

ELECTRONICS

APRIL 2022

sourcing

AN MMG PUBLISHING TITLE

NORTH AMERICA

SEMICONDUCTOR
SOURCING, KEEP YOUR
EYES ON THE HORIZON
PAGE 22

Take your
eProcurement
to the next level



LEARN MORE



DIGI-KEY DIGITAL SOLUTIONS

Take your eProcurement to the next level

Learn more at digikey.com/digitalsolutions



Digi-Key is an authorized distributor for all supplier partners. New products added daily. Digi-Key and Digi-Key Electronics are registered trademarks of Digi-Key Electronics in the U.S. and other countries. © 2022 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA



On the cover – April 2022

Semiconductor sourcing, keep your eyes on the horizon page 22

Editor's Word



On the road again

Electronics Sourcing and its new sister title *Designing Electronics North America* (DENA) are truly international magazines with their readership, contributors, advertisers and suppliers spread evenly across the USA, mainland Europe and the United Kingdom. As a result—bar the last two years—the publishing team is always on the move, with significant time spent in face-to-face conversations with readers and supporters at key industry events.

With the shackles of Covid now removed, we are on the road again. As I write this leader I'm welcoming two of the team home following their trip to the APEX exhibition which took place in Houston, while I myself am preparing for a press conference in London. In May, the team is heading to the *Del-Mar Electronics and Manufacturing Show* in San Diego, quickly followed by the *EDS Leadership Summit* in Las Vegas: and so it rolls on.

Why am I mentioning this? In essence I'm highlighting how the *MMG Publishing* team works hard to physically place itself alongside readers and advertisers alike, with an open invitation to take time to discuss editorial opportunities and marketing campaigns.

Sometimes the magazines have their own exhibition stand, providing a focal point and lounge area. At other times we work on the move as roving reporters, using coffee shops and exhibitors' stands as places for conversation. So if you see *MMG Publishing*, *Electronics Sourcing* or *DENA* listed as an exhibitor or media partner at an event you are planning on attending or exhibiting at yourself, please drop by and let's discuss the future of electronics distribution and design.

Jon Barrett

Contact

EDITORIAL
Managing Editor: Jon Barrett
 jonb@electronics-sourcing.co.uk
Contributing Editor: Amy Barker
 amyb@electronics-sourcing.co.uk
Director of Media & Communications: Thomas Smart
 thomas.smart@electronics-sourcing.co.uk

ADVERTISING
Director of Sales: Emma Evernden
 emma.evernden@electronics-sourcing.co.uk

DESIGN
Production & Design Manager: Josh Hilton
 josh.hilton@electronics-sourcing.co.uk



CIRCULATION
Circulation Manager: Vicky Leary
 vicky.leary@electronics-sourcing.co.uk
Circulation Account Manager: Liz Poole
 liz.poole@electronics-sourcing.co.uk

PUBLISHER
Mark Leary
 mark.leary@electronics-sourcing.co.uk
Director of Operations: Denise Pattennden
 denise.pattennden@mmgpublishing.co.uk

Issue 115, Vol.13 No.04
 Published 12 times per year
 by MMG Publishing US Ltd
 MMG PUBLISHING US Ltd
 Normandale Lake Center
 8400 Normandale Lake Boulevard
 Suite 920, Bloomington MN 55437
 Tel: 866.364.0951
 Fax: 952.378.2770
 @Electrosourcing

Printed in the United States
 © 2022 MMG Publishing US Ltd



Articles appearing in this magazine do not necessarily express the views of the Editor or the publishers. Every effort is made to ensure the accuracy of information published. No legal responsibility will be accepted by the publishers for loss arising from articles / information contained and published. All rights reserved. No part of this publication may be reproduced or stored in a retrieval system or transmitted in any form without the written consent of the publishers.

NEWS



Chip shortages' impacting product design

04

QUALITY



Silver lining for quality programs

14

CONNECTORS



Building an all-electric society

20

Q&A



Buyers' guide to GaN

24

BUYERS' GUIDE



All the facts and figures to help you buy

30



E-mobility partnership announced

Newark and Würth Elektronik have joined forces to provide a wide range of electronic components, expert knowledge and added-value services to help EV product developers overcome design challenges and achieve their goals.

Würth Elektronik's products are designed to simplify the handling of the high currents found in charging and electric motor control. The company's EMC solutions offer support for fast charging and increase product life, reducing electrical waste and helping to future-proof the EV market.

Newark's global head of IP&E, Simon Meadmore, said: "Our customers will benefit from Würth Elektronik's very wide product portfolio, in-stock availability, design-in support and other added-value services to accelerate time-to-market of superior end-products."

Würth Elektronik's VP global distribution and new markets, Lars Fahrbach, added: "We take the noise out of e-mobility. Following this ethos, we have been transferring our comprehensive expertise in the EMC world to the future of mobility. We are proud to present our e-mobility portfolio in cooperation with our partner Newark."

www.newark.com

Chip shortages' impacting product design



The global component shortage is having a ripple effect on product design according to Avnet's Insights survey. When design-in components are not available, most rely on redesigned boards, pin-to-pin replacements with better specs or drop-in replacements. These preferences vary regionally; designers in the Americas are most likely to use drop-in replacements, with nearly three-in-four saying they have done so.

But Avnet found that availability is impacting more than just where engineers are seeking the parts for their designs, it is also impacting how they create designs.

Avnet's vice president of sales enablement and supplier development, Peggy Carrieres, said: "The shift from designing based on first choice to designing based on first available for a prolonged period is a ripple effect from the overall shortages. However, it also represents an opportunity for engineers to lean on their partners with added visibility into the supply chain to ensure they are creating flexibility in their designs based on market conditions to avoid compromising quality."

www.avnet.com

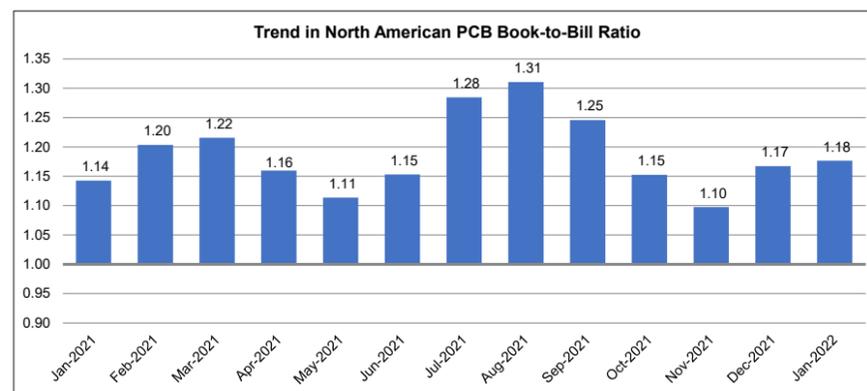
North American PCB sales up 7.7 per cent in January

IPC has announced the January 2022 findings from its North American Printed Circuit Board Statistical Program. Book-to-bill ratio stands at 1.18.

Total North American PCB shipments in January 2022 were up 7.7 per cent compared to the same month last year. Compared to the preceding month, January shipments fell 22.1 per cent. PCB year-to-date bookings in January were up 6.3 per cent compared to last year. Bookings in January fell 28.1 per cent from the previous month.

IPC chief economist, Shawn DuBravac, said: "Supply chains are showing some early signs of improvement, which is helping fuel shipment growth at the start of the year. But backlogs remain higher as manufacturers work through strong orders. We believe supply chain constraints will continue to slowly ease through the remainder of the year which should help companies improve shipment schedules."

www.ipc.org



1887

Emile Berliner receives the patent for the gramophone.

James Blyth builds the first electricity generating wind turbine.

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

Sager opens its first location in Boston, Massachusetts.



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

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

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

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

SAGER
ELECTRONICS®

DISTRIBUTING CONFIDENCE™ FOR
135 YEARS

Sager Electronics, a TTI Inc., Berkshire Hathaway Company

www.sager.com | 1.800.724.8370

In Brief

Revolutionizing automation

Digi-Key Electronics has launched Revolutionizing Automation, a new video series exploring cutting-edge automation and control technologies. Sponsored by Omron and Siemens, the four-part video series highlights how Digi-Key processes over 5.3 million orders annually with an efficient and effective supply chain enabled by the world's leading suppliers. www.digikey.com

Replacement JFET switch

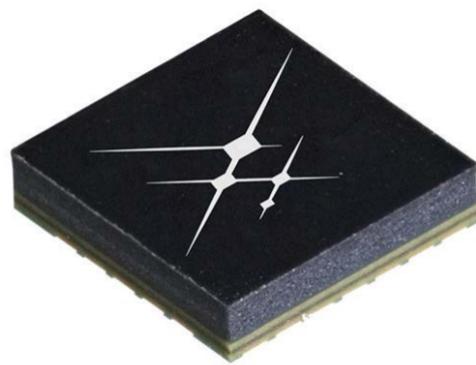
Linear Integrated Systems has released a direct, pin-for-pin replacement for the Philips/NXP BF510. President, Timothy S. McCune, said: "These are highly capable parts used in a variety of applications and establishing Linear Systems as an ongoing source for them will be important to a wide range of users." linearsystems.com

Capacitor acquisition

Kyocera AVX is set to acquire Rohm Semiconductor's tantalum and polymer capacitor business assets, including manufacturing lines and relevant intellectual property. Kyocera AVX's CEO, Johnny Sarvis, said: "Kyocera AVX is excited to announce the acquisition of Rohm Semiconductor's tantalum and polymer capacitor business assets and further expand its portfolio of electrolytic capacitor solutions." www.kyocera-avx.com

Improved buying experience

Allied Electronics & Automation has upgraded its website to improve the buying experience. Updates include: streamlined search and filtering functions for finding and comparing products; a centralized area for managing email preferences; and a revamped order history interface to provide customers with straightforward access to previous orders, order status updates and reordering capabilities. www.alliedelec.com



Multi-band RF IoT front-end module now shipping

Mouser Electronics is stocking Skyworks Solutions' SKY68031-11 multi-band RF IoT front-end module. The low-profile product supports LTE-M and NB-IoT transceiver platforms, offering output power up to +23.5dBm optimized to support LTE for 1RB to 6RB.

The module integrates the entire RF front end necessary for an LTE multi-band radio operating in low and mid-band frequencies. This feature includes a broadband power amplifier with bias controller, transmit low-pass harmonic filter, antenna switch and MIPI RFFE controller.

The module's PA load-line is optimized for high efficiency, while simultaneously meeting 3GPP ACLR and emissions mask specifications with LTE up to 6RB. The integrated low-pass filter rejects the PA and transceiver harmonics while at the same time minimizing any post-PA loss for an optimized transmit current consumption. Out-of-band emissions performance is emphasized by the design to be 3GPP-compliant for low-band and mid-band frequencies.

www.mouser.com

2W DC/DC converter suits IoT applications



With its RSH2 series, Recom has added a regulated, low-noise, isolated, SMD, 2W DC/DC converter to its portfolio. With nominal inputs of 3.3, 5/9, 12 and 24V, it suits battery and bus-powered systems in industrial, IoT, test/measurement and transportation applications.



Buying into sensor products

CUI Devices' Sensors Group has added pressure sensors to its portfolio. Offering absolute, gauge and sealed gauge pressure types, these sensors are based on piezo technology and feature analog or digital I2C outputs and pressure ranges from 0kPa to 100MPa. All PS series models are temperature compensated and housed in stainless steel construction with an O-ring seal, making them ideal for applications including industrial, scientific, medical, white goods and more.

The sensors offer excitation ratings of 3.3, 5 and 10V or 1.5mA. Terminations are 3, 4, 5 or 6-pin. All models are 19mm diameter and 14mm high, while carrying accuracy ratings as low as ±0.2 per cent and operating temperature ranges from -40 to 125°C.

The sensors are available immediately with prices starting at \$38.28 per unit at 100 pieces through distribution. OEM pricing is available.

www.cuidevices.com

The converters are available with outputs of 3.3, 5, 12, 15 or 24V. Short-circuit and overcurrent protection are provided. A simple external filter lets them meet EN55032 Class A or B limits for input noise. No minimum load is required. On/off control is standard. Isolation power is 2kVDC/60s (optional 3kVDC/60s) with UL/IEC/EN 62368-1 certification.

The series operates without power derating at temperatures from -40 to 85°C and is RoHS-2 compliant.

Supplied in a compact, lightweight DIP14 SMD package, the converters can be soldered in infrared oven and vapor phase reflow processes using industry standard JEDEC profiles.

www.rutronik24.com

It's The Human Component That Sets TTI Apart

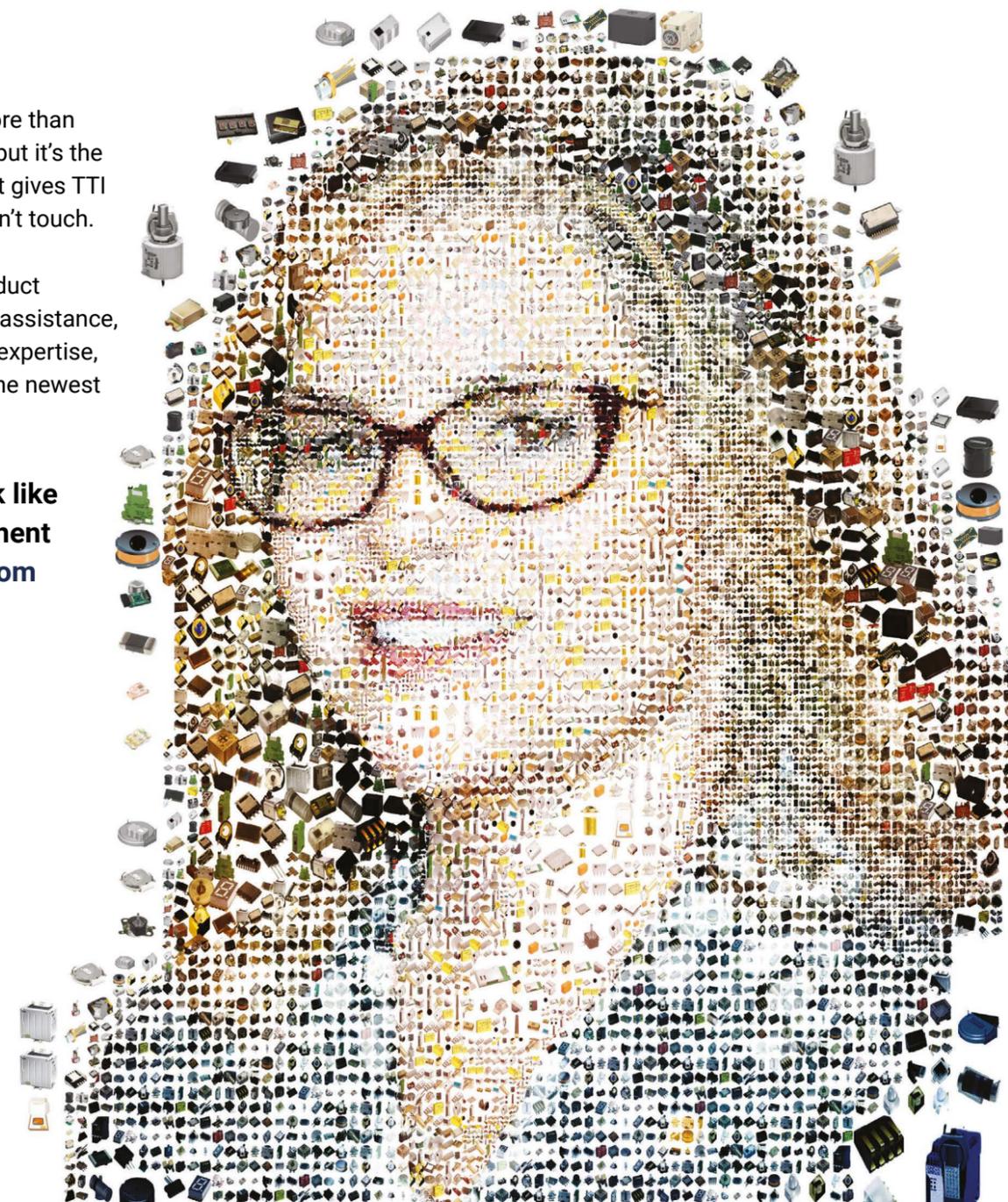
Sure, we warehouse more than 850,000 part numbers, but it's the Human Component that gives TTI an advantage others can't touch.

TTI Specialists add product knowledge, purchasing assistance, industry trends, design expertise, supply chain updates, the newest technology and more.

See what you'd look like as a human component at ttipartsportrait.com

The
HUMAN
COMPONENT

Natalie Jozefiak
Business Development
Manager



The Electronic Components Specialists

1.800.CALL.TTI | tti.com

A Berkshire Hathaway Company

Smart-home: it's a matter of time



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

Using his own experience planning and integrating a Smart-home, John Denslinger, is looking forward to new device compatibility technology due in 2022

Smart-home • By John Denslinger

Forty years in the electronics industry and still fascinated by innovative technology: how great is that? So, when I decided to build a new house in 2021, I knew it had to be Smart. Typically, I wouldn't expound on a personal activity, but the experience produced some real eye-openers worthy of honest, technical discussion.

Planning a Smart-home was easy, integrating one was not. The market is flooded with products covering every imaginable function and under-estimating the importance of brand selection caused more than one false start. User set-ups were needlessly difficult and I quickly recognized compatibility was a big problem. Meshing with other devices was trial and mostly error. Adding another smart function—plan on buying another device. Then there was the burden of managing a multitude of apps. A typical Smart-home may require 15 or more apps for functional control, monitoring or basic information. At this stage of implementation, my Smart-home eco-system involves 12 apps. For perspective, here is a breakdown of devices currently in-play:

Connectivity	Systems management, safety and security	Convenience
Wi-Fi (1G FTTH)	Smart digital door lock	Smart lights
Bluetooth	Smart doorbell w/ video recording and two-way communications	Smart voice assistants
Z-wave	Smart garage door controller	Smart TVs
	Smart exterior security w/video recording camera	Roku for non-smart TVs
	Smart interior security w/sensors for smoke, motion detection, glass breakage and panic w/third party monitoring	Direct streaming of video / audio content
	Smart thermostats	Smart window shades
	Smart sprinklers	Smart refrigerator
	Primary line surge protection	Smart coffee
		Smart printers
		Smart plugs and switches
		Motion sensing lights
		Wireless speakers
		Smart vacuum

Homeowners, like myself, see AI technology saving energy, saving time, increasing both comfort and convenience in daily living. This was also the conclusion of a 2021 Smart-home study by LG ThinQ. While early adopters tended to be techies, the work-from-home movement really transformed Smart-home into a mainstream need. With that said, there remains much to improve upon, particularly device compatibility and system complexity.

Why is it a matter of time? If all goes well, a much-needed breakthrough will occur in 2022: a common language protocol. Smart-home devices will be able to communicate with each other regardless of brand. The initiative is being championed by Apple, Amazon, Google, Samsung, and other well-known companies who recognize the tremendous value of creating a common platform for Smart-home growth. The new standard is named Matter. Matter will simplify installation. Adding Matter-compatible devices to your network might be as easy as scanning QR codes. Matter is designed to work with minimal internet dependence thus offering faster response times while assuring greater privacy and improved security.

Smart-home products bought within the last few years are said to work with the new standard, but anything older, plan on replacing. One additional caveat mentioned dealt with complex products like cameras and appliances. These are not expected to sync initially. One could say: 'that's the price of innovation'. As a cost-sensitive consumer though, that news is quite disappointing.

Matter is the missing link to faster Smart-home adoption. ABI Research seems to concur predicting 5.5 billion Matter-compliant Smart-home devices shipped by the end of this decade. That's huge. Smart-home...it's a Matter of time.



WORLD-CLASS COMPONENT SOURCING.

Fusion Worldwide is the premier sourcing distributor of electronic components and finished products. We work alongside customers to create customized solutions to overcome their biggest supply chain challenges.

Learn more about the Fusion Advantage at www.fusionww.com.



Distributors see rising sales from auto industry

The auto industry is facing continuing chip shortages and many tier 1-4 automotive suppliers are turning to distributors for parts and services



James Carbone

Distributors report that sales to tier 1-4 automotive suppliers have grown significantly over the last two years as many semiconductors and other components needed by the automotive industry have been in short supply.

While chip shortages have contributed to distribution sales growth, it is not the only reason distributor business in the automotive segment has grown robustly. Distributors note that electronic content in vehicles continues to increase as automakers design in more sophisticated advanced driver assistance systems, which are chock full of semiconductors and other components. In addition, automakers are increasing production of electric vehicles (EVs), which have a higher electronics content than internal combustion engine automobiles.

As a result, many automotive suppliers that build systems, subsystems and modules for carmakers, need to buy more semiconductors, passives, connectors and other parts. Many of those automotive suppliers, purchase from distributors.

One distributor that has seen its sales from automotive increase over the last several years is Digi-Key. "We have many different customers in this segment from individual engineers, design companies, OEM/ODMs and contract

manufacturers," said Ian Wallace, vice president, Americas and EMEA business development for Digi-Key.

Digi-Key's global growth was more than 60 per cent in 2021 compared to 2020, and the "automotive market played an important part in that," according to Wallace. He said semiconductor shortages have helped drive Digi-Key's business over the past two years.

"Semiconductors have been the biggest area of shortages but there have also been shortage requirements from customers on passive components too, such as MLCCs, resistors and inductors," said Wallace. But even if there weren't any shortages, component demand from the automotive segment would have grown, albeit not at the same rate, because of rising electronics usage in automobiles, light trucks and most other commercial and off-road vehicles.

Chip content rises

"The use of electronics in cars has increased steadily with each new model or generation in recent years," said Wallace. In addition, demand for "certain electronic components is really accelerating due to electric vehicles, electric vehicle chargers and autonomous applications," he said. Digi-Key supplies a range of components for EVs and chargers



Gabe Osorio, director, transportation business unit marketing, Americas for TTI

"Within transportation, EVs are our fastest growing market segment"

including microcontrollers, digital signal processors, power management components such as DC/DC converters and sensors.

Many different kinds of sensors are being used in the latest cars for applications such as voltage control, temperature control, current control, humidity sensors, distance control, speed control/throttle position, seat occupancy and movement/gesture control, said Wallace.

Digi-Key is adding lines to further support the automotive segment. "Yes, Digi-Key has always stocked the newest parts from our growing line-up of authorized

manufacturers," said Wallace. The high-service distributor wants to "provide the broadest range of components to cover as many applications as possible" in the automotive industry, he said. "We are constantly increasing the selection and availability of parts across various product families," said Wallace.

Automotive is also an important growth segment for TTI, which supplies connectors, passives, electromechanical devices, discretes, circuit protection, sensors and charging couplers to the auto industry.

TTI has seen strong growth from its transportation

segment, which includes "anything that moves on land or in water with the exception of military and aerospace," said Gabe Osorio, director, transportation business unit marketing, Americas for TTI. Cars, commercial trucks, recreational vehicles, boats, trains, all-terrain and agricultural vehicles and other vehicles are part of transportation. However, automotive sales account for 60 per cent of TTI's revenue in the transportation segment, he said.

"Within transportation, EVs is our fastest growing market segment in transportation," said Osorio. That could be because more electric vehicles are shipping than just a few years ago and EVs have a higher electronics content than internal combustion vehicles. For instance, the semiconductor content of an internal combustion car is about \$620 while content in an EV is about \$1,200, according to researcher IC Insights.

The importance of EV

The distributor supplies the same components for EVs that it does to internal combustion engine vehicles: interconnect, passives, electromechanical, discretes, circuit protection, sensors, as well as charging couplers. "TTI has placed a high importance on the EV segment and has a very robust and dedicated strategy to support and grow this market," said Osorio.

"Automotive is a very important if not critical market segment for TTI and our transportation group," said Osorio. "It grows steadily each year and its share of our business stays pretty level and steady," he said.

Osorio said TTI has a very "focused and strategic line card especially when it comes to transportation and automotive." TTI carries components from the world's top automotive, interconnect suppliers "as

well as top suppliers in other technologies," he said.

"We are not necessarily wanting to grow our line card in terms of suppliers but rather are looking to augment our existing lines with other core technologies crucial to the transportation, EV and autonomous markets," said Osorio.

Another distributor that has durable sales growth in the automotive segment is Avnet. "We have experienced well over double-digit growth in automotive for the past two years, and there is no indication that this will slow down," said Jason Skoczen, sales director, lightspeed and transportation of Avnet. The reason for the growth is partially due to the shortages but it is "primarily due to the technology advancements, new emerging companies, and the amount of semiconductor content that is included in passenger vehicles," Skoczen said.

While Avnet supplies a range of semiconductors, passives and interconnect devices to automotive customers, it also offers them "financial service models and supply chain services. We are also engaging with the OEMs directly and discussing how we can provide logistics services to them," he said.

Avnet also supplies parts for EV production, including power ICs, interconnect, microcontrollers to auto OEMs, charging station companies and module integrators.

Checking for technology gaps

Avnet will add linecards "if we have any technology gaps for how we need to support the industry," said Skoczen. Avnet is constantly evaluating the companies on its line card, checking where the market is heading, he said.

Skoczen said automotive has specific requirements that

"Semiconductors have been the biggest area of shortages but there have also been shortage requirements from customers on passive components too, such as MLCCs, resistors and inductors"



Ian Wallace, vice president, Americas and EMEA business development for Digi-Key

must be met, particularly as regards to safety. "Much of that is handled at the manufacturing and component level. However, we have the ability to provide the necessary documentation that is required to use automotive components," he said.

Avnet has a dedicated quality team specific to automotive that has a "deep expertise of automotive requirements and certifications to ensure we are meeting our customers' needs," Skoczen said.

Wallace said requirements from automotive customers often are different than other customer segments. "Certain markets and applications require different levels of component durability and component traceability and the automotive sector is one of them," he said. Digi-Key supplies a range of automotive specified parts and provides traceability of parts, which at Digi-Key are all from authorized sources and manufacturers said Wallace.

"We work closely with several automotive customers to ensure the supply of key components, whether for new product introduction or high-mix or low-to-medium production quantities," he said.

Osorio said that automotive customers are "strict and require significant data such as testing and have design cycles. He added there is a "significant amount of liability" to manage as well as long-term service agreements to support.

TTI's value proposition supports this type of business. "We are a stocking distributor first. We know that having available-to-sell inventory paired with our unique supply chain solutions such as proximity warehouses, in-plant stores, and APIs, position us to continue to grow with the automotive market and strengthen our position as a preferred supplier partner," said Osorio.

Investing in lead-free R&D

In this article, IPC highlights new investment in lead-free R&D, while also warning readers that high material and labor costs continue to challenge the sector

The US Senate has approved an FY2022 spending package containing \$7.5 million for further lead-free R&D in defense and high-performance applications, sending the measure to President Biden for his expected signature.

IPC vice president of global government relations, Chris Mitchell, said: "With lead-based electronics becoming more difficult and expensive for the US Defense Department to procure—and with other nations now leading the world in electronics manufacturing—greater US reliance on lead-free electronics is imperative to improve military readiness and innovation.

"The migration of the commercial electronics industry to lead-free technology has created supply-chain concerns for the defense and high-performance sectors that can only be overcome through public-private R&D. These funds will support an ongoing, collaborative effort that will help ensure that mission-critical systems have full access to cutting-edge electronics from a robust global supply chain.

"It's also important to realize that the lead-free electronics R&D project is both consequential as a stand-alone project and as a test of American resolve to reassert leadership in electronics. We thank the congressional leaders who understand this issue, and we call on Congress to keep funding this project to completion over the next three years."

Participants in the two-year-old R&D program include Auburn University, Binghamton University, Purdue University, University of Maryland, BAE Systems, Boeing, Lockheed Martin, Northrop Grumman, Plexus, Raytheon Technologies and others. The R&D is being carried out under the auspices of the Defense Electronics Consortium of the US Partnership for Assured Electronics (USPAE).

In other IPC news, data shows that high material and labor costs are expected to continue for the foreseeable future while recruiting and retaining skilled talent continues to be a challenge.

IPC's March economic update and global electronics manufacturing supply chain sentiment reports found that more than nine in 10 manufacturers have experienced an increase in lead times for parts and components since the start of the pandemic, with approximately half indicating an increase of one to three months. The overall global economic picture is also complicated by the emerging Russia-Ukraine conflict.

Among other conclusions, the IPC survey results show:

- More than three-fourths of electronics manufacturers are experiencing rising material and labor costs, and most expect this to continue for six months
- Ease of recruitment, inventory available from suppliers and profit margins are declining

- Sentiment improved slightly this month, suggesting supply chain constraints are continuing to ease
- Firms operating globally are seeing a quicker rate of improvement regarding available inventory compared to those operated only in North America

IPC chief economist, Shawn DuBravac, said: "Any disruption to an already stressed supply chain can have an outsized impact. Until recently, there was a general feeling in Europe that the economy was set to accelerate and leave Covid in its rearview mirror. The Russia-Ukraine conflict changes this somewhat."

www.ipc.org

The migration of the commercial electronics industry to lead-free technology has created supply-chain concerns for the defense and high-performance sectors that can only be overcome through public-private R&D

Enclosure products



Enhanced enclosure stability

OKW has updated the canting kit for its Smart-Terminal extruded aluminum enclosures, enhancing stability when used as a desktop housing.

Smart-Terminal is a handheld, desktop and wall-mount enclosure. Applications include: peripheral and interface equipment; office and communications technology; safety engineering; biometrics; medical and laboratory technology; automation, smart factory and Industry 4.0; gateways; measurement and control engineering.

OKW has subtly redesigned the canting kit used

to incline the enclosure at a 12deg angle for more ergonomic viewing and operation. Each of the two triangular canting stands now features additional location elements, ensuring greater stability.

The kit includes two stands and four anti-slip rubber feet. The stands are molded from ASA+PC-FR in lava to match the enclosure end covers. No screws are needed, the stands slide into the base and are held in place by the end covers and soft-touch TPV seals.

www.okwenclosures.com



Smooth equals clean

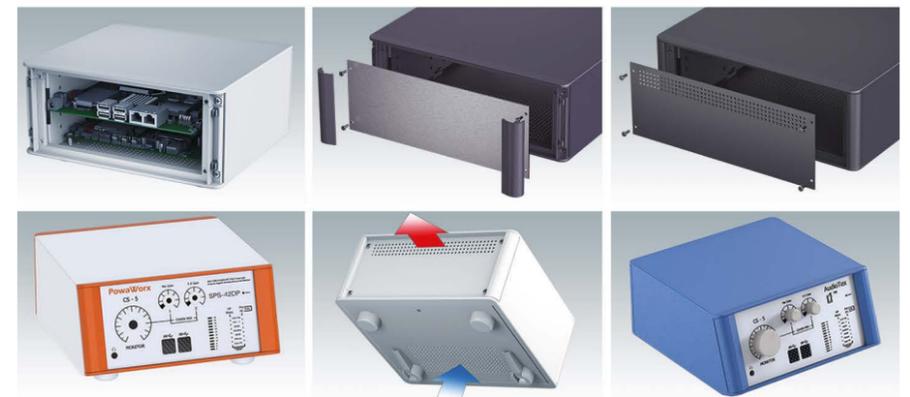
Hammond Manufacturing's new HYJ Series 304 stainless steel enclosures are designed for hygiene critical environments. They meet UL508A Type 3R, 12, 4 and 4X, NSF-ANSI169 and IEC60529 IP69/IP69K. They withstand high temperature, high pressure washdown and are free of dirt traps.

The family is initially available in five sizes from 7.94 by 4.88 by 4.00in to 16.36 by 13.30 by 8in. The symmetric design means units can be vertically or horizontally mounted. All sides slope to ensure water quickly drains off after cleaning and a smooth finish stops water pooling. There are no slotted screw heads, quarter turn latches or welded mounting brackets. The front cover is secured with crevice-free hex head bolts fitted with a silicone washer.

A blue hygiene silicone gasket is fitted beyond the cover edges and is removable for cleaning or replacement. To eliminate dirt traps behind the enclosure, stand-offs ensure the HYJ is fixed proud of the wall.

www.hamfmfg.com

ALUMINUM INSTRUMENT ENCLOSURES



DESKTOP/PORTABLE CASES

TECHNOMET is our latest and most advanced range of instrument housings. Standard features include snap-on trims which hide all the fixing screws, ventilation slots, bail arms, ABS tilt feet and an internal chassis for fitting PCBs. The enclosures can also be supplied fully customized to your exact specifications.

METCASE ENCLOSURES

800 965-9872 | www.metcaseusa.com



METcase



Silver lining for manufacturing and quality programs

Sanmina Corporation's SVP and CQO, Anca Thompson and VP medical quality and regulatory affairs, Tim McGinnis, explore the pandemic's influence on quality procedures

If someone had told manufacturers a few years ago they would have to cope with temporary closure of facilities, travel bans and complex new restrictions once plants were reopened, no one would have believed operations could carry on effectively.

What we actually saw was tremendous resilience, with manufacturers and quality teams successfully navigating their way through new rules, restrictions and PPE requirements. They continued running operations effectively and managed to support demand spikes for essential goods, such as medical products.

There will not be a distinct moment that signals the pandemic's end and the world returns to normal. However, we can expect a gradual diminishing over time. In the meantime, quality professionals are wasting no time incorporating lessons they have learned to bolster their quality assurance programs. These improvements help them to continue addressing

pandemic-related requirements, while also ensuring more cost effective, efficient and flexible operations moving forward.

First line of defense

Sanmina's ability to respond quickly, pivot and adapt when the pandemic arrived was largely a result of programs and procedures already in place. For example, the business continuity management system was originally developed at a global level so procedures, processes and templates were already established for worldwide distribution. Thus, a set of actions based on risk assessment and recovery were quickly available. A robust quality management system made it easier to address gaps arising from the pandemic, such as adjusted training for new health and safety protocols.

As governments restricted travel, Sanmina already had technology resources in place including cloud-based IT solutions, such as collaboration software and video conferencing, which quickly became the go-to platforms for managing

contract reviews and other quality activities.

Internally, the frequency of remote meetings and virtual communications between quality teams increased during the pandemic, so everyone stayed on track. As best practices were shared, new ways to work were discovered. Regular information sharing sessions provided an excellent platform to learn from experiences shared by teams in China, Singapore and Malaysia, then from the West as Covid-19 spread. Inspired by concern for the health and safety of colleagues, families and local communities, we found some of the best methods for social distancing practices came from staff.

Implementing new approaches

We expect to see practices adopted during the pandemic continue thanks to the efficiencies and value they have contributed to quality programs. Four of the most significant new approaches follow:

Employee training and social distancing methods: New health and safety procedures have emerged regarding personal protection and social distancing, including alternative sequencing of production lines, physical separators, PPE, screening methods and additional training for split shifts. These have been incorporated into business continuity plans and are now an integral part of protocols and training methods.

Remote audits: Audits can be performed more efficiently via video and web conferencing, provided IT departments have the right communications equipment and connectivity is assured when broadcasting from remote areas. Audits with regulatory bodies can be completed much faster, regardless of where they take place.

Remote document review: Working remotely requires digital management of contracts and device history records for regulated medical products. More parties and regulatory bodies have experienced the

optimise quality programs in this new remote environment:

More frequent communication: Whether across one or multiple factories, communication is essential. When evaluating potential risks and how to mitigate them, communicating scenarios across teams can help harness the best ideas. Employees are an organizations' most valuable asset and their collective knowledge and experience can only strengthen quality programs.

Increase in advanced planning: Taking time to plan and organize virtual audits, meetings and tours is critical, helping ensure the experience is productive for customers, prospects and auditors. Forecast and plan around scenarios brought about by the pandemic, such as how to manage preventative equipment maintenance, at a time when suppliers may have limited access. Planning ahead allows time to work through limitations and reset customer expectations.

Updated electronic tools: Expand technology tools and develop programs for remote use so they are optimized, even as travel resumes. Such tools have become the norm for daily operations and adoption will increase.

Revised employee reviews and projects: When planning budgets, projects, objectives, reviews and goals, factor in restricted travel, remote audits, remote meetings and electronic approvals and their impact on deadlines.

Reshaping the way people work

Remote working and virtual practices proved effective during the pandemic and many approaches will remain. Manufacturing industry was headed this way before the pandemic, as organizations embraced technology to streamline processes and minimise errors. Sanmina has benefitted from automation initiatives as it navigated social distancing and abbreviated manpower.

Moving forward, organizations can benefit from what they learned during the pandemic. Evaluating roles and reshaping job functions that can be done just as well, if not better, by working remotely or in rotating shifts will become a best practice. Supported by robust programs and consistent virtual communications, this approach will help manufacturers work smarter and more effectively, while saving significant time and cost.

www.sanmina.com



Remote working and virtual practices proved effective during the pandemic and many approaches will remain

CML INNOVATIVE TECHNOLOGIES
WHERE INNOVATION COMES TO LIGHT
formerly Chicago Miniature Lamp and SLI Miniature Lighting



Fast supply chain & global distribution

For details of your local distributor or to discuss your requirements further contact:

ussales@cml-it.com

www.cml-it.com

Testing antenna band switching performance

In this article, Kyocera AVX's global marketing manager antennas, Carmen Redondo, explains how the company's new antenna evaluation board reduces time-to-market

Kyocera AVX is launching an evaluation board for testing antenna band switching performance. It comprises standard products including: an embedded, universal broadband, FR4 LTE/LPWA antenna; Ether Switch & Tune chipset for band switching or aperture tuning; battery holder to power the RF switch; female SMA connector; and small evaluation board optimized for testing the antenna performance of standard-sized IoT devices.

The board is engineered for low and high-band frequency (968–960MHz and 1.71–2.17GHz) 4G, 5G, broadband LTE, LTE Cat-M, NB-IoT and cellular LPWA. Applications include cellular headsets and tablets, handheld electronics, embedded designs, telematics, tracking, on-board diagnostics systems, industrial M2M, IoT, healthcare, home automation and smart grid devices.

IoT devices tend to be rather compact and densely populated PCBs can significantly degrade the bandwidth and efficiency performance of the passive monopole and Planar Inverted-F antennas that are widely employed in mobile phones and other modern RF electronics but are susceptible to position-based performance changes and interacting with their surroundings, which can further complicate high-density PCB layouts.

Active antennas capable of band switching, also known as aperture tuning, cover a wider frequency range than passive antennas by actively switching between frequency bands. In addition, active antennas capable of covering the same frequencies as passive antennas have smaller form factors better suited to compact, high-density devices and, at equal size,

will cover more frequency bands than passive antennas.

Kyocera AVX's active antennas are equipped with patented Isolated Magnetic Dipole (IMD) technology, which is designed to deliver unique size and performance advantages including reduced ground plane and keep-out area size requirements for greater design flexibility, superior RF field containment for reduced interaction with surrounding components, and higher efficiency, gain, isolation and directivity characteristics.

Kyocera AVX's global marketing manager antennas, Carmen Redondo, said: "The new evaluation board is the first of its kind available in the global electronics market and will help RF design engineers: optimize antenna size, performance and emissions; reduce the



number of device design iterations; more easily satisfy customer and regulatory specifications; and hasten product time-to-market.

"It is also optimally sized for testing the performance of IoT devices, equipped with proven Kyocera AVX components including a high-performance, universal broadband, FR4 LTE antenna with patented IMD technology and an Ether Switch & Tune chipset."

www.kyocera-avx.com

eBOM.com

The GAME CHANGING site for the electronics industry



0402DC Wirewound Chip Inductors

The Highest Q in an 0402 Size



- 112 inductance values ... from 0.8 to 120 nH
- Includes 0.1 nH increments ... between 2.8 and 10 nH
- Exceptionally high Q ... up to 160 at 2.4 GHz!
- Handy Designer's Kit ... includes 20 samples of each value

Learn more @ www.coilcraft.com/0402DC

Coilcraft

powered by
TrustedParts.com

DISCOVER | SOURCE | COMPARE | BUY

Exclusively sponsored by 

Three Digital Transformation Considerations for Procurement Professionals

by Nathan Pray, manager, digital technology office – B2B, and Stephane Ratelet, digital solutions manager – EMEA, at Digi-Key Electronics



Stephane Ratelet, digital solutions manager – EMEA

The past two years have accelerated a digital revolution in the procurement industry. The transformation has been so profound that Digi-Key has invested in further development of its suite of digital solutions and tools for procurement professionals and also released an eBook on digital transformation in the procurement space.

As companies continue making the shift to digital, here are three takeaways to jumpstart your organization's digital transformation.

There are three major digital solutions, and it's important to select the one that will best serve your organization. Options include:

EDI (Electronic Data Interchange) – EDI provides a standardized format for sending purchase orders, acknowledgements, what's on hand, etc. Organizations can now use EDI to effectively manage their inventory, purchasing and forecasting all at once. EDI is most widely adopted by larger organizations, universities and NPI engineering companies, since it requires an organization to have proper EDI infrastructure prior to use.

Punchouts – A Punchout solution streamlines the purchasing process by making it easier for users to create accurate and detailed purchase orders through an automated process. Punchouts use an organization's existing technology to procure goods and services. These are most popular among medium to large B2B organizations and are even becoming a requirement for many RFPs.

APIs (Application Programming Interfaces) – APIs are a newer digital solution, but they're quickly gaining popularity because of how customizable they are for organizations of every size. Digi-Key's APIs are free to use and digitally connect customers' systems with Digi-Key's system to provide automated, real-time product search, price and availability, quoting and ordering, barcoding, product change notifications and more. Customers who use APIs have a competitive advantage, because they can receive critical information on products they need at lightning speed due to the automated connection.

A digital transformation improves the role of a procurement buyer. One of the biggest misconceptions about digital solutions is that they eliminate the role of a procurement buyer, but this is simply not true. Embracing digital solutions for procurement elevates your role – making it more strategic by reducing time spent on tedious tasks. A digital transformation simply helps you “work smarter, not harder,” as the adage goes.

The easiest way to get started with digital solutions is by setting up a quoting process.

A quoting process alone represents a major timesaver for whoever handles your organization's quotes. Establishing a quoting process will also show you the power and speed of digital solutions. In addition to efficiency, procurement professionals will be motivated by the ROI that accompanies digital solutions.

Take the first step toward streamlining your processes for efficiency by visiting Digi-Key's updated Digital Solutions site at www.digikey.com/digitalsolutions, and get ready to experience the success and speed that accompany automation.



Nathan Pray, manager, digital technology office – B2B

TrustedParts.com

Built by the companies you know and trust.



- ✓ Best defense against counterfeit components
- ✓ Proper packaging and handling
- ✓ Fully warrantied and supported by the manufacturer

Search authorized distributors at  TrustedParts.com

Building an all-electric society

TTI's business development manager, Steve Brahosky, discusses the connector technologies that will allow the promises of electrification to become realities

The desire to become less fossil-fuel dependent and reduce carbon footprints has led to innovation in e-mobility by private industry, with government initiatives serving as a catalyst. Attention has focused on interconnectivity within the vehicle, particularly high-voltage, high power connectors that withstand harsh electrical and physical environments. However, infrastructure is also needed to support e-mobility and the transmission of AC/DC power from the grid to the vehicle, along with data transmission between both for diagnostics and monitoring.

At the same time, component suppliers and design engineers are seeing the bigger picture of electrification's benefits—and infrastructure requirements—beyond the vehicle to the charging station and associated data links. As we innovate to

electrify transportation, we reveal opportunities to improve connectivity throughout society.

Beyond charging cables with emerging standards that control the connector interface, there are other solutions in the charging station or wall box. High-speed, high-reliability connectors will transmit data from those charging stations and electricity meters, delivering real-time intelligence on electrical demand.

Thanks to this smart grid technology, utilities will be able to better balance loads and adjust the amount of power generated. From solar installations and power plants to the charging station, the connectors supplying these sensors with power and transmitting their data must be highly-reliable to ensure a lower operating cost and longer service life. Cables and cordsets must also meet service

requirements in applications where equipment is close to high-voltage cabling.

Meanwhile, powertrain electrification has gone beyond passenger vehicles to encompass agricultural/industrial machines, trucks and last-mile delivery fleets. From freight yards to airports, new charging infrastructure will need to deliver energy reliably—creating demand for connectors required to keep vehicles and equipment functioning.

These applications require connection systems that support fast charging with protection against overheating—allowing rapid and accurate temperature measurement on the contacts. More connectors will be required for transmitting data among sensor and camera systems for ADAS and infotainment, communicating with high-resolution displays and external cellular applications.



TTI's business development manager, Steve Brahosky

All of these connectors need sealing from the hazards of automotive/industrial environments including high-pressure water jets, dust/dirt, oil, fertilizer and more, while meeting IP67, IP68 or IP69K and other standards as needed.

Thanks to TTI's John Sandy and Scott Stemley who contributed to this article.

tti.com



Small but tough

Cinch Connectivity Solutions has expanded its mil-aero circular MD801 series, a lightweight, ultraminiature connector with small form factors and high-density capabilities, ideal for aerospace, military and other harsh environment applications. The product can be adapted for commercial applications including UAVs, vehicle communications, satellite systems, radios and display systems.

The connectors are available as plugs or receptacles with standard crimp, solder and PC tail terminations for board mount applications. They are engineered to provide full performance in extreme environments with protection against cross mating and vibration. The shells (available in sizes 5, 6, 7, 8, 9, 10 and 13) include jam nut receptacle, square flange receptacle and in-line plugs—compatible with leading competitive equivalents. Contact arrangements range from 1 to 130. Finishes include OD/cadmium and electroless nickel.

belfuse.com



USA made for rapid delivery

A full line of standard and custom OEM sparkplug and distributor terminals, insulation boots and battery terminals that comply with IATF, SAE and ISO requirements are available from ETCO.

The company's products include 1,800 standard parts that meet IATF 16949:2016, SAE J2031 and 2032, and ISO 9001:2015 standards and are available with compatible wire-attach equipment and booters. Featuring spark plug and distributor terminals, insulation boots and battery terminals, all parts are manufactured in the USA for rapid delivery.

Designed to simplify automated and manual assembly operations for OEMs and harness makers, products can be supplied in strip form or loose. They can be stamped from brass, tinned steels, stainless steels, beryllium copper, phosphor bronze and other alloys with thicknesses ranging from 0.006 to 0.078in and tolerances to 0.0005in.

www.etcocom



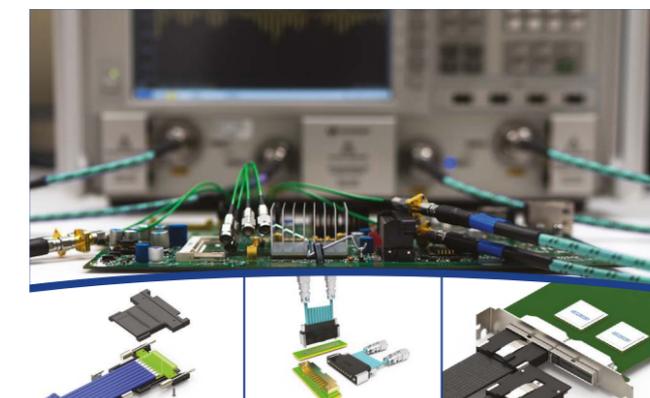
HDMI 2.1 connector/cable assembly now available

Omni Pro Electronics has announced availability of the Adam Tech ultra-high speed HDMI 2.1 connector/cable assembly. The release provides uncompressed 8K video with HDR and supports speeds up to 48Gbps. Support is also provided for 4K video, enhanced audio return channel (eARC), variable refresh rate (VRR), auto low latency mode (ALLM), quick frame transport (QFT) and quick media switching (QMS).

Specifications include 30mOhms contact resistance, 100mOhm insulation resistance and 300VAC dielectric withstanding voltage. The housing is high-temperature black thermoplastic (UL94V-0) with a brass and nickel plated shell. It is rated for 10,000 cycles with an insertion force of 4.5kgf and a withdrawal force of 1kgf~4.0kgf.

The 26AWG double-ended male-to-male cables are available in lengths of 3, 6, 10 and 16.5ft with HDMI-A 2.1 plugs. Jacketed in black PVC, the cable plug pins are gold flash plated with a tin over nickel shell with a black 55P PVC overmold and insulator.

www.omnipro.net



Higher density. Lower losses. Higher data rates. **It's precise performance, delivered.**

Our CoreHC product family, Card Edge Contact systems, and Gen-Z solutions offer high-density interconnects with lower insertion and return losses at densities as high as 2.5 mm. CarlisleT leads the way with high-performance interconnect solutions by offering unmatched signal integrity for today's faster and more complex communication systems operating up to 70 GHz.

That's Performance with Purpose.



DESIGN | BUILD | TEST | CERTIFY

CarlisleT.com



Electronic Connector Co.
"Connecting Solutions...Together"

ShrinkMate™
Cable Joint EMI Shielding



Fast - Flexible - Technical
ECCO's ShrinkMate™
Conductive Heat Shrink
Providing EMI Shielding
Without Solder





eccoconnectors.com
sales@eccoconnectors.com
1-800-742-3262

Forward-looking strategies mitigate semiconductor crisis

PreScouter's technical director, Sofiane Boukhalfa and researcher Hakan Basargan, highlight supply chain issues and offer strategies for mitigating the challenges

Increased demand from IoT devices, chipsets for electric vehicles and smartphones, among others, led to an all-time semiconductor sales record in 2021. Still, companies are hampered by issues with raw materials provisioning and supply chain bottlenecks, exacerbated by the pandemic. These problems include: localization issues between manufacturers, their suppliers and customers; increased demand for specific products coming from customers in high-growth industries; and manufacturing challenges driven by the pandemic.

Major growth drivers

Semiconductor use has increased radically in recent years because of demand for advanced memory chips that process data faster. The main reason for this rise in demand for advanced memory chips is the proliferation of wireless IoT-connected devices. According to Fortune Business Insights, the semiconductor market is expected to grow from \$452.25b in 2021 to \$803.15b in 2028 at a CAGR of 8.6 per cent.

In addition to the explosion of IoT-connected devices, chipmakers are also driving semiconductor market growth, with Samsung Electronics representing almost 50 per cent of the market revenue. Taiwan's TSMC is the top producer of chips up to 10nm, while Intel dominates in the manufacture of laptop and desktop CPUs. Top US chip designers include AMD, Qualcomm, Broadcom and

Nvidia, though the majority of the world's wafers are manufactured in Asia.

The Semiconductor Industry Association reports that between 1996 and 2021, revenue increased from \$12b to \$50b and sales of global semiconductors increased by 23.5 per cent from November 2020 to November 2021, powered by demand for next-gen DRAM in the smartphone market along with the growing selection of SiC chipsets for automotive applications such as electric and hybrid vehicles.

Pinpointing semiconductor manufacturing challenges

In late 2019 and early 2020, logistical challenges and supply issues with raw materials began straining the complex supply chain dynamics. The global semiconductor shortage was further exacerbated by the pandemic, radically affecting the automotive, consumer electronics and similar industries. The automotive industry has been particularly hard hit. Many automakers cut output and reduced or canceled orders for parts, including large quantities of computer chips, at the start of the lockdowns because of the effects of supply chain issues on semiconductor production. The sharp drop in passenger vehicle sales amid the crisis resulted in a fall from 2019 to 2020 of six, 15 and 24 per cent in China, the United States and the European Union, respectively.



PreScouter's researcher, Hakan Basargan



Semiconductor use has increased radically in recent years because of demand for advanced memory chips that process data faster

The ongoing pandemic has brought unique challenges for chip manufacturers, with supply chain problems disrupting every aspect of production from resource procurement to delivery schedules. Also, the market became more competitive, leading producers to alter their manufacturing strategies. Additionally, there have been internal problems such as shortages of workers due to illness and quarantine procedures and hampered production capacity due to hygiene processes.

Strategies for building resilience

In the short term, costs of supplies from certain areas are likely to continue rising due to overtime and expedited freight charges, plus premiums

paid to purchase supplies and maintain capacity. Thus, alternative sourcing tactics are being considered by businesses. Identifying alternate supply scenarios and evaluating what they represent for operations will be crucial moving forward.

Other precautions to help supply chain flexibility include transporting available inventory to locations outside quarantine zones and securing Tier 2 and Tier 3 supplier capacity and delivery status. Companies may also consider: purchasing raw materials that will be in limited supply in affected areas in advance; securing future air transportation to avoid delays with ocean freight or road transportation; informing customers about delays; and offering a discount

on available inventory. Companies can begin to address the more significant consequences to their supply networks as manufacturing facilities in affected countries gradually reopen and knowledge gaps close. This will involve such measures as analyzing the pandemic's potential impacts on supply chain and market performance, undertaking risk assessments on key business functions and conducting scenario planning exercises to better understand the repercussions of various actions.

Finally, capacity for production needs to be increased radically to meet demand—a step that companies started in 2020.

www.prescouter.com/inquiry/overcoming-semiconductor-processing-challenges/



PreScouter's technical Director, Sofiane Boukhalfa

DENA
DESIGNING ELECTRONICS NORTH AMERICA

DENA IS COMING!
THE NEW PUBLICATION
FOR DESIGN ENGINEERS

FIRST ISSUE RELEASES IN MAY 2022

Website in construction. Keep an eye out!

Buyers' guide to GaN

As increasing numbers of applications deploy GaN technology, Electronics Sourcing asked Innoscience Europe's GM, Dr Denis Marcon, for a purchasing overview

Q GaN technology is gaining footholds in new applications. Where is the demand coming from and why does the market need this capacity now?

GaN is a more efficient switching technology than silicon. The only reason it has not been widely implemented before was a perceived difficulty in using it and product availability. New GaN-based solutions are as easy to use as silicon-based devices. Demand is coming from chargers/adapters, mobile phones, automotive, lighting, appliances, LLC converters, data centres—anywhere efficiency and power density are valued.

Q What component technologies will GaN push aside?

GaN will gradually replace Si power transistors and, once GaN is suitable for higher voltages, will also take over the SiC power transistor market.

Q Purchasers will start seeing GaN components on their BoMs for the first time. What will this supply chain look like and will it differ from GaN's predecessors?

There is no reason why the supply chain should look any different from silicon. New names will appear—Innoscience being one of them—but many

familiar brands will likely remain, having switched partially (or fully) from silicon to GaN. GaN components are still semiconductor devices, processed on the same manufacturing line used for silicon. They are familiar in function but extraordinary in performance.

Q How can purchasers trust new suppliers when using them for the first time?

Purchasers must employ due diligence as with any new supplier. Innoscience is well funded with backing from international names such as ARM, SK Hynix, CMB International and CATL.



GaN is a more efficient switching technology than silicon. The only reason it has not been widely implemented before was a perceived difficulty in using it and product availability

The company's 8in GaN-on-Si fabs are certified; the Zhuhai fab already has IATF 16949:2016 certification for automotive device design and manufacturing; and the Suzhou fab will be IATF qualified soon.

Moreover, Innoscience's devices are qualified to JEDEC and the company performs advanced reliability tests (DHTOL, SALT etc) to assure quality. Innoscience has passed several customer quality inspections and has shipped over 30M devices worldwide to customers including Anker, Hesai, ugreen and more. All manufacturing is in-house: epi-growth, device design, processing and qualification.

Q How are buyers protected from obsolescence in this fast moving sector?

Innoscience guarantees continued device manufacturing for several years. The company believes in strong relationships, consulting customers before making products obsolete and giving an agreed notice period for last-time-buy or suggesting alternatives where possible.

Q How is this high value sector combatting counterfeiting?

Innoscience is building a network of trusted supply chain partners which we will soon be announcing. These will include some of the biggest names in global distribution. Buyers should only purchase directly from Innoscience or one of its supply chain partners to be assured of genuine product.

Q What would a first-time GaN buyer's purchasing check-list read like?

In short:
Security of Supply: does the manufacturer own/control its epi-growth and manufacturing facility? What is the maximum capacity? What percentage is in use and foreseen in coming five years? How many devices/wafers can it guarantee over five years? What are capacity expansion plans? Does it operate business lines that might jeopardize GaN attention? Does it hold relevant stock?

Device quality: Which reliability tests are performed? Are accelerated tests used for lifetime extraction?

Price: What is the price scaling in volume?

Support: What level of application design support is offered?

www.innoscience.com



Innoscience Europe's GM, Dr Denis Marcon

40+ years
 Helping keep your production facilities up and running



PRODUCT SOLUTIONS

Cross reference search tool accesses alternatives for over 525,000 industry part numbers
 Expanded range of high quality product lines



GLOBAL DISTRIBUTOR NETWORK

From e-commerce to national, regional & local distribution, we have you covered
 Large inventory in stock
 Average 24-hour shipping times



CUSTOMER SERVICE

Professional and knowledgeable staff
 Volume discounts available

Your trusted source for high quality electronic components
 Consumer – Industrial – Commercial – MRO Applications



visit NTEINC.com
 to see our complete line of products.
 Call us today at 800-631-1250

Exclusively sponsored by



NEARSHORING A STRATEGIC RESPONSE TO THE CURRENT SUPPLY CHAIN MODEL

Introduced in the 1960s, offshoring became a primary cost-savings business strategy for industries to outsource manufacturing operations to Asia. However, as supply chain constraints intensified within the past couple of years, many businesses have considered transferring operations back to nearby countries. This practice, known as nearshoring, has emerged to create a buffer against supply chain disruptions.

As a result of offshoring, the US now only domestically manufactures 12% of the chips it designs. Comparatively, Taiwan manufactures over 60% of the world's chips. The lack of varied resources within the electronic component industry has caused bottlenecks within the global supply chain. Diversifying resources would add necessary support and reduce the impact of shocks and shortages.

According to an April 2020 Thomas survey, 64% of North American manufacturers reported they are likely to bring manufacturing production and sourcing back to the Americas. Latin America, specifically Mexico, is poised to profit the most from this developing trend. More recently, Latin America saw a 156% increase in hiring from foreign companies, particularly for software engineers.

European, Middle Eastern and African companies have been looking to neighboring countries in Central and Eastern Europe and North Africa as nearshoring options. In response to COVID-19, Ernst & Young conducted flash research and found that in Europe, 88% of respondents were contemplating nearshoring over low-cost areas outside of EMEA. Sixty-

one percent were seeking to reduce reliance on dominant source countries like China.

Despite its attractiveness, nearshoring is costly, and it will take years to move operations. The total cost for US and European companies to move manufacturing out of China would come to \$1 trillion over the next five years. Relocating to a new country also adds pressure to the local economy. If a company were to withdraw just one percent from China and nearshore to a country like Poland, Poland would have to increase its production by 25%. The cost, compounded by how long these changes could take, is enough to make some companies wary.

Even with the concerns associated with nearshoring, many companies have already begun transitioning their operations closer to home. A prime example is Samsung Electronics, which has set the goal of becoming the world's biggest semiconductor firm by 2030. To assist the growth of its business, Samsung has prioritized local partnerships with domestic parts manufacturers and local material suppliers. With moves like this, Samsung and others that opt for a nearshoring business model will bolster their local economies and offer essential flexibility in the supply chain.

THE NORTH AMERICA TOP 50 DISTRIBUTORS REPORT 2022

SUPERIOR SOURCING WITH A GLOBAL REACH

Find the electronic components you need at
www.fusionww.com/part-search/



FUSIONWORLDWIDE

INCLUDED IN THE NEXT ISSUE - MAY 2022



Lead times will remain long for discretes through 2022

Prices for MOSFETs, IGBTs and rectifiers increased in 2021 and there could be more price hikes in 2022



Buyers can expect continued tight supply for discrete semiconductors through most of 2022 but supply could loosen towards the end of the year and lead times for some discretes could shrink a bit.

However, lead times will still remain long with some chip manufacturers saying that MOSFETs, rectifiers and transient voltage suppressors (TVS) will have lead times of 52 weeks for most of the year but rectifiers and TVS parts could fall to the 30- to 40-week range later in the year.

Lead times will remain long although demand for discretes won't be as strong as it was last year. Unit shipments of discretes are expected to grow 6 per cent in 2022 compared to 23 per cent in 2021, according to researcher IC Insights. Discretes sales revenue will rise 5 per cent to \$36.1 billion in 2022. In 2021, sales revenue grew 27 per cent.

Discrete semiconductors include diodes, small signal transistors, power transistors, rectifiers and thyristors. In

2021 power transistors revenue grew 26 per cent; small signal transistors, 29 per cent; diodes, 32 per cent and small signal transistors 29 per cent.

"It was a good growth year for discretes in 2021," said Rob Lineback, senior market research analyst for IC Insights. Chipmakers that make discretes including ABB, onsemi, STMicroelectronics, Nexperia and Vishay had strong sales.

"In fact, it was a record year," said Lineback. This year, however, the discretes market will "settle back into a little more normal growth," he said. For instance, power transistors revenue will have the highest growth rate of 6 per cent and growth of other discretes will range from 3-5 per cent, according to IC Insights.

Prices rise
One reason there was record revenue for 2021 was higher prices. Discretes manufacturers increased prices several times in 2021. "Prices have gone up substantially,"

said Dave Valletta, executive vice president of worldwide sales for Vishay Intertechnology. Vishay makes MOSFETs, rectifiers and TVS components.

"We increased prices three times in 2021, 5 to 10 per cent each time. We just completed another increase in early 2022," he said. There could be more price increases later in 2022.

Valletta said discretes prices are rising because Vishay and other chipmakers had increased materials and logistics costs. "The cost of wafers, other materials and logistics are through the roof," he said. Despite the price increases, Vishay's profit margins are under pressure although "we are shipping more than ever," said Valletta.

He said Vishay is "trying to keep our heads above water" from a profit point of view. "We are struggling on that. It is a challenge. It's not just Vishay, it's the whole industry," according to Valletta.

He added customers have been "fairly understanding" about the price hikes. "They see what's going on." When materials and logistics costs decline, prices will decline, too, Valletta said.

Prices could also decline and lead times could shrink if demand lessens later in the year and more discretes capacity comes online. Lineback noted that in 2021 there were shortages of power discretes, transistors and some other discretes and "that is still somewhat the case but it is now relaxing a bit."

Discrete capex lags
He noted there have been some increases in discrete capacity capital spending, but discretes investment has lagged behind leading-edge ICs. There's more caution among discretes manufacturers concerning investment in new capacity. "They kind of know discretes will eventually swing back to be a glut market," he said.

In addition, it's been difficult for discrete semiconductor

manufacturers to add capacity because of the lack of equipment to make chips on 200mm and 150mm wafers. Most discretes are made on those size wafers. However, integrated circuits often use 300mm wafers and semiconductor manufacturing equipment companies are building equipment to handle larger size wafers.

"It's a big problem for the industry. All the attention is focused on new expensive fabs," said Lineback. Why don't we see equipment makers going ahead and building new equipment for 200mm and 150mm wafers? They focus on the leading edge," he said.

In some cases, chipmakers are building new fabs for production of some discretes. For instance, Vishay is building a 300mm fab in Germany that will make MOSFETs for the auto industry. The fab will go online in 2024.

Extra capacity will likely be needed by the auto industry because of the growth of advanced driver assistance systems (ADAS) and rising production of electric vehicles which need more discretes than internal combustion engine vehicles.

"Automotive is a big segment for discretes," and

for other semiconductors as well, said Lineback.

"There's a tremendous amount of semiconductors—including discretes—that are going into midrange, mainstream cars," he said. ADAS systems and EVs need to be power efficient and that requires more discretes, he said.

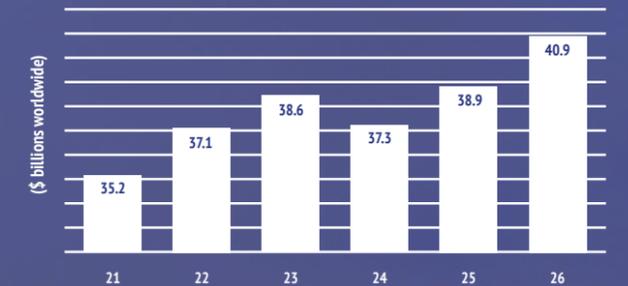
Advanced automotive systems that have safety systems, infotainment, navigation, and fuel efficiency security, will be drivers for discretes for years.

EVs will drive IGBTs
Electric vehicles use power transistors, power diodes and insulated gate bipolar transistors (IGBTs). IGBTs are integral components in the EV power electronics systems and demand will rise over the next several years as the amount of EVs built increases. About 6.6 million EVs were built in 2021 and accounted for 9 per cent of global car sales, according to the International Energy Agency (IEA). The number is expected to grow as more carmakers say they plan to build more EVs.

An IGBT is used as a switch in an EV inverter. It is connected to the traction motor and takes DC from the car's battery and, through the inverter, converts AC

Discretes sales growth will be relatively slow and mostly stable through 2026 when the market reaches \$40.9 billion. Source: IC Insights

Expect mostly steady sales growth for discretes through 2026



control signals to the high power needed to operate the motor.

Semiconductor buyers at automotive companies can expect to see more silicon carbide discretes over the next several years.

Last December, STMicroelectronics introduced silicon-carbide (SiC) MOSFETs for electric-vehicle (EV) powertrains and other applications where power density, energy efficiency, and reliability are needed. Also last year, Alpha and Omega Semiconductor Limited introduced a 1200V silicon carbide MOSFET to meet the high efficiency and reliability requirements of EV onboard chargers, motor drive inverters, and off-board charging stations.

While ADAS and electric vehicle technologies have ramped up demand for IGBTs and other chips, other customer segments will also help drive discretes over the next several years.

Computers and industrial applications have helped drive discretes demand in the past, and new applications from those segments will further drive demand over the next several years.

"Applications were previously mechanical are going to electronic control," said Valletta. Industrial

automation, robotics, Internet of things will drive more demand.

Valletta is bullish about the overall discretes business in 2022 and beyond although some analysts have said that there was inventory building of discretes in 2021 by OEMs, electronics manufacturing services (EMS) providers and distributors. As a result, some applications where power density, energy efficiency, and reliability are needed. Also last year, Alpha and Omega Semiconductor Limited introduced a 1200V silicon carbide MOSFET to meet the high efficiency and reliability requirements of EV onboard chargers, motor drive inverters, and off-board charging stations.

However, Valletta isn't so sure. Vishay does not see any signs of the slowdown. "We track inventory building in distribution and we do not see any meaningful signs of it," said Valletta. "We speculate that inventories may be building at customer shelves, but they insist they are not putting stock on the shelf," he said.

Valletta added that 2021 was probably the best year ever for discretes sales. "If I look at past cycles for discretes, 2010 was incredible, 2018 was a record year, but 2021 was our best year," he said. He added that discretes demand from 2021 carried over into 2022. In fact, in early March orders were rising, according to Valletta.

Discrete unit shipments climb



Strong demand from multiple customer segments will drive discretes demand through 2026. Source: IC Insights

By the Numbers Source: IC Insights

27%
The worldwide sales growth rate for discretes in 2021

3.1%
The compound annual growth rate for sales revenue of discretes from 2021-2026

\$37.1 billion
The forecasted size of the discretes market in 2022

515.1 billion
The number of discrete semiconductor units that are expected to ship in 2022

7.2 cents
The expected average selling price for discrete semiconductor in 2020

\$40.9 billion
The forecast size of the global discretes market in 2026

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

Advert Index

Advert	Page	Advert	Page
Carlisle Interconnect Technologies	21	Fusion Worldwide	9
CML Innovative Technologies, Inc.	15	Mouser Electronics	10, 11, 28, 29, 31 & IBC
Coilcraft	16	METCASE Enclosures	13
Designing Electronics North America (DENA)	23	NTE Electronics, Inc.	25
Digi-Key Electronics	FC & IFC	Rutronik Inc.	BC
eBOM.com	17	Sager Electronics	5
ECCO (Electronic Connector Co.)	20	TTI Inc	7
ECIA (Trusted Parts)	19		

Increase your engineering and buying confidence

The advertisement features a man and a woman standing in the center, looking towards the camera. They are surrounded by a large number of logos for various electronic component manufacturers, including:

- Honeywell
- cinch
- TDK
- TE
- infineon
- nichicon
- HRS
- AVX
- TEXAS INSTRUMENTS
- BROADCOM
- SILICON LABS
- TOSHIBA
- molex
- ANALOG DEVICES
- VISHAY
- XILINX
- BOURNS
- intel
- maxim integrated
- muRata
- OMRON
- ST
- NXP
- Amphenol
- KEMET
- Littelfuse
- DIGI
- RENESAS
- PHENIX CONTACT
- onsemi
- MICROCHIP
- CREE
- samtec
- OSRAM
- ADI Power by Linear
- Coilcraft

Engineers and buyers find the leading brands and the widest selection of products in stock at mouser.com



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

Buyers' Guide

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

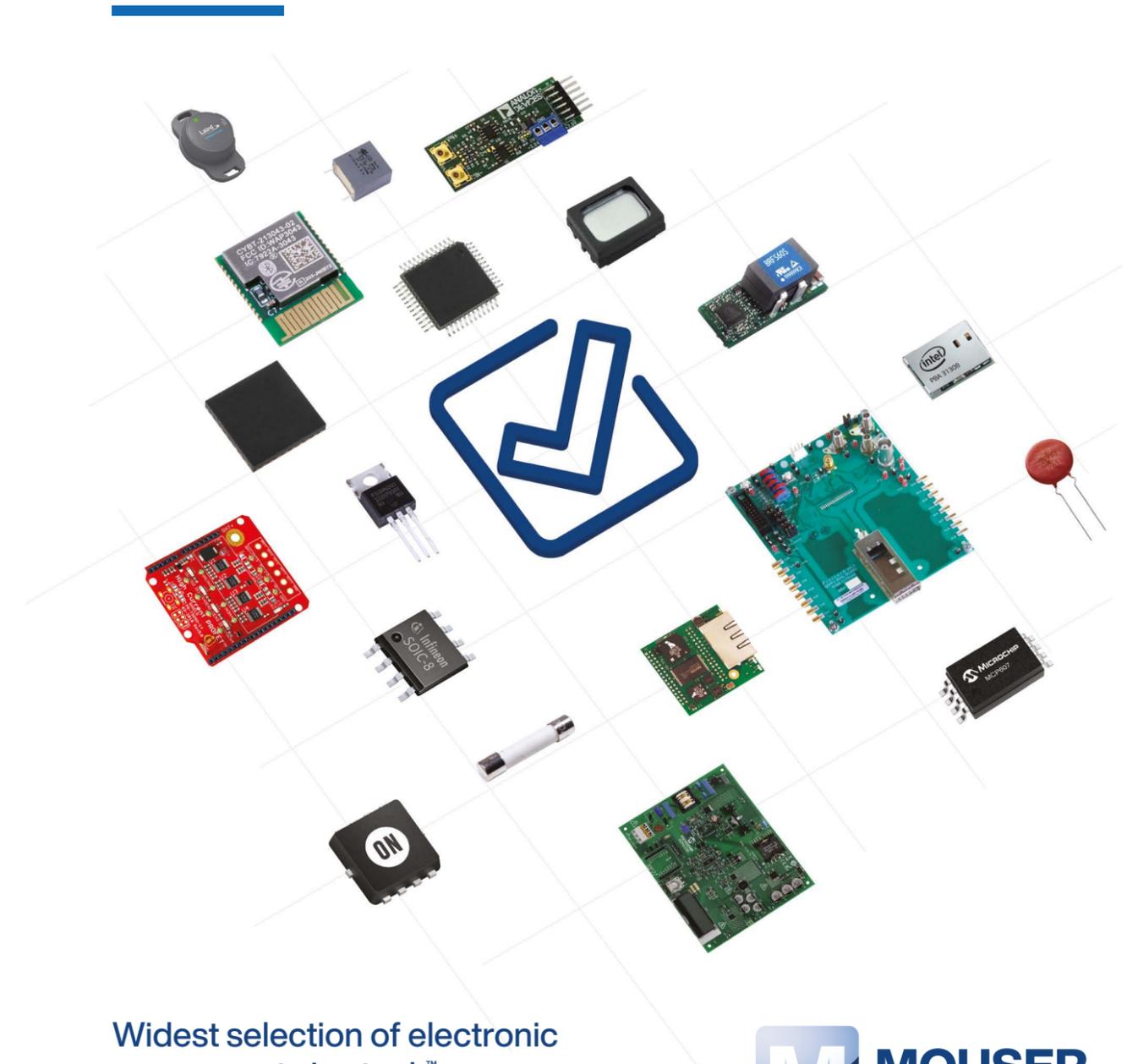
Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
PASSIVES (Continued)											
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	\$0	100.00%	50	1,000+	Y
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	\$0	64.00%	50	1,000+	Y
Würth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	\$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	\$0	100.00%	50	1,000+	Y
POWER & BATTERIES											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bel Power Solutions	Bel Fuse	Power & Batteries	belfuse.com/power-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mornsun	+1-978-567-9610/+1-978-293-3923	www.mornsunamerica.com			N/A	N/A	\$0	100%	N/A	2000+	Y
Phihong	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
RECOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schaffner	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK Lambda	Mouser Electronics	800-346-6873	www.mouser.com	Y	405	N/A	\$0	80.00%	N/A	N/A	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vicor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
REED SWITCHES											
HSI Sensing	HSI Sensing	405-224-4046	www.hsisensing.com	M	75	N/A	\$200	100.00%	15	275	N
SENSORS											
ams	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Analog Devices Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bosch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,059	N/A	\$0	64.00%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,379	N/A	\$0	45.00%	50	1,000+	Y
Melexis	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,915	N/A	\$0	59.00%	50	1,000+	Y
Sensirion	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
STMicroelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	914	N/A	\$0	65.00%	50	1,000+	Y
SWITCHES & KEYBOARDS											
OTTO	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TEST & MEASUREMENT											
B&K Precision	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Fluke	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,008	N/A	\$0	94.00%	50	1,000+	Y
Keysight	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lasca Electronics		814-835-0621	www.lascarelectronics.com	Y	130	\$602,000	\$0	100%	10	175	Y
Tektronix	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	\$0	96.00%	50	1,000+	Y
THERMAL MANAGEMENT											
Materials Direct	Materials Direct	+44 (0)1908 222 211	www.materials-direct.com	N/A	N/A	£1,000,000	N/A	N/A	5	55	Y
Universal Science	Universal Science	+44 (0)1908 222 211	www.universal-science.com	N/A	N/A	£1,000,000	N/A	N/A	5	55	Y

Contract Manufacturers Buyers' Guide

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

Ensure your products are 100% authentic

Mouser was the first SAE AS6496 accredited distributor



Widest selection of electronic components in stock™

[mouser.com/authentic-products](https://www.mouser.com/authentic-products)



WE ARE HIRING

careers_usa@rutronik.com

Join our Rutronik family! Our North American team is expanding rapidly. Diverse people. Diverse product portfolio. #RUTRONIKfamily.

If you are enthusiastic, highly motivated & results driven, apply now for the following positions:



Product Management

Coral Springs, FL

Materials Management

Coral Springs, FL

Technical Field Sales

Minneapolis, MN | Tampa, FL | Dallas, TX

Financial Analyst

Coral Springs, FL

#YourGlobalBroadliner

