-978-293-3923	www.mornsunamerica.com		N/A	N/A	\$0	100%	N/A	2000+	Y	
Pihong	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
RECOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schaffner	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK Lambda	Mouser Electronics	800-346-6873	www.mouser.com	Y	405	N/A	\$0	80.00%	N/A	N/A	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vicor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
REED SWITCHES											
HSI Sensing	HSI Sensing	405-224-4046	www.hsensing.com	M	75	N/A	\$200	100.00%	15	275	N
SENSORS											
ams	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Analog Devices Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bosch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,059	N/A	\$0	64.00%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,379	N/A	\$0	45.00%	50	1,000+	Y
Melexis	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,915	N/A	\$0	59.00%	50	1,000+	Y
Sensirion	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
STMicroelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	914	N/A	\$0	65.00%	50	1,000+	Y
SWITCHES & KEYBOARDS											
OTTO	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TEST & MEASUREMENT											
B&K Precision	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Fluke	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,008	N/A	\$0	94.00%	50	1,000+	Y
Keysight	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lasca Electronics		814-835-0621	www.lascarelectronics.com	Y	130	\$602,000	\$0	100%	10	175	Y
Tektronix	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	\$0	96.00%	50	1,000+	Y

Contract Manufacturers Buyers' Guide

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



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Internal Sales Assistant

Texas, Florida

Material Manager

Texas, Florida