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2022 EXECUTIVE FORECASTS LOOKING AHEAD

On the cover – December 2021

2022 Executive Forecasts looking ahead

Find out more on pages 14-26

Editor's Word

The great learning

Forget the 'great reset' or 'great resignation', the past two years have been the 'great learning' for the electronics supply chain. Finally, some key just-in-time supply chains optimized over decades for cost reduction—rather than resilience—reached the limits of their capabilities and failed.

Electronics Sourcing has devoted its December Forecast features in both its North American and UK editions to asking electronics supply chain specialists for their opinions on the origins of this disruption, what can be done to mitigate the problems and how long before supply chains settle down.

Some issues are deep seated. For example, while the cost and time involved in designing, building, commissioning and starting production operations at a leading edge semiconductor facility remain so significant no amount of forward planning will ever guarantee that supply and demand cycles remain synchronized. Likewise, electronics innovation drives the industry's growth and sales, yet it also drives obsolescence which in turn drives counterfeiting.

These issues aside, most of the current headaches relate to the accumulation of many smaller decisions which can be addressed. For example, the supply chain could simply hold more stock if OEMs were willing to swap short-term negotiated orders for long-term supplier partnerships.

Regarding the design department's role, engineers with sufficient understanding of a component's specifications and design intent are in a position to advise on multi sourcing regarding the choice of part numbers, manufacturers and distributors at the start of the design phase, not in panic mode when the part unexpectedly becomes unavailable.

I could go on but I've run out of words. For the full story, turn the page and read what the supply chain has to say.

Jon Barrett

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ES News

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Analogue power ICs in stock

Newark has signed a new global franchise agreement with Torex Semiconductor to expand its portfolio of high-performance analogue power management IC solutions designed to offer ultra-low power consumption and high reliability. Applications include industrial, medical, entertainment and automotive products.

Newark's global head of semiconductors and single board computing, Lee Turner, said: "Design engineers want high performance solutions in compact packages that are easy to implement, and Torex Semiconductor leads the way with its range of ultra-low power semiconductors designed for demanding power management applications. We have invested significantly in our semiconductor range to ensure we can meet our customers' diverse needs."

Torex Semiconductor's MD, Gareth Henson, added: "We have a longstanding and very successful partnership with Avnet and this new relationship with Newark will help us expand our reach into new markets, equipping more engineers with the critical products and components they need for their designs."

www.newark.com

Cost savings up to 50 per cent

Mouser Electronics is now stocking EP-SMA 27GHz connectors, adaptors, and cable assemblies from TE Connectivity. The portfolio provides customers with increased bandwidth, power and performance, ideal for 5G, automated test equipment, aerospace/defense, wireless devices and radar.

The portfolio is said to offer low insertion loss, plus exceptional voltage standing wave ratios of <1.15 (max) for adaptors and <1.20 for cable assemblies. The components have the same footprint as SMA-6GHz, 12GHz and 18GHz solutions, which means designers can often avoid altering existing layouts to expand frequencies up to 27GHz or higher-signal SMA performance.

Using these connectors in an upgrade can provide cost savings of up to 50 per cent in applications currently using 2.92mm (40GHz) or 3.5mm (33GHz) products performing at 27GHz or lower. Additionally, the products' robust materials allow up to 500 mating cycles.

www.mouser.com

Electronics manufacturing outlook darkens

A new global survey found that the shortage of semiconductors and other components continues to have serious consequences for electronics manufacturers, leading to rising costs and higher prices. The IPC survey also found companies continue to face difficulty finding qualified talent, with only 15 percent indicating the situation is improving.

Two-thirds of manufacturers were forced to raise prices in 2021 and 71 per cent expect to have to do so again in 2022. Shortages and supply chain issues have led manufacturers to increase costs by an average of 14.5 per cent this year. Firms expect to raise prices another seven to eight per cent next year.

Nine in ten manufacturers report rising costs, while 75 per cent report rising labor costs, both of which have led most electronics manufacturers to report profit margin decreases.

IPC president and CEO, John Mitchell, said: "Even as sales expectations for electronics manufacturers have improved, they face increases to both material and labor costs, leading to declining inventories and increasing backlogs around the globe. The longer the shortage crisis continues unresolved, the more difficult it will be to overcome these compounding problems and return to normal."

www.ipc.org

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ES News

In Brief

One-stop surface mount shop
Houston, Texas-based Alert Tech has launched a new SMT division, specializing in low-volume printed circuit board development and assembly. VP of sales and product, Brian Laney, said: "With so much human expertise and equipment, Alert Tech SMT is a top-tier choice for those looking to onshore their production, save on tariffing, improve logistics and gain quality collaboration."
alerttechsmt.com

Growing family of specialists
TTI has entered a purchase agreement to acquire SMD, an electronic component distributor headquartered in Irvine, California. TTI Americas' president, Don Akery, said: "The specialized nature of SMD's business and their dedication to product knowledge and customer support make the company a perfect fit for the TTI family of specialists."
www.tti.com

Powerful purchase
Qorvo has acquired Princeton, New Jersey-based United Silicon Carbide. The acquisition expands Qorvo's reach into markets for electric vehicles, industrial power, circuit protection, renewables and data center power. Qorvo IDP' president, Philip Chesley, said: "This acquisition enables Qorvo to deliver high-value, best-in-class intelligent power solutions covering power conversion, motion control and circuit protection applications."
www.qorvo.com

Enabling zero emissions
Onsemi has acquired GT Advanced Technologies, a producer of silicon carbide (SiC). The acquisition enhances Onsemi's ability to secure and grow supply of SiC. Onsemi's president and CEO, Hassane El-Khoury, said: "As we move to a carbon free economy, SiC technology is a key driver to enable zero emissions in high efficiency electric vehicles, renewable energy and charging infrastructure."
onsemi.com

Long life at high temperatures

Rutronik is offering Samwha VP series aluminum electrolytic capacitors which are said to offer longer service life with a 135°C guarantee.

Designed for lower resistance at high temperatures, VP series products are engineered for reliability in the -40 to 135°C temperature range, while benefitting from a low rate of change in capacitance at high voltage and temperature.

The capacitors are AEC-Q200 compliant, suiting regenerative braking systems, EV power supply and LED applications.

The VP series was developed with a low-resistance, high-temperature electrolyte and efficient raw materials. The capacitors meet special requirements for miniaturization by lowering resistance at high temperatures, which also helps to extend the life of circuits.

Specifications include 10, 16, 25 and 35V up to 10,000µF and various sizes from 10 by 12.5mm to 18 by 40mm. RoHS conformity and halogen-free are given.

www.rutronik24.com

Supply chain transformed

Digi-Key Electronics has released a video series, entitled *Supply Chain Transformed*, that follows the journey of components across the supply chain as they are integrated and incorporated into next-generation asset monitoring and tracking systems.

Sponsored by Analog Devices and Molex, the three-part series highlights the stops a product makes throughout its route from design to production, including warehouses, manufacturing facilities, shipping and more. With so many eyes on the global supply chain this year, it's important for accessible, automated monitoring and tracking to be available to everyone.

The first video, *Components at the Source*, is live on Digi-Key's website. The episode focusses on how inventory is tracked throughout a warehouse, as well as emerging technologies like indoor positioning, robots/cobots and more.

The second video, *The Product Journey*, released in November, follows a product through its journey from origin to destination and explores the technologies used to optimize routes, manage fleets of vehicles and track assets.

The third video, available in December, is titled *Next Generation Production*. This will showcase the variety of monitoring solutions available to ensure security, safety and reliability, such as temperature monitoring, condition-based monitoring, the use of blockchain in supply chain management and more.

www.digikey.com

Mexico facility achieves Nadcap cable and harness accreditation

Cinch Connectivity Solutions has announced its Reynosa, Mexico facility has received Nadcap accreditation for electronics cable and harness assemblies (AC7121) by the Performance Review Institute. The AC7121 certification enables the Reynosa facility to manufacture cable and harness assemblies in accordance with the Class 3 requirements of IPC/WHMA-A-620, cementing Cinch's commitment to the growing aerospace market.

Following the auditing procedure, the Nadcap process and product certification is awarded by the Performance Review Institute (PRI), the only auditing company approved by the aerospace industry to offer official certification audits.

Cinch's president, Pete Bittner, said: "Achieving Nadcap accreditation is no easy task, particularly during the pandemic era, and truly shows which companies are committed to manufacturing high quality products and solutions for the aerospace industry.

"In addition to exemplifying the industry's best cable harness manufacturing expertise, our team continues to demonstrate its dedication to the expanding aerospace market by satisfying stringent aerospace industry specifications and increasingly challenging customer requirements."

www.belf.com

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ES News

Competitive lead times for low profile, high current inductors

Vishay has announced lead times for its IHLP low profile, high current inductors remain stable and competitive at 10 to 16-weeks. Thanks to improved productivity and capacity expansion, the company is experiencing no shortages of IHLP products. With the company's continued efforts to expand capacity, it doesn't see any issues supplying customers into 2022 and beyond.

Available in 10 case sizes ranging from 1212 to 8787, IHLP inductors are offered in commercial and automotive grades. Applications for commercial devices include: notebooks, desktops and servers; low profile, high current power supplies; POL converters; battery-powered devices; and distributed power systems and FPGAs.

Automotive grade devices are designed for filtering and DC/DC conversion in engine and transmission control units; diesel injection drivers; and entertainment/navigation systems, plus noise suppression for: high current BLDC motors; windshield wipers; power mirrors/seats; HID/LED lighting; and heating/ventilation blowers.

www.vishay.com

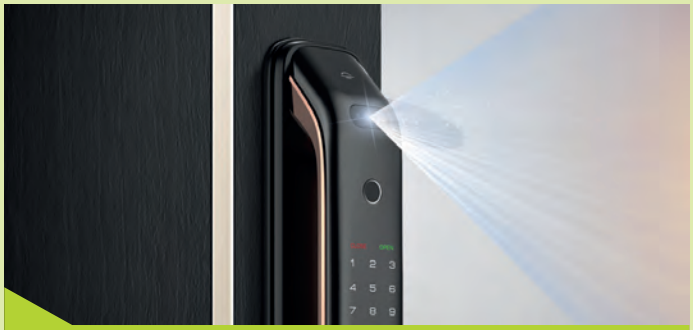
Switches offer industry-best lead times

CUI Devices' Switches Group has announced the addition of tactile switches boasting industry-best lead times. Ideal for consumer electronics, office equipment and industrial applications, the switches are housed in 6 by 6mm packages with actuator heights from 2.5 to 17mm and lifecycle ratings up to 100,000 cycles.

The switches feature SPST circuits, surface mount or through hole mounting styles and terminations including gull wing, short crimped, or long crimped. Rated at 12VDC and 50mA, the models carry operating temperature ranges from -30 to 80°C and operating forces from 100 to 260gf. Several models offer IP67 ratings for dealing with moisture and environmental contaminants.

The switches are available immediately with prices starting at $0.07 per unit at 500 pieces through distribution.

www.cuidevices.com



E-lock features time-of-flight sensor

Ams Osram has partnered with e-lock provider Kaadas, with the company's TMF8801 ToF sensor providing distance information as an input to the facial recognition system.

Featuring an integrated VCSEL infrared emitter; multiple single photon avalanche photodiode light detectors; time-to-digital converter; and on-chip microcontroller for histogram processing, the TMF8801 is said to offer superior performance. Compared to distance averaging employed with an indirect ToF system, the direct ToF time measurement methodology delivers higher accuracy and true-distance measurements.

Ams Osram's marketing manager, Barry Guo, said: "The TMF8801 provides more accurate distance measurements to help Kaadas achieve more reliable, effective and energy efficient e-lock solutions. It can be used for user presence detection to automatically wake up or put the system into a low-power sleep mode based on the presence or absence of a user."

Kaada's executive VP, Xian Li, added: "The TMF8801's precise ranging and excellent sunlight immunity capability make our e-lock work well in a variety of application scenarios, the hidden optical opening design enables flexibility in industrial design and makes more beautiful appearance possible."

ams.com

In-house manufacturing meets rising sensor demand

The electronics sector is facing component shortages, long lead-times and rising prices. However, Danisense states it remains able to supply customers within normal lead times, thanks to its in-house manufacturing, established supply chains and experience.

Danisense's sales and marketing director, Loic Moreau, said: "One of our key markets is EVs, so we were well aware of the fast move to electrification and what that would mean both for the need for increased testing and also the likelihood of component shortages.

"Therefore, we anticipated the current challenging situation and increased our inventory well in advance, so now we can still supply our customers within normal lead times. We have seen similar cycles before, such as in 2008/2009 when there was a big collapse followed by a strong recovery, so we were well-prepared."

www.danisense.com

Digital MEMS accelerometer reaches distribution

TDK has announced that Tronics' AXO315 miniature high-performance one-axis closed-loop digital MEMS accelerometer, is now available at Digi-Key, Mouser and Farnell and its affiliates Newark and Element 14.

AXO315 is a ±14g range, in-plane linear accelerometer designed to provide precision and reliability in challenging environments in industrial, land, railway, naval, oil/gas and construction applications. It achieves a one-year composite repeatability of 1mg and a 600ppm composite scale factor repeatability over temperatures ranging from -55 to 105°C and under 4g vibrations, with an outstanding vibration rejection.

TDK claims its characteristics enable significant reduction in size, weight and cost of materials for applications including: servo inclinometers and dynamic inclinometers in industrial motion control units; inertial measurement units (IMU) and inertial navigation systems (INS) for GNSS-aided positioning; and navigation of manned and unmanned ground vehicles and trains.

www.tronics.tdk.com

Stock quantities of accelerometer modules

Silicon Designs has announced stock quantities of its best-selling single axis Model 2210 series. These low-noise, low-cost MEMS capacitive accelerometer modules are designed to offer accurate and repeatable measurements across a variety of lower-frequency vibration testing applications, including vibration analysis, machine control, modal analysis, robotics, and crash event detection.

Offered in standard ranges from ±2 to ±400g, the device incorporates a MEMS capacitive accelerometer chip with high-drive, low-impedance buffering. When used with a mounting block accessory the series can measure vibration and acceleration on either one, two or three orthogonal axes with equal accuracy and repeatability.

Measurement versatility lets customers specify just one part number for multiple, unique measurement requirements, reducing in-house costs and inventory counts.

All Model 2210 series MEMS modules generate two analog voltage outputs which vary in response to applied acceleration. Customers can use either a single-ended or differential output, the latter doubling accelerometer sensitivity.

www.silicondesigns.com

Distributors see double-digit sales growth in Europe this year

Most are optimistic that strong component demand will continue in 2022

James Carbone

Electronics distributors say component sales in Europe bounced back in 2021 with some reporting double-digit revenue increases because of strong component demand across all customer segments.

Distributors expect business will remain solid in 2022 but may not be as strong as 2021. The impact of the pandemic in Europe may wane next year but supply chain challenges will continue and lead times for many components will remain long at least through the first half of 2022, according to distributors. Further price increases are also likely.

One distributor that has seen strong growth in 2021 in Europe and is optimistic about 2022 is Richardson Electronics. Richardson's two main markets are 5G infrastructure and power management. It carries RF and are hot. We take this data and combine it with historical data and then get very aggressive in ordering products," said Peloquin.

Tight supply conditions are likely to continue in 2022, according to Peloquin. He says there will not be "standard" lead-times until the second half of 2022. Peloquin added he is excited about 2022 and Richardson is prepared to meet whatever challenges are ahead. "We have greatly increased revenue, added key technology partners, increased our customer base and added key talent each quarter," he said.

European business "booming"

Another distributor that saw strong sales growth in Europe and expects to post healthy growth in 2022 is Mouser Electronics. Mark Burr-Lonnon, senior vice president global service and sales, says Europe has been Mouser's strongest growth region in 2021. Sales were up 77 per cent through October, compared to Asia which increased 66 per cent. Americas' revenue grew 45 per cent.

"We will exceed $1 billion for the first time this year in Europe, Middle East and Africa (EMEA). All customer segments were "booming," in 2021, said Burr-Lonnon.

He said strong sales growth should continue in 2022 as component demand remains durable. He added Mouser expects at least 10 per cent revenue growth in Europe next year.

The downside of continued strong component demand is long lead times for many parts will persist well into 2022. "It's tough to gauge but we expect the shortage market to last through most or all of 2022," Burr-Lonnon said.

He said that supply will remain tight and further price increases are likely. "Next year will not be any easier for customers sourcing parts," said Burr-Lonnon. He added even if lead times are long now, customers should redesign systems and use parts that are more readily available from either manufacturers they currently use or to other manufacturers. He does not expect lead times to shorten until late 2022 or possibly into 2023.

"So far, 2021 has been improving and we are up 4 per cent compared to 2020 sales and up 9 percent compared to 2020 bookings"

PEI-Genesis' senior vice president and managing director for Europe, **Jonathan Parry**

Sales and bookings rise

PEI-Genesis' European sales were up 4 per cent through October and its bookings were up 9 per cent compared to 2020, according to Jonathan Parry, PEI-Genesis' senior vice president and managing director for Europe. He said all customer segments are seeing growth, but there is "particular acceleration" with electric vehicles, military, green energy and factory automation.

"Commercial air is slowly growing now after a very sharp decline and I expect this to continue to slowly recover into 2022," he said.

Because of robust demand and long lead times for many components, PEI-Genesis' backlog is growing. Parry added PEI-Genesis invests "more in inventory than all of our competitors" so that even when there are issues with raw materials the company can provide a buffer for customers. He said the distributor is adding stock packages of several million dollars to its inventory worldwide to ensure that it can support the new and growing market segments and "satisfy our customers' needs for their prototyping and production requirements."

Parry expects component shortages to continue in 2022 as "the economies of the world come out of the pandemic at different times and at different velocities." The supply chain will not fully recover in 2022 so lead-times will remain an issue.

Parry added it is vital that project planners and procurement managers "get ahead of the curve and schedule their product requirements 6-12 months in advance."

Despite the challenges in the supply chain, Parry said he is optimistic about European business in 2022. "I look forward to working with many more new customers across Europe and showing them that PEI Genesis are more than a distributor'

Avnet posts double-digit growth

Mario Orlandi, president Avnet EMEA, global IoT and Avnet Integrated, said Avnet's European sales will post double-digit growth this year. "At the end of last year, we started to see the uptick in the European market, which became even stronger during this year," said Orlandi. However, growth will cool in 2022 compared to 2021. He noted the current tight supply of electronic components is "probably the worst ever." As a result, there have been price increases almost across the board. "Our customers do not expect us to bear the full burden of absorbing the price increases. That's why it is important we maintain strong relationships with our customers and suppliers," said Orlandi.

He said Avnet is "far from having the right level of inventory. We hope and somehow expect that this supply chain will improve in 2022 and very likely this will occur in the second half of next year."

Orlandi added the supply chain "will remain a key topic in the years to come and is an opportunity for Avnet. He noted that Avnet has made a major investment in demand creation.

"We plan to work even closer with our customers and suppliers to design the right solution," said Orlandi. "To have a proper supply chain, a proper design chain is required."

Jörg Strughold, vice president of sales for Arrow Electronics' components business in Europe, said Arrow has seen strong demand across almost all vertical business segments. Lead times for many components are long and are "here to stay," he said.

Arrow is working with customers on joint demand planning in an effort to mitigate the impact of long lead times and shortages.

However, the current supply chain situation will remain the key challenge in 2022. "Improving supply chain management and transparency will help companies to be more resilient and reduce impact from disruptions," said Strughold.

"At the end of last year, we started to see the uptick in the European market, which became even stronger during this year"

Mario Orlandi, president **Avnet EMEA, global IoT and Avnet Integrated**

Purchasing 'super-cycle'

Future Electronics' corporate VP, Karim Yasmine reflects on the factors that drove the industry to record levels and what to expect in the next phase of the market's 'super-cycle'

As opposed to prior market allocations, this round has lasted for four to five quarters, with strong indications it will remain until July 2022. 2021 was driven by a perfect storm of challenges including: record breaking weather patterns; massive transportation/freight issues; heavily reduced air travel; fab fires; and many more curve balls impacting supply chain recovery.

This is on top of unplanned and unforecast demand impacting major wafer foundries, OSATs and raw materials. Naturally, Covid-19 also impacted consumer spending patterns and manufacturing sites across the world.

Heading into 2022, many of the challenges remain. Manufacturers have enforced long-term visibility and long-term commitments. This will allow them to make long-term commitments and reserve capacity with their foundries.

Major foundries have launched multiple rounds of price increases to the manufacturing community which have been passed to distribution and the customer base. It is also important to note that flexibility on backlog will be minimal in 2022.

Shipping delays and freight costs are expected to remain at all-time highs throughout the year.

We recommend purchasing executives show long-term visibility with accurate requirements for the short-term so limited product output is directed to actual usage, driving end products to end consumers.

www.futureelectronics.com

Future Electronics' corporate VP, Karim Yasmine

Confidence and trust

Digi-Key Electronics' president, Dave Doherty, reveals his predictions for the electronics supply chain in 2022

If the past two years has shown us anything, it's that the market can be more unpredictable than anyone thought. Using the past as a predictor of the future, the 35 years I've spent in the electronic component distribution industry have taught me that this current capacity/supply crunch will likely not last as long as expected.

We know how difficult it is for customers to get their hands on some high-demand parts they need now, in some cases leading to increased order volume. I believe that will start reverting to more realistic levels in 2022 as customers find breathing room.

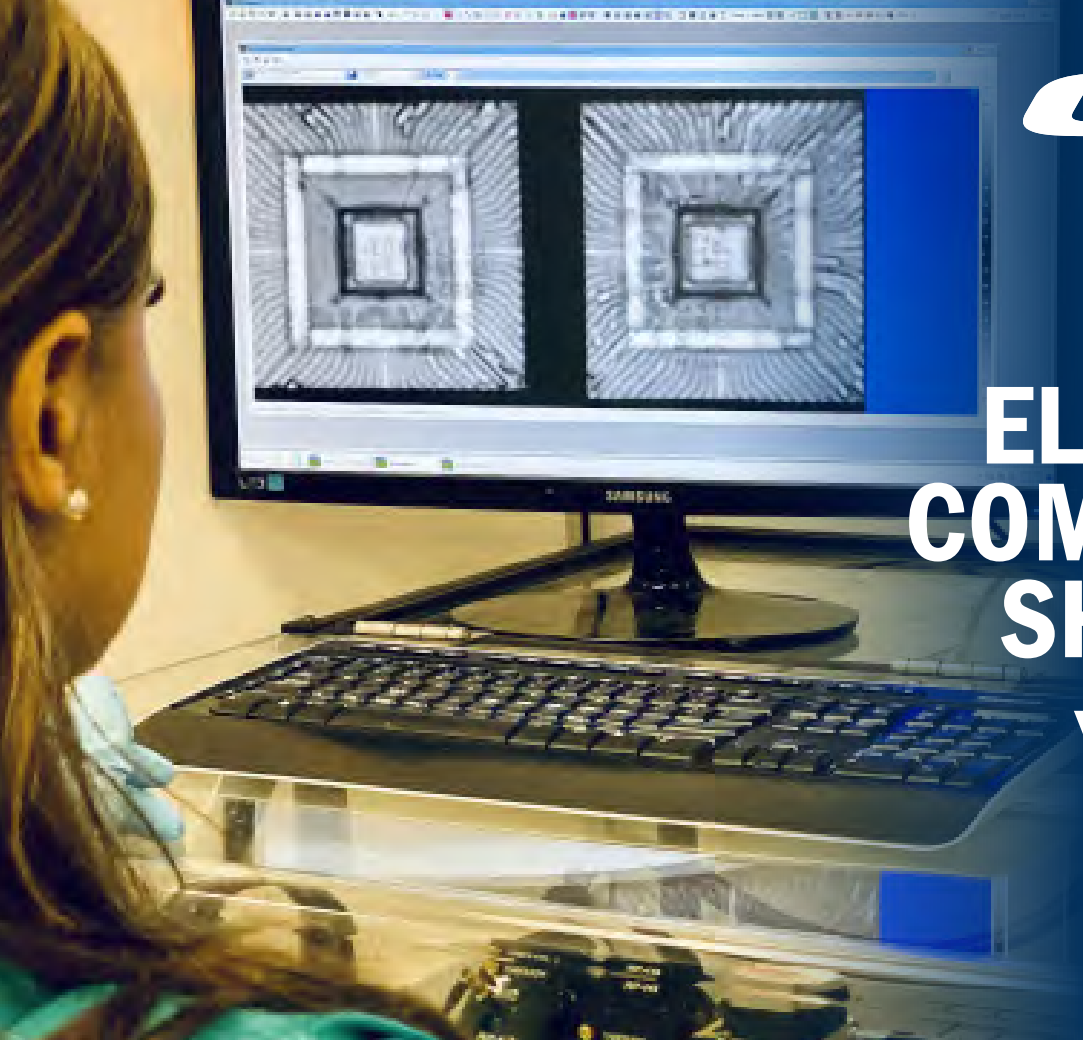
Additionally, I've often found suppliers overachieve and find new, creative ways to increase supply. I'm hopeful 2022 will see an uptick in supply as a result, and trust our partners are doing everything in their power to meet demand.

Digi-Key has increased its capital infrastructure investments in recent years as we've scaled capacity to meet skyrocketing demand. Those investments will continue to scale as our business grows for the next 15 to 20-years. These include our Product Distribution Center expansion in Minnesota, more robust and predictive web search functionality, higher inventory levels and increased warehouse automation, which ultimately benefit customers by providing an easy and efficient research, shopping and delivery experience.

The impact of the last 24-months on Digi-Key, and I think industry as a whole, has been the confidence and trust gained in each other and our ability to meet a crisis head-on—ultimately benefitting customers.

www.digikey.com

Digi-Key Electronics' president, Dave Doherty



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Investing in additional capacity

TTI Americas' president, Don Akery, looks at factors impacting customer growth and a return to normal lead times

As we begin 2022, strong customer demand will remain the single largest driver of overall growth in the electronics supply chain. However, it will also continue to be the number-one driver of supply chain constraints. Alongside continued high demand for components, extended lead times for those components are the second biggest factor impacting an otherwise strong business climate.

We're continuing to see strong demand across most customer segments. Transportation, industrial, military/defense and communications are showing the strongest booking growth. Commercial air—while down for most of 2021—has begun to recover and we expect that recovery to continue at a slow, gradual pace through 2023.

In addition to elevated demand our biggest supply chain concern remains in worldwide logistics and transportation delays. We expect the shortage of air freight capacity, delays at ports, railway bottlenecks and unpredictability around ground freight will continue through most of 2022 and into 2023. Transportation costs will remain at elevated levels until these bottlenecks are resolved.

For these reasons, we expect current supply chain issues to continue through the first half of 2022, leading to some improvement in lead times during the second half of the year.

Our suppliers are delivering more products since increasing output and investing in additional capacity. We expect those trends to continue throughout 2022.

www.tti.com

TTI Americas' president, Don Akery

An uneven healing process

Exponential Technology Group's president, Michael Knight, examines the critical factors facing electronic component distributors and manufacturers in the year ahead

As 2021 wraps up, most companies in the electronic components supply chain will finish with flabbergasting annual book-to-bill ratios and backlogs that, if they hold, will provide the basis for higher sales in the new year—but the common qualifier for all forecasts will be: 'if we can get parts'.

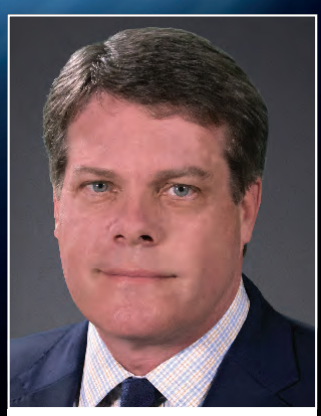
That qualifier aside, the combination of price increases, improving logistics and ongoing strong demand in almost all end markets (including soft sectors like aerospace) all but guarantees that, when the dust settles, most companies in the electronics industry will have set new sales records.

Supply chain constraints will continue to make forward progress arduous in 2022 and beyond, with semiconductor supply lead times being the most difficult drag to overcome. As the new year unfolds, it will become more and more obvious that it isn't just new chip capacity that is needed, but incremental capacity for a wide range of component types.

In addition, it will become more obvious that industry's thinking and planning approach to supply chain issues is linear in nature, and out of sync with the exponential growth that is occurring.

Ultimately, all breaks in the supply chain need to be healed before the whole system can return to pre-pandemic conditions. That healing process will be uneven, slowed by trade wars and disrupted by extreme weather events, but progress will be made, although, probably not fast enough to prevent negative impacts on OEMs that have suffered for access to parts due to a lack of leverage, relationships and/or purchasing power.

www.tti.com



Exponential Technology Group's president, Michael Knight

Covid-19 put us here, the market will get us out

Sager Electronics' senior VP marketing, Faris Aruri, explores the origins of today's supply chain disruptions and how to plan for 2022 and beyond

Sager Electronics' senior VP marketing, Faris Aruri

The pandemic has been unchartered waters for the entire world and we have learned much about what to expect and how to cope as we approach two-years of disruption to our personal lives and business norms. To predict what lies ahead for the supply chain in 2022, it is best to examine the factors that led to the current environment of excessive component lead-times, increased component prices and soaring freight costs.

When we began to understand Covid-19 in March 2020, we prepared for the worst business conditions, lockdowns, drop in demand and rise in unemployment. Order cancellations started, led by the automotive industry cancelling semiconductor deliveries for much of 2020.

Anticipating a drop in housing starts, the lumber industry followed. In the electronics industry, customers started notifying of their mandatory shutdowns and putting product deliveries on hold. Other industries followed, recalling past recessions and prepping for a new major one. A couple of lackluster quarters followed but it seemed that large government stimulus money prevented a meltdown and in Q4 of 2020, we saw signs of recovery.

By Q1 2021, the recovery was full on and the supply chain started warning of shortages due to reduced staffing levels, distance requirements, transportation issues, commercial flight reductions, sailing cutbacks, customs delays and port entrance bottlenecks. What followed was an unleashing of Covid-19 related pent up demand, population spend changes and consumer spending for everything.

Shortages of raw materials, limited manufacturing capacity and transportation issues added up to price increases and extended lead times not seen in years.

Our industry spent 40-years perfecting just-in-time, first introduced in Japan by Toyota. It has largely served us well, making companies more efficient, improving customer satisfaction and cash flow. The model has adjusted through speed bumps over the last several years but Covid-19 proved too much. It left us unprepared for the drastic increase in demand and as word got out, caused the industry to open its buying horizons even wider, leading to the incredible backlog we see today.

The free-market system will come through however, driving us to acquire additional raw material, make more shipping containers, add warehouse capacity, hire more production workers and truckers, upgrade infrastructure and eventually relieve all the port congestion: but it will take time and come with higher costs. Open jobs will start to fill but require increased wages. Inflation may become a real concern. We must work through the substantial 2022 backlog and there are no shortcuts. It will take up to six-months to see the beginnings and likely up to 12-months to the other side. We should all be planning for this horizon while keeping an eye on 2023.

www.sager.com

Transparent communication

To navigate 2022, Velocity Electronics' president and CEO, Kris Kelly, encourages buyers to focus on what is true, immediate and important

With 2022 quickly approaching, I think the only thing we can say for certain is we will need to manage through a tremendous amount of uncertainty in the coming year. We will continue to see price increases for components across most commodity types.

This upward pressure is driven by five macro factors affecting the global supply chain: surging demand across all verticals; ambiguity surrounding Covid 19 and variants; strained China/US relations; component stockpiling; OCM M/A activity; and labor shortages in logistics/manufacturing.

If we continue making semiconductors in multi-billion dollar fabs that take years to complete, we can expect cyclical shortages to persist. Fabs are pushing older technology into premature obsolescence to make room for newer technology, creating challenges for verticals with longer product life cycles.

We should see easing by 2H22 regarding product availability and lead times. However, nothing is certain. Energy shortages in China, Taiwan's drought and other unexpected events could prolong the shortage into 2023.

Two key factors all procurement professionals need to understand are supply chain agility and flexibility. Adaptability will help us navigate ups and downs in 2022. High levels of transparent communication between buyers and sellers are paramount to our mutual success. Collaboration and the exchange of market intelligence is also critical. Lastly, I would encourage all of us to focus on what is true, immediate and important.

velocityelectronics.com

Velocity Electronics' President and CEO, Kris Kelly

Shortening lead times for plastic enclosures

OKW Enclosures' president, Sean Bailey, believes lead times for housings are finally about to shorten—but only if you use the right supplier

OKW escaped the worst of the Covid-19 crisis by being well prepared. We kept inventory levels high and ordered 150 per cent of the plastics needed to mold our enclosures.

The Pittsburgh, PA company ships many of its products by air, avoiding the long delays and exorbitant container shipping prices that hit the electronics industry. Most of OKW's cargo traveled on passenger jets. When those were grounded, OKW turned to cargo flights. We secured good rates and absorbed any price rises—we haven't passed them on to our customers.

By doing all enclosure customization in-house (machining, lacquering, printing, laser marking, RFI/EMI shielding, installation and assembly) OKW has also mitigated the impact of Covid-19 on lead times.

Everything is done in-house so only a few components (screws, battery contacts) are sourced from third parties. Again, OKW has been careful to maintain good inventory levels. Assembly screws remain the most pressing issue on the horizon but OKW's purchasing team is already on the case.

If anything, OKW tends to benefit during tough times. Many electronics manufacturers who would previously have specified a fully bespoke housing instead turn to OKW for a customized standard enclosure. They soon realize that modern standard enclosures don't look 'standard'. With today's technology and the range of standard models available for specialized applications, it doesn't take much customization to create a fully branded enclosure that looks truly unique.

www.okwenclosures.com

OKW Enclosures' president, Sean Bailey

Providing end-to-end support

Newark's business president, Uma Pingali, explains that the company's stock position is offering customers better access to products regardless of market conditions

The market dynamics we're currently seeing are primarily the result of two trends. Firstly, traditional semiconductor customers who paused activity during the height of the pandemic are now returning to market. Secondly, demand is increasing from customers since the pandemic began. This combination has outstripped supply and is unlikely to subside soon.

Component shortages will certainly continue into 2022 and, in some sectors, beyond. We can also expect the increased demand we saw driven by the adoption of technology to support home working and at-home entertainment, to be permanent, likely to continue or even accelerate.

Newark is well placed to cope with supply chain challenges in the semiconductor market. We have more stock available in our warehouses than ever before, offering customers better access to products regardless of market conditions. We can fulfil most orders from stock thanks to the expanding breadth and depth of our line card.

Beyond simply providing inventory, we can offer customers specific advice and support, ensuring they have the best possible user experience prior to purchase, during the product selection/purchasing process and after they receive the parts they need. In these challenging times, Newark is proud to be able to provide this end-to-end support.

www.newark.com

Newark's business president, Uma Pingali

2022 & 2023 – The Reality of Component Supply and Demand

NewPower Worldwide's CEO, Carleton Dufoe, warns purchasing professionals that increased pricing paired with long lead times will be commonplace

Throughout the Covid-19 pandemic many businesses have undergone a digital transformation to thrive—or in some cases, just survive. This has significantly increased demand on the semiconductor ecosystem, fueling forecasts for continued growth in 2022. Factor in geopolitical relations and 2022 promises to be a year of continued uncertainty. It's likely the world will not see pre-pandemic supply chain operations until 2023 or 2024.

Component manufacturers have a clear understanding of their 2022 production limits. Many are already planning staggered price increases of 25 to 35 percent into 2022. Some are offering customers 60 to 70 percent delivery commitments if the scheduled price increases are agreed to and NCNR POs are placed well in advance. Purchasing professionals must adapt to this new climate, as increased pricing paired with long lead times will be commonplace.

With global supply chains in flux and demand for semiconductors accelerating, manufacturers will have to choose which customers and industries to prioritize. 2022 and 2023 will bring the perfect supply/demand storm as basic economics take over.

For ODMs that can make more money reselling components they receive vs building and shipping, profits and margins may skyrocket without the liabilities of production. OEMs with significant market share and profitability are buying and stocking components, refusing to let a ten-cent part hold up revenue any longer. As shortages become more prevalent, the market is shifting like never before: OEMs that aren't prepared to react will be left behind.

newpowerww.com

NewPower Worldwide's CEO, Carleton Dufoe

Lessons learned

Fusion Worldwide's President, Tobey Gonnerman, offers lessons for future-proofing the supply chain

Fusion Worldwide's President, Tobey Gonnerman

COVID-19 challenged the global supply chain but has offered a few lessons we can take note of to future-proof our manufacturing, packaging and distribution processes moving forward. These lessons include globalization, strategic partnerships and diversifying your AVL.

While consolidating all manufacturing to one geographic location may have worked in the past, the pandemic has revealed how vulnerable this can leave companies. We especially saw this with the COVID-19 outbreaks in Southeast Asia, where many of the largest factories consuming components are located. By spreading the risk, rather than consolidating in one location, you're less susceptible to major impacts from manufacturing disruption.

Having trusted partners to help fill shortages when product is scarce is imperative to keep the manufacturing lines running. Scrambling to find product without the help of qualified distribution partners can be scary, risky, time-consuming, and often futile. When you're at the risk of shortages and the high over-cost of parts, it's the global competence, supply assurance and quality-check initiatives qualified vendor partners provide that will get you what you need.

Designing in just a single component manufacturer's product where alternate manufacturers exist can be a risky approach. It can leave you at a disadvantage when extreme shortages abound. To avoid having to go back to the drawing board and consider a product re-design, a diverse AVL will provide a buffer for supply chain shocks.

The journey back to more a normalized market will certainly come with continued surprises, stresses and uncertainty. Applying the lessons and enhanced supply chain strategies learned along the way can help companies cope with whatever's next – inevitably additional shocks that will occur while the shifting scales continue to move.

www.fusionww.com

Investing in inventory and new products

Mouser Electronics' senior VP of products, Jeff Newell, states that inventory and selection are key in times of shortages and allocation

Look for supply chain instability to persist short term. However, there are reasons for optimism and confidence looking forward to 2022 and beyond. The industry outlook shows robust demand for components, particularly in the data, communication and transportation sectors.

At Mouser, our inventory position continues to help set us apart. We experienced a record year in 2021, due in large part to the overall semiconductor shortage throughout most of the industry. This continues to send customers our way as they know we are a well-resourced, authorized distributor with the widest selection of products in the world. We work continually with our logistics partners to provide shipping and freight at the best prices possible.

Expect to see continued growth in semiconductor products as those supply chains will continue to be spotty. We also expect to see growth in other major product categories (interconnect, passives, electromechanical), though likely not to the same extent. Engineering tools and new product introductions are two focus areas where we anticipate continued growth for 2022.

Inventory and selection are key in times of shortages and allocation. This year, Mouser has added a record 100-plus new manufacturers to its lineup and is stocking the industry's widest product selection, giving customers the most choices. In 2022, we will continue with our strategy to invest in inventory and new products.

www.mouser.com

Mouser Electronics' senior VP of products, Jeff Newell

Strong demand throughout the year

Smith's president Americas, Todd Burke, argues the role of established independent distributors will increase to meet rising component demand

As we head into 2022, many of the same supply chain challenges we are facing now will remain. Long lead times and price increases from global chip manufacturers will continue to be announced as they ramp production to meet demand. Volatile electronic component market conditions will likely start improving as companies implement more sophisticated supply chain procurement strategies.

Readers should expect to see a migration away from just-in-time purchasing models and a move toward more strategically planned procurement. The fluctuation of the electronic component market is challenging and relying on a single, traditional source is no longer sufficient. Major global electronics manufacturers are looking to build trusted partnerships to help them navigate market shifts, make more informed procurement decisions and handle the intricacies of logistics and operations. The need for electronic components will continue to grow and we expect the role of established independent distributors like Smith to increase accordingly.

With more component fabs scheduled to come online in the new year, the market may see pockets of excess supply for specific commodity groups. In this situation, readers should expect a leveling-off period for excessive prices. While these pockets of part oversupply are likely few and far between, we can count on strong electronic component demand throughout the year and a matching need for dynamic support to meet it.

www.smithweb.com

Smith's president, Americas, Todd Burke

Global Reach

26 Offices **16** Countries

Strategically located in the Americas, APAC, and EMEA.

We are where you need us to be.

Exceptional Quality

Quality is a top priority for our partners – that is why every aspect of what we do, from our real-time vendor rating system to our order accuracy guarantee is so valuable. Utilizing three global Inspection and Distribution Centers, Velocity is certified to more standards in more regions, than any other distributor:

- AS6081 certified in Austin, Amsterdam, and Singapore.
- AS9120 and ISO 9001 certified in Austin, Amsterdam, and Singapore.
- Velocity's inspection protocol is accredited to ISO/IEC 17020:2012.
- ANSI/ESD S20.20 certified in Austin, Amsterdam, and Singapore.

Inventory Solutions

Our in-stock and bonded inventory, global sourcing resources, and integrated solutions are vital to Velocity's competitive advantage in component procurement and management. **Count on seeing reduced costs across the board with our streamlined processes.**

Our collaborative approach and commitment to building long-term partnerships includes every aspect of our innovative supply chain services. **Velocity will reduce your overall cost of procurement** and keep your production lines running with continuity of supply.

Our Trusted Solutions

- Shortage
- Obsolete
- PPV
- EOL/LTB
- Bonded Programs

Values

Velocity is committed to providing Exceptional Experiences and Outcomes to our customers, supply partners, and to each other. We insist on adhering to a set of internal core values and a code of business conduct emphasizing honesty and integrity in everything we do.

Manufacturers explore alternative components at unprecedented rate

NewPower explains a critical skill in today's market is finding alternative parts, often last minute, when normal distribution channels fail

The global component shortage has made it almost impossible for manufacturers to find the components they need on a timeline to meet their production demands. Sophisticated manufacturers have augmented many pre-pandemic policies and are now deploying more aggressive tactics to ensure success. One example is the turn to independent distribution for shortage mitigation and alternative component sourcing.

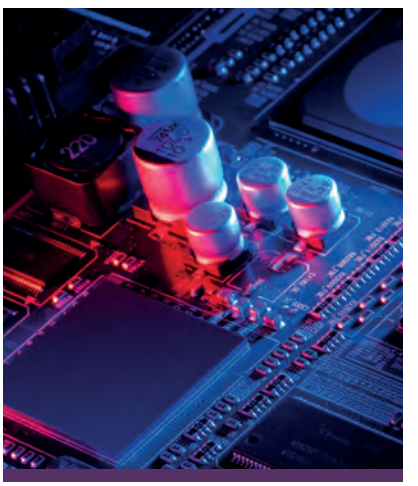
Pre-pandemic, sourcing components and scheduling production was typically a smooth process. With minimal supply chain disruptions, issues were few and far between and solved without panic or long-term effects. Manufacturers would look to independent distributors for alternative components when parts became scarce, but only when necessary.

Pandemic induced halts to production and labor shortages have caused existing supply chain costs to skyrocket. Shortages are commonplace as lead times extend, causing many to rely on alternative sources to find fairly priced components on acceptable lead times. Manufacturers must accept there are too many current supply chain issues to not be consistently searching for alternative parts. Engineers need deeper involvement as 'business as usual' no longer exists.

As an independent distributor, NewPower's business model focusses on finding parts quickly. Perhaps more importantly, we excel at finding alternative parts, often last minute, when normal distribution channels fail. With no supplier allegiance, loyalty is focused on the manufacturer. We help manufacturers find alternative components that function similarly—or even exactly the same—quickly and efficiently, so production lines don't stop.

NewPower's proprietary sourcing platform, Empower, helps it globally locate quality parts in real-time, along with alternative solutions for unavailable parts, letting the company meet manufacturers' time-sensitive demands without sacrificing quality, form or function. In some cases, NewPower can reduce costs and decrease lead times simply by sourcing alternative part numbers.

www.newpowerww.com



> **Pre-pandemic, sourcing components and scheduling production was typically a smooth process**

Predict disruptions before they happen

IBS Electronics' CEO, Rob Tavi, states the pandemic was an igniter to set up the 2020 decade for a technology revolution accelerating the digitalization of the electronics ecosystem

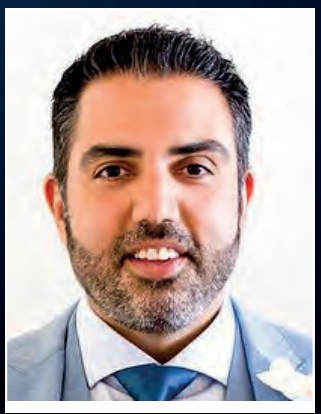
Electronics demand in 2021 is outpacing capacity and will continue to grow into 2022 and beyond as countries, businesses and consumers invest in technologies designed to enhance infrastructure, compute architecture and smart connected systems.

The biggest supply chain constraints are old human powered systems that are not sufficient to keep pace with the growth trajectory. Today, only a small percentage of OEM or EMS companies are modernized into digital MRP systems or Industry 4.0 which allow compute and machine learning systems to predict potential disruptions.

The pandemic has been a wake-up call for all companies involved in the supply chain to invest in their capacity, technology stacks and improved internal processes that are more data driven than ever.

Supply disruptions will persist for two years as demand will outpace production capacities well into 2023 until companies' technology and capacity investments catch up.

www.ibselectronics.com



IBS Electronics' CEO, Rob Tavi

Long-term changes ahead

Sourceability's founder and CEO, Jens Gamperl, predicts a rapid rise of AI, automation and machine learning to provide a more integrated and transparent supply chain

As our supply chain becomes increasingly unstable, I'm foreseeing a rise in digital solutions and AI. We have already seen surging interest in digital solutions, like Sourcengine.com, due to procurement teams scrambling to find alternative ways to pushout products for the holidays.

The magnitude of shortages leading up to 2022 illuminates the dire need for the electronics industry to start correcting the supply/demand imbalance. This needs to be done by digitizing the supply chain, which will create a more integrated and transparent system. We'll see more companies embracing AI, automation and machine learning, developing a 360-degree supply chain view to prevent or predict future disruptions.

Digitization will offer faster data analysis, allowing AI in marketplaces to support and accelerate supply chain processes.

We may also see diversified manufacturing. While most materials are made in East Asia, an overreliance on one world region has proved unsustainable. We've seen calls for government funding to help ensure future global crises won't create such damaging shortages.

Although shortages are a common occurrence in the semiconductor industry, the current crisis is unique due to its scope and duration. Some products and commodities will still have major issues into 2022, and we'll likely be dealing with shortages until 2023. That said, there will be long-term changes to how electronic components are sourced, especially given the interest in digital solutions and government interest in updating the supply chain.

www.sourceability.com

Sourceability's founder and CEO, Jens Gamperl

Long lead times for connectors will continue into first quarter of 2022

Prices are also likely to rise because of higher raw materials costs

The connector industry is on target to post a 24 per cent increase in sales for 2021 because of strong demand, limited supply and rising prices for many connectors.

Strong demand will continue into 2022 and buyers can expect lead times to increase or stay at higher-than-normal levels at least through the first quarter of next year. Prices will also rise, although increases may be more modest.

Year-to-date through September the connector industry grew 28 per cent, said Ron Bishop, president and founder of connector research firm Bishop & Associates. "It is unbelievable," how strong connecter sales growth has been in 2020, he said. He noted the initial 2021 sales forecast for the connector market was 3 per cent and then was updated to 7 per cent.

The sales growth rate for connectors will decline in the fourth quarter when sales rise 13 per cent. "It will be a good quarter," he said. If sales increase 13 per cent, it will bring down annual connector sale growth to 24 per cent, which would mean sales would total about $77.7 billion up from $62.7 billion in 2020. It would be the strongest sales growth rate for the industry since 2010, when sales increased 28.2 per cent, said Bishop.

He noted that industry backlog at the beginning of 2020 was $8 billion. As of September 2021, backlog grew to $19.3 billion. "People now are extra ordering. There's no doubt in my mind that people are saying 'I better get my order and so I am a first in line,'" said Bishop. "There's a lot of advanced ordering." He said the book-to-bill ratio for the connector industry was 1.0 at the end of 2019. At the end of 2020 it was 1.04 and at the end of September of this year, the book-to-bill was 1.15.

"It's amazing. I think this is the best the industry has ever done. We set all kinds of records for sales this year," said Bishop.

Don Hnatyshin, senior vice president and chief supply chain officer for connector manufacturer Molex, said demand for connectors has been strong because of certain "market dynamics" that are at play that are impacting the connector industry. "Advancements in technology, smart devices and other electronics are adding major demands to already constrained capacity," he said. Increased demand for cloud storage, the growth of electric vehicles and the greater use of industrial automation are all increasing connector demand.

Strong all-around growth

One distributor that has seen a huge increase in its connector business is TTI. "2021 is turning out to be an all-time record year for TTI with respect to our connector business," said Lew LaFornara, vice president product and supplier marketing. "The sales and unit demand are up significantly year-over-year, and we have also increased our order backlog," he said.

TTI has seen "significant growth" across a wide range of end markets and customers as well as a wide range of connector product types, said LaFornara. "Our strongest growth is coming from transportation, both automotive and non-auto transportation," he said. Connector demand has also been strong from industrial, appliance, events and communication sectors and from EMS providers that support those end markets, LaFornara said.

The most challenging market segments have been the commercial aviation segment and the oil and gas industry, but "we are seeing signs of business improvement in both these markets over the past several months," he said.

One reason for strong connector sales was pent up demand after Covid-19 shutdowns of electronics equipment production for a while in 2020, according to Bishop. It addition there was "a lot of government stimulus" which resulted in more people having money to spend. "A lot of people were buying stuff," he said. Many purchased electronics equipment including computers, smart phones and other consumer electronics equipment. In addition, a lot of buyers at electronics companies did a lot of advanced ordering parts in an effort to make sure

"Consistent with the positive 2022 outlook for global GDP growth and technology innovation along with strong semiconductor demand, we see the outlook for connector demand remaining strong in 2022

Don Hnatyshin, senior vice president and chief supply chain officer **for connector manufacturer Molex.**

their companies' production lines were not forced to shut down because of lack of connectors.

Such strong demand has created "supply chain challenges" in the connector business such as long lead times, said LaFornara. Longer lead times may continue for a while. Hnatyshin said lead times for connectors continue to be extended versus historical lead times with no sign of reductions in the near term.

Lead times differ

Lead times vary depending on the type of connector and the manufacturer. For instance, lead times for connectors from TE Connectivity range from 12 to 20 weeks, according to a commodity manager at mid-size electronic manufacturing services provider. Lead times for many Molex connectors are in the 16-26 weeks due to material shortages. However, lead times for Molex header, DIN, IDC and PCB connectors range from 24-27 weeks.

Amphenol lead times are 10 to 16 weeks on average, but RF connector wait times are 28-30 weeks. JST lead times are 28-40 weeks while Samtech connector wait times are 8-12 weeks, the commodity manager said.

Connector manufacturers may have different lead times because of the types of connectors they make, and the customer segment that they serve. For instance, Amphenol manufactures military and aerospace connectors and lead times for such parts can be six months.

Lead times are "horrendous on rectangular and circular connectors," said Bishop. "It's a different manufacturing process. We are starting to see shortages."

While lead times for some connectors are out to 40 weeks most lead times averaged 8 to 10 weeks, according to LaFornara. "Lead times on average have gradually extended but overall, the extension has been fairly moderate," he said. "Unfortunately, most suppliers are meeting their original delivery commitments at a lower rate due to the many challenges."

Materials shortages continue

He said unexpected demand that began in the second quarter of 2020 outpaced the manufacturing capacity for many types of connector products. Shortages of raw materials, metals, and resins and labor shortages, have all contributed to long lead times for connectors. "Unfortunately, I see all of these challenges continuing well into next year and perhaps beyond," said LaFornara.

Hnatyshin agrees that current supply chain challenges will continue ."Base resins continue to have long lead times with compounded resins extending because of global logistics disruptions that impact end-to-end supply. "We expect this to continue well into 2022," he said.

He added base metal and metal strip processing are seeing significant inflationary pressures and extended lead-times impacted by a shortage of labor. Ocean logistic disruptions that are forecasted well into 2022, Hnatyshin added.

However, connector manufacturers are taking steps to improve delivery including adding capacity, increasing their outsourcing, developing alternate/added sources of raw materials, and moving some level of manufacturing closer to their customers' point of consumption, according to LaFornara.

Connector prices rise

While lead times have stretched, prices have also increased due in part to higher material costs. Bishop said prices for connectors "usually increase modestly, but this year "prices have gone up like crazy."

"Connector suppliers had two or three price increases per year," he said. Bishop added it's not like "the old days when the connector industry transitioned to Asia and had all this cheap labor and there was all this price erosion. That's long over with."

Bishop says one reason connector prices are going up is because material cost increases. He noted plastics cost were up 14.4 per cent in the second quarter of 2021. The price of copper increased about 25 per cent from the end of November 2020 to November 2021, according to COMEX, the largest exchange for metals futures and options trading.

LaFornara said there have been "unprecedented" cost and price increases this year. "The magnitude of the increases and the urgency which our suppliers are implementing these increases is the greatest I've experienced in my career," he said. "The root cause is simply that everything costs more for our suppliers." Connector manufacturers have no option but to pass cost increases on, according to LaFornara.

"Freight and logistics are a huge factor with these costs increases," he said. In addition, labor costs are up significantly and the need for overtime and weekend production to meet the demand has added to cost increases. "Packaging materials are up significantly. Add to that investments for capacity expansion, safety protocols, increased inventory and it will add up to record cost increases," said LaFornara.

Hnatyshin added increased base material pricing, energy costs, wage inflation and logistics will impact pricing through 2022. "We will see a continuation of what we are experiencing in 2021," he said.

Growth to continue

Despite current supply chain challenges, the connector industry will continue to grow over the next five years. Bishop noted that over the past 20 years, the industry has had a compound annual growth rate of 5 to 6 per cent. While sales have increased more than 20 per cent this year, annual growth over the next five years will be

2021 is turning out to be an all-time record year for TTI with respect to our connector business

Lew LaFornara, vice president product and supplier marketing, **TTI**

in the historical range of 5 to 6 per cent.

LaFornara said TTI was optimistic for continued growth in 2022, but at a lower rate of growth than 2021. He said connector demand should remain robust in 2022.

"We are going into next year with a strong backlog and are still experiencing strong incoming order rates," LaFornara said. The overall rate of growth will vary by market segment with some normalizing from the high growth of this year but will be offset by an improving commercial aviation market and energy market, he said.

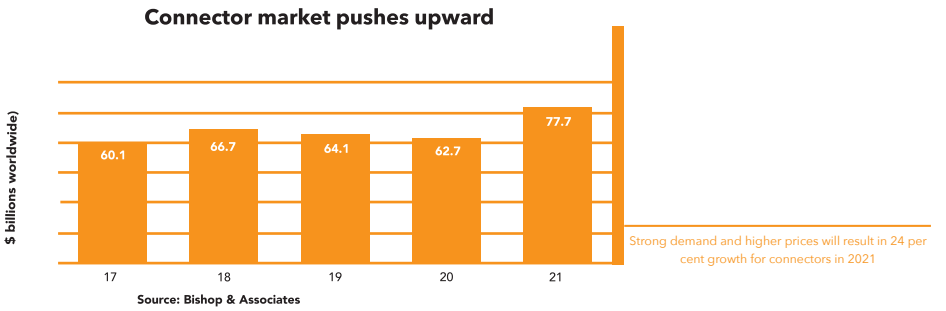
There is a lot of uncertainty about the second half of next year, according to LaFornara. The first half of 2022 "will see slow but steady" improvement in delivery for most products, he said. "The freight and logistics challenges will continue for a long time, but I am optimistic that as demand normalizes, and the many actions suppliers of connectors are taking, on-time delivery will gradually improve," said LaFornara.

TTI has taken "proactive steps' with its suppliers to improve lead times for customers, according to LaFornara. The distributor has grown its inventory over the past five months despite strong demand. "We are now positioned with all-time record inventory to support our customers," he said.

Hnatyshin said the connector industry will grow in 2022 and beyond as "more and more smart devices and electronics features are widely adopted." He added that connectors "are playing a significant role" connecting different devices and enabling different electronics features. He added continued innovation in the auto industry will also drive connector demand. Consistent with the positive 2022 outlook for global GDP growth and technology innovation along with strong semiconductor demand, we see the outlook for connector demand remaining strong in 2022," said Hnatyshin.

However, supply chain issues impacting the connector industries and most other industries will continue in 2022. "With the ongoing global logistics disruptions, we have not seen an improvement in freight capacity or freight costs for ocean or air during the second half of 2021," said Hnatyshin. "The current outlook for the first half of 2022 is more of the same."

He said in the first six months of 2022, Molex was not forecasting any "meaningful improvements" in availability, material costs or logistics. However, supply conditions should improve later in the year because of extra capacity that has been added and a slowdown in orders, said Bishop.



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Discover Endless Possibilities

Reducing Supply Chain Complexity

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No matter what stage of your product lifecycle, we provide engineering support services aiming at optimizing the assembly of your product.

Vendor Consolidation

Doing business with multiple vendors can be time consuming. With an extensive line card, we offer the benefits of vendor consolidation. Increase Purchasing Power, Reduce Freight Cost and Reduce Supply Chain Complexity.

Dedicated Support

Our team of experts are dedicated to monitoring market availability and shifts in price to provide an optimal customer experience that can also impact your bottom line.

WHY CHOOSE US?

IBS Electronics creates an integrated supplychain with our customers and suppliers by becoming a seamless extension of their operations worldwide. IBS delivers "Best in Class" processes, information, technology, tools and people.

- **Seamless Global Network**
- **Solutions to Shortages**
- **"Smart" Distribution Process**

ABOUT OUR COMPANY

IBS Electronics is an ISO 9001:2015, AS9120B & AS6081 certified authorized franchise distributor and a global leader in the delivery of innovative electronic components and logistic solutions.

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AUTHORIZED GLOBAL DISTRIBUTOR

ABOUT US

ONEIBS STRATEGY

IBS Electronics Group is an ISO 9001:2015, AS9120B and AS6081 Certified Global Franchise Distributor with over 40 years of experience. As a customer and people centric organization, IBS Electronics customers' experience dedicated support and endless possibilites from vendor consolidation to value engineering resulting in improved supply chain visibility and resilience, regardless of the geography, cost point, technology or market demand.

Discover custom solutions crafted to solve your greatest challenges with OneIBS, delivered ON TIME, EVERY TIME.

"The pandemic was an igniter"

to set up the 2020 decade for a technology revolution accelerating the global digitalization of our ecosystem.

The demand for electronics in 2021 is out pacing the capacity and it will continue to grow into 2022 and beyond as countries, businesses and consumers all invest into technologies that enhance infrastructure, compute architecture and smart connected systems to improve efficiencies in business and our way of life.

The biggest constraint is the supply chain of manufacturing due to the old traditional human powered driven systems that are not efficient enough today to keep up with the growth trajectory of global demand.

Today only a small percentage of OEM or EMS manufacturers are modernized into digital MRP systems or Industry 4.0 that allows compute and machine learning predictive systems to be ahead of potential disruptions.

The pandemic has been a wake-up call for all companies no matter where they are in the supply chain to invest into their capacity, technology stacks, and improve internal processes that are more data driven than ever.

Supply disruptions will persist for the next couple years as demand will outpace production capacities well into 2023 until companies technology and capacity investments catch up with the demand of the future.

- Rob Tavi, CEO of IBS Electronics

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Unsnarling America's supply lines

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

In this article, John Denslinger investigates the scope of work required to unsnarl America's supply lines, covering causal, flow and macro-economic factors

Supply chain • By John Denslinger

After years of stellar operational performance applying lean manufacturing and efficient JIT techniques, America's supply lines have broken down. This isn't to say lean and JIT are the cause, but rather highlight the need to stretch the scope of work if we are to unsnarl America's supply lines in short order.

The movement to globalize supply chains started around the time China was admitted to the WTO in 2001. The success that followed delivered positive results to many manufacturers year-after-year outweighing mounting concerns and perceived risks in a growing geopolitical world. With Covid as the catalyst, it took less than two-years to expose inherent fragility that was always there.

Seemingly overnight, manufacturers and their customers experienced the unthinkable. Reliable supply lines were no longer reliable. Quick solutions to bottlenecks merely created larger bottlenecks downstream akin to the carnival game 'whack-a-mole'. The cumulative impact produced unpredictable deliveries, historic lead times, depleted inventories, factory shutdowns, and for the consumer, empty shelves, fewer options.

As the Wall Street Journal recently noted: 'Nothing embodies the promise of globalization more than the humble supply chain'. Are we still a globalized world? Is it possible to revitalize supply chains? The answer is yes to both questions, but one must clearly understand the scope of work ahead to unsnarl America's supply lines.

Scope of work—contributing problems fall into three categories: causal factors directly snarling global supply lines; flow factors hampering early recovery; and macro-economic factors distorting recovery efforts. Let's review each factor in detail.

Causal factors collectively dealt repeated disruptive blows to supply lines:

- Covid pandemic—the unforeseen catalyst
- Global economic expansion—severely under-estimated demand at the pandemic's start
- Force majeure—supply interruptions from factory fire in Japan, winter storm in Texas, drought in Taiwan, rolling blackouts in China, etc
- Critical component shortages—the realization of constrained capacity and the investment lag time to satisfy demand
- Inventory depletion—panic buying
- Critical raw material surge—elevated concern over access and sustainability of core minerals vital to electronic component production

Flow factors hampered recovery. These problems surfaced because of causal factors and tend to be transitory. Nevertheless, solutions are still critical to early recovery:

- Post-pandemic restrictions—continued uncertainty over free movement what of people and goods
- Global labor shortages/workforce talent retention
- West Coast port congestion
- Truck and trucker shortage
- Workplace return delay/vaccination mandate conflicts
- Work stoppages and strikes

Macro-economic factors (largely politically driven) distort recovery efforts. It's likely the benefits of a revitalized supply chain will be diminished as manufacturers and consumers absorb the financial burden of higher costs.

- Infrastructure stimulus
- Social spending and climate stimulus
- Inflation
- Tax increases

Mapping solutions won't be easy or a one-time event and continued economic shocks will only serve to choke off early recovery. I am confident industry can reconfigure supply lines accommodating the causal factors. I am equally confident industry can address and resolve the flow factors. Less certain is the macro-economic impact. Will it support the industry's ability to unsnarl America's supply lines?

Respect the supply chain

Glenn Richey, the Raymond J Harbert Eminent Scholar and chair of the Department of Supply Chain Management in Auburn University's Harbert College of Business, discusses the current supply chain crisis

Q Is the Covid-19 pandemic completely to blame for supply chain disruptions?

The pandemic created a cascading disruption that impacted supply chains at their most vulnerable points. Plants that normally operated 24/7 were closed. Suppliers were also closed. Many manufacturers and suppliers could not ramp quickly enough to meet the post-pandemic demand because a focus on cost above responsiveness provided no safety net. Raw materials and parts suppliers paused and held limited inventory. Being so lean caused inventory to dry up.

Shortfalls in human resources in manufacturing and trucking, poor labor relations and productivity at ports, aging US rail infrastructure, outdated just-in-time manufacturing focus, misplaced emphasis on lean inventory management, spiked growth of e-commerce and panic forward buying all had a major impact. You can blame management, unions, government, experts and customers. All of us are involved in supply chains, and we all have contributed to this problem.

Q What caused overseas factories to close?

In China and the US an entire plant or port might be closed if one employee tested positive. Other countries closed plants depending on non-business specific issues, but plants also shut down when parts and raw materials aren't available or when labor has the means to not return to their jobs.

Q Why are cargo ships unable to dock and unload cargo?

There are many reasons as port operations are complex, but I think the current critical issues are pandemic recovery demand, e-commerce demand growth and an unwillingness to do the work required at choke points, including some western US ports.

When supply chain functions create bottlenecks, employees and management step up and do what it takes to avoid being the weakest link. That was not happening at US West Coast ports until recently. They finally started working nights and weekends in southern California and now say they're moving to 24-hours. The situation is more than an infrastructure issue. It is a labor relations and productivity issue that is adding pressure to other ports like Savannah, Georgia.

Some of this is customer panic buying—which is causing retail panic buying—which will cause manufacturers to overproduce. My suggestion to federal government is to encourage customers to not stockpile or rush to buy products. Stop saying things like 'buy your Christmas presents now'. That behavior is inflaming the situation. If you hear politicians saying, 'buy now', don't trust their understanding of supply chain management or the economy.

Q There was a shortage of truck drivers, who take the goods from ports to warehouses, before the pandemic. Why has the pandemic exasperated this labor shortage?

We have been trying to grow the truck driver ranks for 20-years. A recent report noted we will need an additional half million truckers by 2035, despite automation. Truck driving is a solid career. Over-the-road drivers can make a six-figure salary, receive superior health care and retire after 20-years. We need more outreach in high schools and trade schools about the benefits of joining this career path.

Q Is supply chain automation a possible long-term solution to many of these problems?

Automation can help us toward a long-term solution, but there is no magic bullet. Automation assists supply chain processes. If the company focus is efficiency, it works to speed the process while also reducing human error. That's a big plus, but not something that fixes a major bottleneck like we are experiencing today. If the focus is adjusting to market issues, automation can become a massively costly investment that might even become irrelevant.

Glenn Richey, Raymond J Harbert Eminent Scholar and chair of the Department of Supply Chain Management in Auburn University's Harbert College of Business

> **Our Supply Chain Management program at Auburn has seen massive interest and related growth, but many universities pay almost no attention to supply chain management education**

Automation saves cost and human error but can limit a company's ability to respond to market and customer needs. Innovative management and employees remain our most important asset in the US. Combining those people with automated material-handling equipment and automated trucks should help us to return to normalcy in time.

There is a shortage of computer chips, so auto manufacturers can't make new vehicles. Why?

Raw materials are in high demand and low supply while manufacturers are ramping production. It is easier for chip manufacturers to send millions of devices to cell phone companies. They could send the same to GM, but why deal with interventionism when you can distribute at home in massive quantities? Why deal with the relationship and political risk in the US?

One silver lining may be that consumers now have a better understanding, even respect, for all facets of the supply chain. What a teachable moment for the Auburn students studying supply chain. Agree?

Community: Customers now know what a supply chain is, but they don't understand supply chains. They don't know the complexity, distance, cost and speed issues, and why should they? Consumers just want the product now. Understanding that supply chains have limited capacity, maybe customers will come to realize that they don't need everything in two days.

Government: Politicians need to know there is no 'the' supply chain. Supply chains are many and beyond direct control of our government, outside of blocking/delaying distribution to our citizens. Supply chains make up massive networks of global companies connecting to support world commerce. Politicians should not criticize private industry when many supply chains involve public entities, including the Chinese and other governments. Maybe public servants will spend time learning about and understanding the importance of the supply chain?

Universities: Our Supply Chain Management program at Auburn has seen massive interest and related growth, but many universities pay almost no attention to supply chain management education. That needs to change if we want to respond effectively to future disruptions. Perhaps all this attention to supply chain management will encourage the growth of new programs, helping us increase the much-needed talent pool. Until then, I encourage every interested undergraduate and graduate student to consider Auburn.

Analog IC supply conditions will improve in 2022

Semiconductor buyers can expect lower prices and shorter lead times for analog chips next year because of weaker demand

James Carbone

The analog integrated circuit (IC) market will end 2021 growing 30.8 per cent, but demand and revenue growth will cool off in 2022 when sales will decline 9.3 per cent because of higher inventories and declining prices, according to Semico Research.

Buyers can expect lead times to shrink because analog IC manufacturers have added capacity this year due to strong demand from multiple customer segments. In addition, purchase orders will decline next year because many buyers have double ordered parts and OEMs and electronics manufacturing services (EMS) providers have increased stockpiles of analog chips, according to industry analysts. Analog ICs include operational amplifiers, instrumentation amplifiers, comparators, voltage reference ICs and filter ICs among others.

Purchasers double ordered analog ICs as well as other semiconductors and increased inventories because they feared the lack of low-cost chips could end up shutting down production of computers, smart phones, and other consumer electronics equipment.

"Over the last 20 years, the industry struggled to refine the supply chain and do just-in-time inventory where some companies get their parts the day before or the day of production," said Jim Feldhan, president of Semico Research. With JIT, OEMs and EMS providers reduced their own inventory levels and cut total cost.

"But when you get a disruption like a production shutdown because of a pandemic, it throws a wrench into the whole mix," he said. An OEM does not want to shut down production just because they could not get an analog part that may cost 50 cents.

"So, all of a sudden the cost of holding inventory is not that great compared to not being able to ship products," said Feldhan. Companies have had a change of attitude about inventory and are now willing to build a little bit of an inventory buffer in order to keep production lines running, he said.

Inventory grows

Feldhan says it appears there is double ordering of parts and inventory building occurring. He notes that unit shipments of analog ICs grew 23 per cent in 2021. "It is hard to believe that the end markets such as laptops, cell phones, and other consumer electronics equipment are growing more than 23 per cent, he said. Such strong unit demand indicates more parts are being purchased than are being used and companies are building inventories of analog ICs and other chips.

One end-market segment where there may be a lot of double ordering of parts is automotive, which accounts for about 30 per cent of the total analog IC market, according to Semico.

The automotive IC market will grow from about $8.8 billion in 2020 to $11.5 billion in 2021, said Feldhan. Unit shipments to automotive in 2020 were 15 billion and will end up rising to 19 billion in 2021, he said.

"That is a 31 per cent increase in revenue and almost 25 per cent increase in units from 2020," said Feldhan. "Obviously car companies are not making 25 per cent more cars that they did last year."

"So where are all those parts going? I say they are going into inventory" because an automaker doesn't want to delay shipments of vehicles because they don't have an analog IC for a computer board needed for a car, he said.

With high inventories, there will be fewer parts purchased in the automotive segment at least through the first half of the year. "We think orders will slow down and we are projecting revenue of analog ICs in automotive will decline 5 percent to $10.9

By the Numbers

$72.3 billion
The forecasted size of worldwide analog IC market in 2021
Source: Semico Research

-9.3%
The rate of decline of the analog chip market in 2022
Source: Semico Research

30.8%
The growth rate of the global analog IC market in 2021
Source: Semico Research

33.9 cents
The average price of an analog IC in 2021
Source: Semico Research

213.8 billion
The number of analog ICs that will ship in 2021
Source: Semico Research

$75.6 billion
The forecasted size of the analog integrated circuit market in 2026 Source: Semico Research

billion. Units will grow 2.5 per cent," said Feldhan.

That would mean automakers and their suppliers "are holding inventories and they will be going back to a "normal buying pattern" where they are consuming some inventory and buying a relatively small amount of parts compared to 2021, he said.

In 2021 there will be more of a decline in the overall analog IC market compared to automotive. The global analog chip market will decline from $72.3 billion in 2021 to $65.9 billion in 2022, according to Semico. Unit shipments will decline 1.6 per cent.

Prices to fall

A decline in demand and the addition of more capacity will result in greater supply availability and lower prices. The average price of an analog IC should decline from 33.3 cents in 2021 to 31.2 cents in 2022, according to Feldhan. In 2020, the average price was 32 cents.

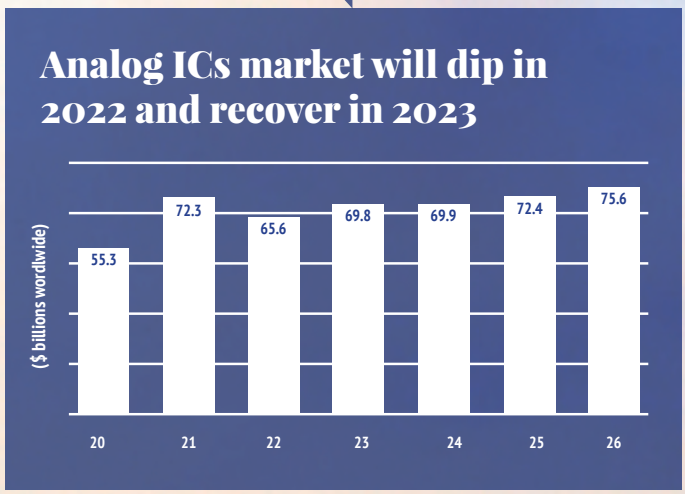
He said supply and demand for analog ICs will be more in balance beginning early in 2022. Feldhan noted that manufacturers have added some capacity as demand for analog chips increased in 2021. "There were so many orders this year that prices went up and lead times stretched. But next year, unit demand is not going to grow and companies will continue to add capacity," said Feldhan.

One analog IC manufacturer that is adding internal and external capacity is microchip technology. Rich Simoncic, Microchip's senior vice president of analog power and interface business unit, said Microchip is adding internal capacity and is working "closely with our supply chain partners who provide wafer foundry, assembly/test and materials to secure additional capacity wherever possible."

He said the extra capacity is needed. "We are in the midst of the worst semiconductor shortage we have seen in many years," said Simoncic. The balance between supply and demand worsened over the last six months, he said.

"The rate at which new orders are coming in is outpacing the capacity that we can bring on board," he said. "Depending on the technology corridor, some technologies will be faster or slower to recover." Fortunately for analog IC buyers, devices such as operational amplifiers and converters "will recover faster given the lower level of technology complexity," said Simoncic.

The worldwide analog IC market will decline in 2022 but then post strong annual growth through 2026 *Source: Semico Research*



The average price of an analog IC will increase in 2021 but will fall steadily through 2024 *Source: Semico Research*

Production capacity grows

"We expect our combination of internal and external actions to increase overall capacity every quarter in calendar 2021 and 2022," he said. Despite the growth in production capacity, Microchip expects "wafer fab as well as assembly and test constraints will persist through 2021 and quite likely through most of 2022," he said.

To help some customers manage supply constraints Microchip has instituted a preferred supply program (PSP) that gives their best customers supply priority.

The program provides customers with supply priority beginning 6 months after their order in exchange for at least 12 months of non-cancellable orders. "Customer response to the program has exceeded our expectations with direct customers and distributors alike," said Simoncic. More than 50 per cent of Microchip's backlog is now in the PSP program.

"Additional PSP backlog continues to come in every week. This gives us a solid foundation to enable us to prudently acquire constrained raw materials, invest in expanding factory capacity, and hire employees to support our factory ramps," said Simoncic.

He said Microchip makes capacity decisions for its internal factories where possible based on the strength of its backlog, especially our non-cancellable PSP backlog, he said.

Microchip is not the only analog IC manufacturer that is adding capacity. Texas Instruments, the analog IC market leader with 19 per cent market share, has announced plans to build a 300mm fab in Richardson, Texas, to build analog ICs. About half of TI's analog devices were manufactured on 300mm wafers in 2020. It is switching more production to 300mm wafers because the larger size wafers reduce the cost of unpackaged parts by 40 per cent compared to production using 200mm wafers, according to researcher IC Insights. Fully packaged and tested ICs made on 300mm wafers cost about 20 per cent less than those fabricated in 200mm fabs, said TI.

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

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ELECTROMECHANICAL *(Continued)*											
NKK Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	13,976	N/A	$0	86.00%	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Panasonic	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
PUI Audio	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Schneider Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Sensata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Teledyne Relays	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
ENCLOSURES											
Bud	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bud Industries	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	$0	80.00%	50	1,000+	Y
Hammond Manufacturing	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,839	N/A	$0	82%	50	1,000+	Y
METCASE Enclosures	OKW Enclosures, Inc.	(800) 965-9872	www.metcaseusa.com		322	N/A	$0	N/A	10	20	Y
New Age Enclosures	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
OKW Gehäusesysteme GmbH	OKW Enclosures, Inc.	(800) 965-9872	www.okwenclosures.com		2,450	N/A	$0	N/A	10	20	Y
ROLEC Gehäuse-Systeme GmbH	ROLEC Enclosures Inc	(888) 658-5774	www.rolec-usa.com		1,960	N/A	$0	N/A	4	6	Y
FREQUENCY MANAGEMENT											
Abracon Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,780	N/A	$0	100%	50	1,000+	Y
CTS Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,889	N/A	$0	100%	50	1,000+	Y
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IQD Frequency Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
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ICs & SEMICONDUCTORS											
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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
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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
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MACOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	$0	100%	50	1,000+	Y
Microsemi	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Nexperia	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	$0	100%	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	$0	96%	50	1,000+	Y
Power Integrations	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Qorvo	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Renesas Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
SanDisk	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	$0	100.00%	50	1,000+	Y
Skyworks	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	$0	96.00%	50	1,000+	Y
Swissbit	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	$0	94%	50	1,000+	Y
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	$0	77%	50	1,000+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
INTERCONNECTION											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23,235	N/A	$0	46.00%	50	1,000+	Y
Aero Conesys	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	Mouser Electronics	800-346-6873	www.mouser.com	Y	165,853	N/A	$0	31%	50	1,000+	Y
Anderson Power Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Aptive (Delphi)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Bel Magnetic Solutions	Bel Fuse	+1 858 676 9650	belfuse.com/magnetic-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cinch	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cinch Connectivity/Bel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Cinch Connectivity Solutions	Bel Fuse	+1 507 833 8822	+1 507 833 8822	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ERNI Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
FCI	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,394	N/A	$0	73.00%	50	1,000+	Y
Glenair	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Harting	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,160	N/A	$0	51.00%	50	1,000+	Y
Harwin	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Hirose Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
ITT Cannon	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ITT Cannon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
JAE Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,02	N/A	$0	100%	N/A	N/A	Y
JST	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
LEMO	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Mill-Max	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	$0	89%	50	1,000+	Y
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	$0	100%	50	1,000+	Y
NorComp	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	$0	77.00%	50	1,000+	Y
Radiall	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	$0	27%	50	1,000+	Y
Stewart Connector	Bel Fuse	+ 1 717 235 7512	belfuse.com/stewart-connector	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	$0	55%	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	$0	69%	50	1,000+	Y
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	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	26,533	N/A	$0	98.00%	50	1,000+	Y
Fair-Rite	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Kemet	Mouser Electronics	800-346-6873	www.mouser.com	Y	77,568	N/A	$0	66%	50	1,000+	Y
KOA Speer	Mouser Electronics	800-346-6873	www.mouser.com	Y	34,078	N/A	$0	58%	50	1,000+	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	33,780	N/A	$0	99%	50	1,000+	Y
Nichicon	Mouser Electronics	800-346-6873	www.mouser.com	Y	20,389	N/A	$0	84.00%	50	1,000+	Y
Ohmite	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,293	N/A	$0	55.00%	50	1,000+	Y
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,948	N/A	$0	100.00%	50	1,000+	Y
Signal Transformer	Bel Fuse	+1 516 239 5777	belfuse.com/signal	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	$0	98.00%	50	1,000+	Y

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
PASSIVES *(Continued)*											
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	$0	100.00%	50	1,000+	Y
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	$0	64.00%	50	1,000+	Y
Wurth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	$0	100.00%	50	1,000+	Y
POWER & BATTERIES											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Bel Power Solutions	Bel Fuse	Power & Batteries	belfuse.com/power-solutions	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Mornsun	+1-978-567-9610/+1-978-293-3923		www.mornsunamerica.com		N/A	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
Lascar Electronics		814-835-0621	www.lascarelectronics.com	Y	130	$602,000	$0	100%	10	175	Y
Tektronix	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	$0	N/A	50	1,000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	$0	96.00%	50	1,000+	Y

Contract Manufacturers Buyers' Guide

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

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Internal Sales Assistant
Texas, Florida

Material Manager
Texas, Florida

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