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2022
EXECUTIVE FORECASTS
WHAT'S IN STORE

On the cover – December 2021

2022 Executive Forecasts what's in store

Find out on pages 08-16

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 optimised 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 UK and North American 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 synchronised. 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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Sensing, control and monitoring products shipping from stock

Farnell has signed an exclusive agreement with Omega to become the only high service distributor to stock its full product portfolio including sensing, control and monitoring products for factory automation and Industry 4.0.

Omega's portfolio adds 620 products to Farnell's inventory, including power supplies, sensors, transducers, switches, relays, transformers, thermal management components, enclosures, panel displays/ instrumentation, cables, connectors and more. There is no minimum order quantity.

Farnell's product segment leader, Mike King, said: "We are very pleased to be appointed as the exclusive distributor of Omega's fast-growing range of sensing and monitoring technology products. Investment in process automation and Industry 4.0 is critical to the growth of our economy and Farnell customers can now buy all of their Omega products from a single source with fast delivery options."

farnell.com

Circular connectors now available

RS Components has announced availability of a complete series of circular connectors manufactured by Conec Elektronische Bauelemente, part of the Amphenol Group. Featuring 0.8mm diameter contact pins, the compact range of M8x1 D-coded circular connectors are optimised for industrial automation applications, meeting ISO11801 Class D for up to 100Mbit/s signal transmissions.

Ethernet-based communications applications include industrial interfaces, control and regulation units, sensors, cameras and robotics. Key features include variable mounting and connection options on the device side, power and data signal on one data pair and continuous shielding.

Electrical characteristics include 50VAC and 60VDC working voltages and a 4A at 40°C current rating. All devices are IP67.

The field attachable connectors include axial female and male connector variants and come with optional screw connections (female) or crimp connections (female and male).

uk.rs-online.com

Inflation hits 13-year high

In the IPC's October 2021 *Outlook Report*, supply chains remain under tremendous pressure with container ship reliability stuck near all-time lows across the world. Compounding the problem, ships are stuck at anchor waiting for a berth to unload. Recent data from Long Beach and Los Angeles ports (accounting for nearly half of all US imports) shows 147 ships in port but only 51 at berth. The remaining 96 are anchored or adrift waiting to unload.

Airfreight capacity is also stymied, potentially taking until 2024 to return to pre-pandemic capacity. About half of airfreight capacity is in the belly hold of commercial airlines and commercial airline capacity remains 28 per cent below 2019 levels. In both cases of containerised cargo and airfreight, prices remain extremely elevated.

The Euro zone saw inflation hit a 13-year high in September. Manufacturers are seeing prices rise across the board. They are facing higher raw materials costs and because many have been forced to look to the broker market for needed parts, they are also paying higher prices for other inputs.

ipc.org

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ES News

In Brief

Connector support expands
Ametek Engineered Interconnect and Packaging (EIP) is expanding its sales and customer service activities for its interconnect and packaging products into Europe. The decision was based on rising demand for hermetic connector and packaging solutions in defense, aerospace, industrial, medical, semiconductor, telecom and other markets.
www.ametekinterconnect.com

World class cable assemblies
Cable and wire harness assembly specialist, Nicab, has announced UL Traceability Accreditation, a global traceability standard for wiring harnesses assembly. MD, Nick Locke, said: "The benefit for our customers is we can certify our cables and wire harnesses to UL standards enabling global supply of the assemblies we manufacture in the UK."
www.nicab.co.uk

Buying into semiconductor packaging
Russel Industries has acquired RAM Innovations, a bespoke R&D and manufacturing services provider. Based in North Wales, RAM offers a range of specialist services, mainly relating to semiconductor packaging. It's facility features: die placement/bonding; laser direct imaging; lamination; CNC machining; SMT processing; plus wet chemistry for metallisation and chemical milling.
www.ram-innovations.com

Reducing semiconductor ecological footprint
Imec has announced Apple has joined its Sustainable Semiconductor Technologies and Systems (SSTS) research program. The program is rallying stakeholders from across the IC value chain to anticipate the environmental impact of choices made at the chip technology definition phase. The program is designed to help the IC-making industry cut back on its ecological footprint.
www.imec-int.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

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

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 optimise 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

The canny prosper in a booming market

Forward thinking is key to navigating a difficult supply chain and exploiting strong demand says Anglia Components' CEO, Steve Rawlins

The market is booming and customers are seeing strong demand. Yet, this demand is difficult to fulfil because of an exceptionally difficult supply chain—a situation that is unprecedented in my experience. There is inventory in the supply chain, but you've got to be smart and forward thinking to get your hands on enough to keep production lines and businesses going.

The position on lead times today is worse than a quarter ago and I don't see it improving until next Summer at the earliest. As we emerge from the pandemic we are seeing pent-up demand, yet Covid has reduced capacity at raw material sources, manufacturing sites and in logistics organisations. Raw materials are harder to obtain so manufacturers are seeing significant price increases which have to be passed to customers. Also, freight charges are increasing and delivery times extending even when stock is available. We know of distributors quoting 17-days delivery on ex-stock orders.

With careful planning and forward ordering it is possible to find enough inventory. We're telling customers to order now for Easter deliveries. Anglia has invested by increasing its forward ordering when stock was relatively plentiful, against the lean times we saw coming. We've been told we started ramping ordering at least six months ahead of the market. We're carefully protecting this inventory position to support customers who partner with us. Working together allows everyone to prosper. We're forecasting 20 per cent growth as a result—well ahead of the ecsn market forecast.

www.anglia.com

Anglia Components' CEO, Steve Rawlins

Confidence and trust

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

If the past two years have taught us anything, it's that the market can be more unpredictable than anyone ever 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 and supply crunch will likely not last as long as expected.

We know how difficult it is for customers to source some high-demand parts they need right now and in some cases this has led to increased order volume. However, I believe things will start returning to realistic levels in 2022 as customers experience more breathing room.

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

Digi-Key has significantly increased its capital infrastructure investments in recent years as we've scaled our capacity to match skyrocketing demand, and those investments will continue to scale as business grows.

These include: Product Distribution Centre expansion in Minnesota; more robust and predictive web search functionality; higher inventory levels and increased warehouse automation—all ultimately benefitting customers by providing an easy and efficient research, shopping and delivery experience.

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

www.digikey.co.uk

Digi-Key Electronics' president, Dave Doherty

Mitigating supply chain risks

Astute Group's sales and marketing director, Mark Shanley, advises buyers to seek support and guidance from a forward-thinking, trusted partner

2021 has challenged the electronics industry like never before with no end in sight. Lead times will continue to increase over the next two quarters as shortages begin to impact telecoms, which avoided the initial impact due to their long-term planning. Volumes will continue to increase as we consume more components.

Customers have secured stock for this year's production. However, when they begin purchasing at the start of 2022, they are going to find a market with no signs of recovery. Many global distributors have been effectively managing allocation over the past few months, but the next two quarters will be a juggling act deciding who to support.

High-volume industrial component consumers are buying up pockets of stock when available at prices 10 times the standard cost. This can only be maintained temporarily and costs will have to be passed down the chain. Most OCMs will look to increase their price-book in Q1 as the impact of rising raw material costs are considered.

Open market stockists are driving up prices, with changes happening by the hour. This will drive desperate buyers to the grey market which introduces risks. The waters are tough to navigate at the best of times but will become murkier over coming months. Buyers should seek support and guidance from a forward-thinking, trusted partner, experienced in mitigating risk to the supply-chain from counterfeit and fraudulent suppliers and navigating turbulent market conditions.

www.astutegroup.com

Astute Group's sales and marketing director, Mark Shanley

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.co.uk

Mouser Electronics' senior VP of products, Jeff Newell

Customer confidence is high

G English Electronics' MD, David English, explores the causes of current supply chain problems, while remaining upbeat regarding customer confidence and innovation

The pandemic has shocked the global supply chain and impacted UK electronics manufacturing. Gelec can see that disruption will likely continue into 2022 and expects its impact may be felt into 2023. Historically, this industry has experienced shortages and price fluctuations but the current situation is unprecedented.

With some exceptions, we expect component prices will remain at current levels for some time. Price inflation was caused by increased demand, material cost and transport issues. For many items, capacity simply cannot meet demand and the improvements needed will not happen overnight.

Pre-covid the supply of most electronic parts was not a concern. However, the pandemic has created significant challenges for supply chains, putting them under intense pressure and exposing vulnerabilities. Providing normal working practices and capacities resume in coming weeks a path to recovery will become visible.

Sea freight capacity and container availability is unlikely to improve for many weeks. When ports are operating normally the backlog will reduce slowly. Staff shortages at ports and the pay/working conditions of critical workers, including HGV drivers need to be addressed.

There has been a significant reduction in airfreight capacity from Asia. When China reopens capacity will return and cost will reduce but this is months away.

China's zero-Covid strategy means that further lockdowns are possible, stretching the situation, with quarantine delays and ships waiting to dock.

On a cautionary note, inflation and interest rates need consideration but the momentum is promising. With so many opportunities, the market expects to grow and customer confidence is high. Many developments and new products are due for 2022 release.

www.gelec.co.uk

G English Electronics' MD, David English

Forecasts

2022: output catches demand

Jauch's managing director, Nicholas Ribton, encourages buyers to take advantage of UK-based buffer/pipeline inventory when available

I believe the first six-months of 2022 will be similar to what we have experienced in 2021 as the industry looks for a stable supply chain. At Jauch and in the wider industry, order books are full throughout 2022 as a minimum. If they're not, customers should not be surprised at real ripples in their components supply.

Additional factory capacity takes time to become volume production, so lead times of over 52-weeks are still a real scenario for 2022. As an example, we have seen many traditional 'blue chip' battery cell suppliers favouring global EV OEMs and >52-weeks has become the norm. Thus, we are using our battery pack design team to ensure manufacturing stability by securing robust, lower risk, supply chains for the entire pack—a similar trend is expected well into 2022.

In the UK, the added challenges of fewer HGV drivers, coastal port delays, hold-ups in offloading and the lingering Covid-19 threat to the logistic and supply chain remain real risks. If your vendors can hold UK-based buffer/pipeline inventory of key components (which Jauch does for many customers) I would certainly take advantage of their service. On a more positive note, I think we should expect prices to level in Q3 and Q4 2022 as output catches up with demand.

www.jauch.com

Jauch's managing director, **Nicholas Ribton**

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

Streamline supply chains where possible

Rebound Electronics' COO, Stefan Mason, emphasises that supply chain visibility is more important than ever

Rebound Electronics' COO, Stefan Mason

The past two years have been marred by the unprecedented disruption caused by a perfect storm of component shortages, trade wars and coronavirus pandemic. This disruption has significantly decreased availability and increased lead times for many products, which can be damaging to manufacturing businesses. Rebound expects the market issues to last well into 2022, potentially into 2023.

Market demand is not going anywhere and even when availability strengthens we expect to see demand increase as confidence that product can be delivered inside 52-weeks (allocation's magic number) returns.

It is worth noting that you are more likely to experience complexities when your supply chain is itself more complicated. Thus, look to streamline your supply chain where possible.

Having many suppliers to get the lowest prices on individual components can make it much harder to keep track of stock you need and align it with customer or client orders, which will cost money in the long run. Vendor consolidation makes it easier to manage a supply chain and integrate any new processes end-to-end.

While you may not be able to prevent troublesome market conditions, you can prepare by being proactive and aligning yourself with an experienced supply chain partner, like Rebound Electronics.

reboundeu.com

Power cuts amplify supply issues

In this article, Midas Displays' sales manager, Mark Lovick, explains some of the reasons why lead times/prices are increasing and when to expect some stability

It is clear to Midas Displays that the electronics supply chain will continue to suffer from increased prices/lead times, due to rising demand and supply shortages, throughout 2022.

Regarding ICs, there is currently extremely high demand and a severe shortage. Reasons include: high IC demand for the development of 5G networks; high demand for displays and ICs used in home-office and home-schooling equipment; plus pent-up demand caused by the pandemic. In addition to driver ICs and microcontroller shortages, TFT glass is in demand for mobile phones, laptops, automotive and numerous MMI products, yet there is a limited number of display glass manufacturers. Thus, supplies to TFT manufacturers have been limited, leading to significantly longer lead-times and inevitably higher prices.

In Q4 2021 another issue further impacted lead times. A number of Asian factories stopped production for up to four days per week because of power cuts/curbs. Several provinces including Guangdong, Anhui, Jiangsu, Zhejiang, Shandong, Guangxi and Yunnan have implemented measures to curtail power and suspend production. Essentially, to catch up from the Covid-19 pandemic, factories have used their 'allocated energy quota' quicker than expected and are now suffering from severe supply shortages.

The severe supply issues of displays will continue throughout 2022 and, we believe, in to 2023.

www.midasdisplays.com

Midas Displays' sales manager, Mark Lovick

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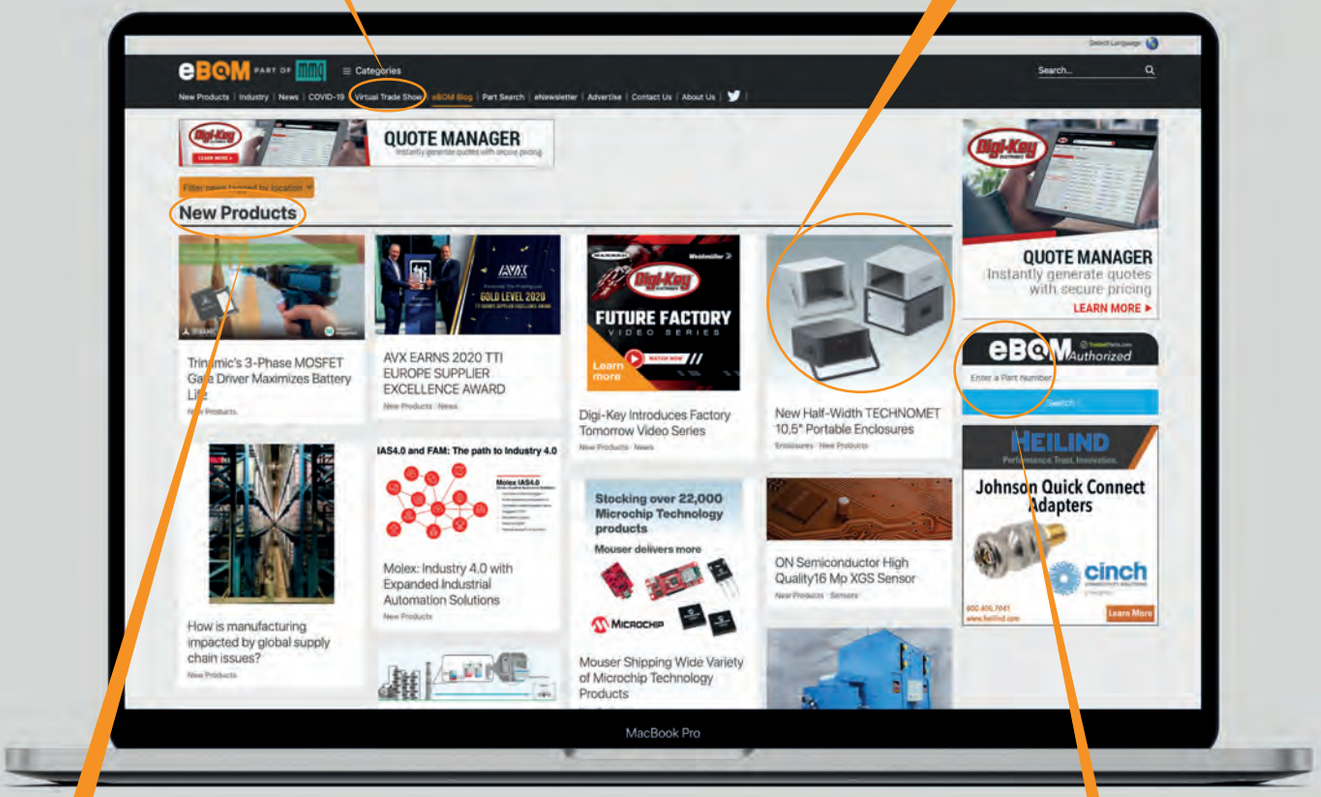

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Stabilising critical pricing

Charcroft's Debbie Rowland emphasises that talking matters. Talking to customers can allow new solutions to be developed, including stabilising critical pricing for up to eight years

Industry is moving so fast customers need real help steering their way through lead-times and allocations. Past shortages were resolved quickly as facilities ramped capacity. This time shortages are not a quick flash, lasting for two years. This is partly due to increased demand but also availability and shipping costs, which have increased ten-fold over the past year.

Disruption is not confined to components, as some raw materials are also experiencing shortages. Cutting lead-times is not simply a matter of increasing capacity. New, more creative solutions are needed.

For Charcroft, talking to customers is important. It helps us understand each customer's forecasts and concerns. Customers certainly want deliveries but they also need to stabilise pricing, including material and delivery costs.

Charcroft is looking years ahead and accepting the risk of investing in customer inventory more deeply than ever. Orderbooks have been extended to secure delivery and pricing of critical parts for timescales which range from six-months to 2030.

As a two-way commitment, the stabilised price is agreed with the customer and Charcroft will hold the inventory. For example, components received in June are scheduled to fulfil orders to 2030.

Alternative components can also be identified by discussing with the customer why the original component was specified. This lets product specialists adjust the parameters and identify viable alternatives.

www.charcroft.com

Charcroft Electronics director, Debbie Rowland

$100 million component inventory

PEI-Genesis UK's senior VP and MD Europe, Jonathan Parry, suggests it will take some considerable time for the global value chain to re-establish demand/supply equilibrium

The demand/supply imbalance applies to all markets and all countries. Whether you are looking for a new car, additional labour or shipping containers from the Far East, all are in short supply, driving prices higher and higher.

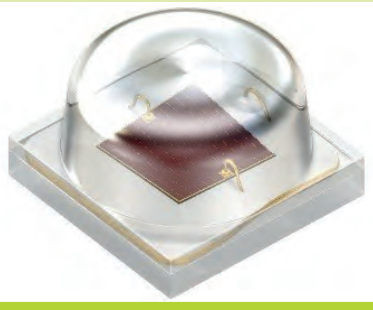
In the connector market we too are seeing greatly extended lead-times from most manufacturers, along with more frequent price increases. This means planning for purchasing professionals is getting incredibly difficult—unless you partner with an expert like PEI-Genesis who can support you during these problematic times.

PEI-Genesis holds over $100 million of component inventory around the world and can offer alternative compatible connector products if a first-choice solution is unavailable. We help thousands of customers every day as their trusted advisor and make the right product selection to meet their requirements for price, availability and quality.

2022 is going to be very tough and it will continue to be impossible to predict future demands. I encourage you to contact the PEI-Genesis team who can assist you and bring our 75-years of connector know-how to your project.

www.peigenesis.com

PEI-Genesis UK's senior VP and MD Europe, Jonathan Parry



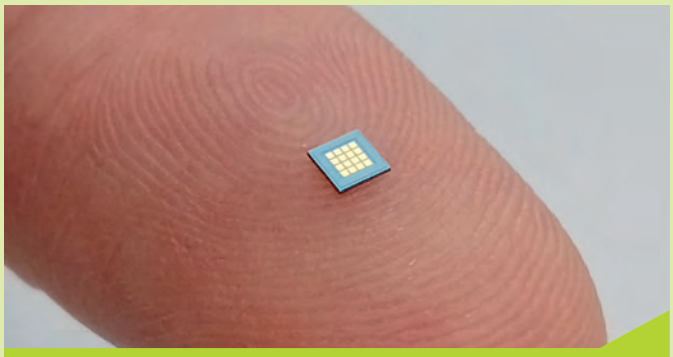
First batwing optic LED family for horticulture

AMS Osram has expanded its portfolio of horticulture LEDs with the Oslon Square Batwing. The new batwing optics enable a special radiation pattern of light that looks like wings. The 140deg beam angle and rectangular light distribution enables higher uniformity and optimum space utilisation in greenhouses.

The wider angle also allows a larger distance between luminaires, potentially reducing the number of fixtures. Compared to lighting systems using LEDs with secondary batwing optics, the primary Batwing lens solution can offer up to five per cent higher system efficiency.

The Oslon Square family extension features four new devices: hyper red (660nm), deep blue (450nm), far red (730nm) and horti white–covering all necessary wavelengths for horticulture applications. All versions feature a 3.0 by 3.0mm footprint and offer a lifetime exceeding 102,000h. The hyper red version achieves an optical output of 1,042mW at 700mA causing a wall plug efficiency (WPE) of 74 per cent.

ams-osram.com



Tiny laser emitters

Hamamatsu Photonics has developed high-density integration technology for chip-scale light sources, creating an integrable phase modulating surface emitting laser (iPMSEL) array that emits laser beams in various switchable patterns. This expands the range of high-precision 3D shape measurement applications.

This technology is the world's smallest class of semiconductor lasers capable of emitting light beams in 2D patterns. The device comprises 16 elements formed in four rows and columns on a chip measuring 2mm².

Each element can be independently switched to emit light beams in various patterns making the array ideal for industrial 3D shape measurement systems requiring high accuracy. The array also suits motion capture and facial recognition. The tiny size and light weight aligns with compact handheld fiberscopes in medical and industrial fields.

www.hamamatsu.com

Ultra-thin OLED displays feature flex cable

Display Visions' high-contrast OLED graphic displays are only slightly thicker than a bank card. Designed for economical energy consumption and suitable for use across a range of temperatures, these micro OLEDs suit compact handheld units which must function reliably under extreme conditions.

Specifications include: 1.3mm thickness; an active surface measuring 21.1 by 3.5mm; and 1,536 luminescent white OLED pixels located on a black background in a 96 by 16 matrix with a 0.22mm pixel pitch.

As luminous objects, they do not need separate backlighting. When displaying a 50 per cent chequered pattern, their power consumption is typically 15mA. Contrast is 2000:1, allowing for a 160deg viewing angle. Typical brightness is 120cd/m² ensuring good sunlight readability. Reaction time is 10µs. Temperature range is -40 to 80°C. The minimum service life is 20,000 hours at 25°C before brightness has halved.

www.mouser.com
www.digikey.com

Bright, colourful and consistent images

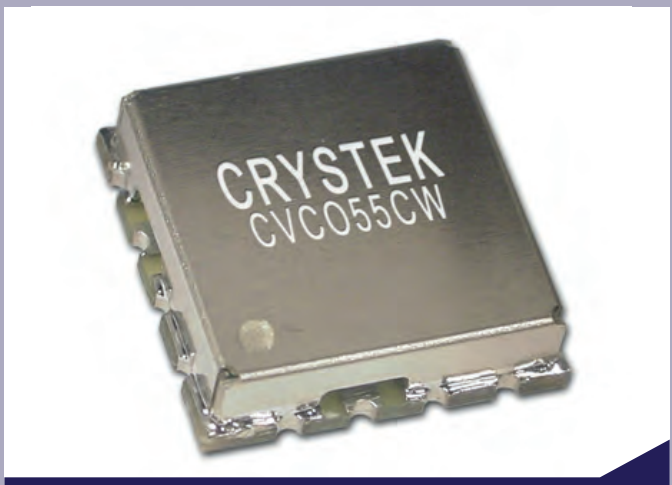
Review Display Systems has announced a new 13.3in TFT display module from Tianma. The P-series P1330FHF1MA00 features HD resolution (1920 by 1080px); a 16:9 aspect ratio; and in-plane switching (IPS) technology.

These professional series modules have been designed to deliver exceptional optical performance and meet the requirements of industrial/medical display markets and applications where reliable and consistent operation is paramount.

RDS' displays division manager, Justin Coleman, said: "The Tianma 13.3in P-series display offers a strong feature set that provides excellent optical performance and a colour gamut that delivers bright, saturated colour display images that can be easily seen from all viewing directions. P-series display modules have been specifically designed for use in a wide range of human-machine interface applications where reliable, long-term operation in challenging application environments is required."

Specifications include: 1000:1contrast ratio; white LED backlight with integrated driver; 1000cd/m² brightness; 50k hour half-brightness lifetime; and 88deg viewing angle.

www.review-displays.com



VOC suits digital radio

Crystek's CVCO55CW-0200-0400 voltage controlled oscillator operates from 200 to 400MHz with a control voltage range of 0.0~5.0V. The device features a typical phase noise of -102dBc/Hz @ 10kHz offset and has excellent linearity. Output power is typically 4.0dBm.

Engineered and manufactured in the USA, the component is packaged in an industry-standard 0.5 by 0.5in SMD package. Input voltage is 5.0V and maximum current is 15mA. Pulling and pushing are minimized to 5.0MHz pk-pk and 6.0MHz/V, respectively. Second harmonic suppression is -10dBc typical.

The device suits applications such as digital radio equipment, fixed wireless access, satellite communications systems and base stations.

www.crystek.com

Accurate timing and stability

SiTime has announced that Square is using its SiT8008 low-power, programmable MEMS oscillator for its Square Terminal and Square Register point-of-sale (POS) products.

Timing subsystem stability plays a critical role in ensuring POS accuracy. System vendors can use an external, standalone timing device or on-chip oscillator on their microprocessor/SoC. SiTime states an external oscillator, like the SiT8008, will consistently deliver 10 to 100 times better clock stability because of superior MEMS and analog technology and SiTime's systems expertise. Additionally, the component's programmable architecture offers configurability and ensures fast delivery.

Square's general manager for hardware, Thomas Templeton, said: "Our goal is to provide sellers with POS solutions that operate with exceptional reliability and accuracy at all times. SiTime's timing solutions are a good match for our Square Terminal and Register products because they help us to deliver an accurate, reliable product to our customers."

SiTime's executive vice president of marketing, Piyush Sevalia, added: "Square's POS products are renowned for their high quality, ease of use, innovative design and reliability. SiTime's MEMS timing solutions are a good fit for Square's products as they deliver innovation, flexibility, high quality and reliability in a small form factor. We look forward to continuing to work closely with Square."

www.sitime.com

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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?

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
CABLE ASSEMBLY & HARNESSING											
Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,000	N/A	0 €	N/A	50	2,500+	Y
FTDI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	50	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,550	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
CIRCUIT PROTECTION											
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,800	N/A	0 €	N/A	50	2,500+	Y
EPCOS/TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,950	N/A	0 €	N/A	50	2,500+	Y
Littelfuse	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	11,450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
ENCLOSURES											
Bud Industries	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,600	N/A	0 €	N/A	50	2,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Hammond	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,350	N/A	0 €	N/A	50	2,500+	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
New Age Enclosures	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,750	N/A	0 €	N/A	50	2,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
ECS	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Epson	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	900	N/A	0 €	N/A	50	2,500+	Y

Services Sourcing

CEM

DEVICE PROGRAMMING

TAPE REELING

INTERCONNECTION

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	12	24	Y
IQD Frequency Products	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,500	N/A	0 €	N/A	50	2,500+	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	100%	15	130	Y
Kyocera	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	950	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
TXC Corporation	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
HEATSINKS											
Aavid	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
ICs & SEMICONDUCTORS											
Alliance Memory	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18,700	N/A	0 €	N/A	50	2,500+	Y
Broadcom Limited	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Central Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,250	N/A	0 €	N/A	50	2,500+	Y
Cirrus Logic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Diodes Incorporated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	8,200	N/A	0 €	N/A	50	2,500+	Y
FTDI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	100	N/A	0 €	N/A	50	2,500+	Y
Infineon	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	8,300	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	14,050	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	24,200	N/A	0 €	N/A	50	2,500+	Y
Micron Technology	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	850	N/A	0 €	N/A	50	2,500+	Y
Nexperia	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,600	N/A	0 €	N/A	50	2,500+	Y
Nordic Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	60	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
ON Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18,700	N/A	0 €	N/A	50	2,500+	Y
Power Integrations	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	750	N/A	0 €	N/A	50	2,500+	Y
Qorvo	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	700	N/A	0 €	N/A	50	2,500+	Y
Renesas Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
ROHM Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
Semtech	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	350	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
Skyworks	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10,050	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	39,050	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10,850	N/A	0 €	N/A	50	2,500+	Y
Xilinx	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
INTERCONNECTION											
3M	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,750	N/A	0 €	N/A	50	2,500+	Y
Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	33,200	N/A	0 €	N/A	50	2,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,250	N/A	0 €	N/A	50	2,500+	Y
FCI / Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
HARTING	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,800	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,950	N/A	0 €	N/A	50	2,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
Intelliconnect (Europe) Ltd		01245 347145	www.intelliconnect.co.uk	N/A	N/A	N/A	N/A	100%	5	30	
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100%	6	38	Y
JAE Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	23,600	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17,150	N/A	0 €	N/A	50	2,500+	Y
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Radiall	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
Samtec	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	16,300	N/A	0 €	N/A	50	2,500+	Y
Souriau	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,300	N/A	0 €	N/A	50	2,500+	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	41,850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,650	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
MEDICAL CERTIFIED											
Review Display Systems		01959 563 345	www.review-displays.co.uk				£100				
OBSOLESCENCE / HARD TO FIND											
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£12m	£100	75%	3	78	Y
Rochester Electronics	Rochester Electronics	+44.1480.408400	www.rocelec.com	Y	299	N/A	$250	N/A	10	400+	Y
OPTO ELECTRONICS											
Broadcom Limited	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,800	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
Osram Opto Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
PASSIVES											
AVX	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17850	N/A	0 €	N/A	50	2,500+	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	15,100	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,750	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,450	N/A	0 €	N/A	50	2,500+	Y
KEMET	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	23,650	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18700	N/A	0 €	N/A	50	2,500+	Y
Ohmite	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,550	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25,450	N/A	0 €	N/A	50	2,500+	Y
Taiyo Yuden	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,100	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,050	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	11,500	N/A	0 €	N/A	50	2,500+	Y
TT Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	43850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,750	N/A	0 €	N/A	50	2,500+	Y
Yageo	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	21,450	N/A	0 €	N/A	50	2,500+	Y
PASSIVES ALTERNATIVES											
BEC Distribution Ltd		01844 275824	www.bec.co.uk		5,000	N/A	£0	100%	3	5	Y
POWER & BATTERIES											
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Jauch Quartz		01276 605900	www.jauch.com			£500,000	0	95	15	130	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Bel Power Solutions	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
CUI Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
MEAN WELL	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,400	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1500	N/A	0 €	N/A	50	2,500+	Y
RECOM	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
TDK-Lambda	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
TRACO Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Vicor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
XP Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
SENSORS											
ams	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Bosch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	350	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Sensirion	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	80	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	75	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	650	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	850	N/A	0 €	N/A	50	2,500+	Y
SWITCHES & KEYBOARDS											
Apem	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,850	N/A	0 €	N/A	50	2,500+	Y
C&K Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
E-Switch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
EAO	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,800	N/A	0 €	N/A	50	2,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
NKK Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Omron	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,350	N/A	0 €	N/A	50	2,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,850	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
THERMAL MANAGEMENT											
Bergquist Company	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	250	N/A	0 €	N/A	50	2,500+	Y
Delta Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	700	N/A	0 €	N/A	50	2,500+	Y
ebm-papst	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
EMI Thermal	EMI Thermal	01992 510000	www.emithermal.com	N	800	N/A	£20	100%	12	200	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	4,300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£450,000	£100	100%	7	15	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	24	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,900	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,500	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,200	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,400	N/A	0 €	N/A	50	2,500+	Y
WIRELESS SOLUTIONS											
DIGI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Espressif	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Laird Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	100	N/A	0 €	N/A	50	2,500+	Y
Lantronix	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
u-blox	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10	N/A	0 €	N/A	50	2,500+	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
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£10m	Essex/SE	70	9	AS9100 Rev D, ISO9001:2015, ISO 140001:2015, UL , CCC, IPC-610-G Class 3, TUV	Y	Y	Y	Y	Y	Y
CML Innovative Technologies (uk) Ltd	01284 714700	www.cml-it.com	£12M	UK/EU/China	65		ISO9001, TS16949, UL ISO9001 2015, IATF 16949 2016	N	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£12.5m	UK & Far East	72	10	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£18.6m	Andover (Hampshire)	130	6	AS9100 ISO13485 ISO9001 IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.7m	SE	50	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£11m	Hampshire	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.6m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721	Y	Y	Y	N	Y	N
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2.4m	Staffordshire	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Incap Electronics UK Limited	01782 753200	www.incapcorp.com	€113m+	UK, Slovakia, Estonia & India	2,000	20	ISO9100, ISO14001, ISO13485, AS9100D, ISO45001 & IATF16949	Y	Y	Y	Y	Y	Y
Industrial Electonic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£10m	UK	90	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
KEY-TECH ELECTRONIC SYSTEMS	01592 597711	www.key-tech.co.uk	£5m	UK	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711, BS EN ISO13485:2016, ISO 13485	Y	Y	Y	N	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£15.9m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
NOTE Group	01753 746700	www.note-uk.co.uk	£151m	UK/EU/China	1,100	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	IS9001, ISO14001, IPC-A-610 Class 3, IPC-7711/7721, WHMA-3620, Certified IPC Trainer	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£8.2m	SE	77	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£16m	Derby	130	6	ISO 9001, ISO 13485, ISO14001, IPC 610, 620, 7711/7721	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	5	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (i.e Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-20-30	Metal PCBs	Ceramic PCBs	Heavy Copper PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO9000: 2015	SML	Y	4-10	Y	N/A	N/A	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2015, UL, ISO 14001:2015	SML	Y	4-16	Y	N/A	N/A	Y	Y	Y	Y
DK-Daleba Printed Circuit Boards	01992 510000	www.dk-daleba.co.uk	M	UK, Europe, Asia	ISO 9001:2015, UL, TS16949, JOSCAR	SML	Y	4-58	Y	Y	Y	Y	Y	Y	Y
Fineline VAR Ltd	+44 (0)1249 815 815	www.fineline-global.com	B	UK / Global	ISO9001:2015 / UL/ TS16949 / Nadcap/ AS9100/ISO14001	SML	Y	4-60	Y	N/A	N/A	Y	Y	Y	Y
GSPK Circuits Ltd	01423 798740	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	IS 9001:2015, IATF 16949:2016, EN (AS) 9100	SML	Y	4-34	Y	Y	Y	Y	Y	Y	Y
LEF Circuits Ltd	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2015, IPC-A-610	SML	Y	4-30	Y	N/A	N/A	F/R	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2015, EN 9100:2018, EN 9104:2013, UL796, ISO 14001:2015	SML	Y	4-44+	Y	N/A	N/A	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01543 622 435	www.tatecircuits.com	M/B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	N/A	N/A	Y	Y	Y	Y

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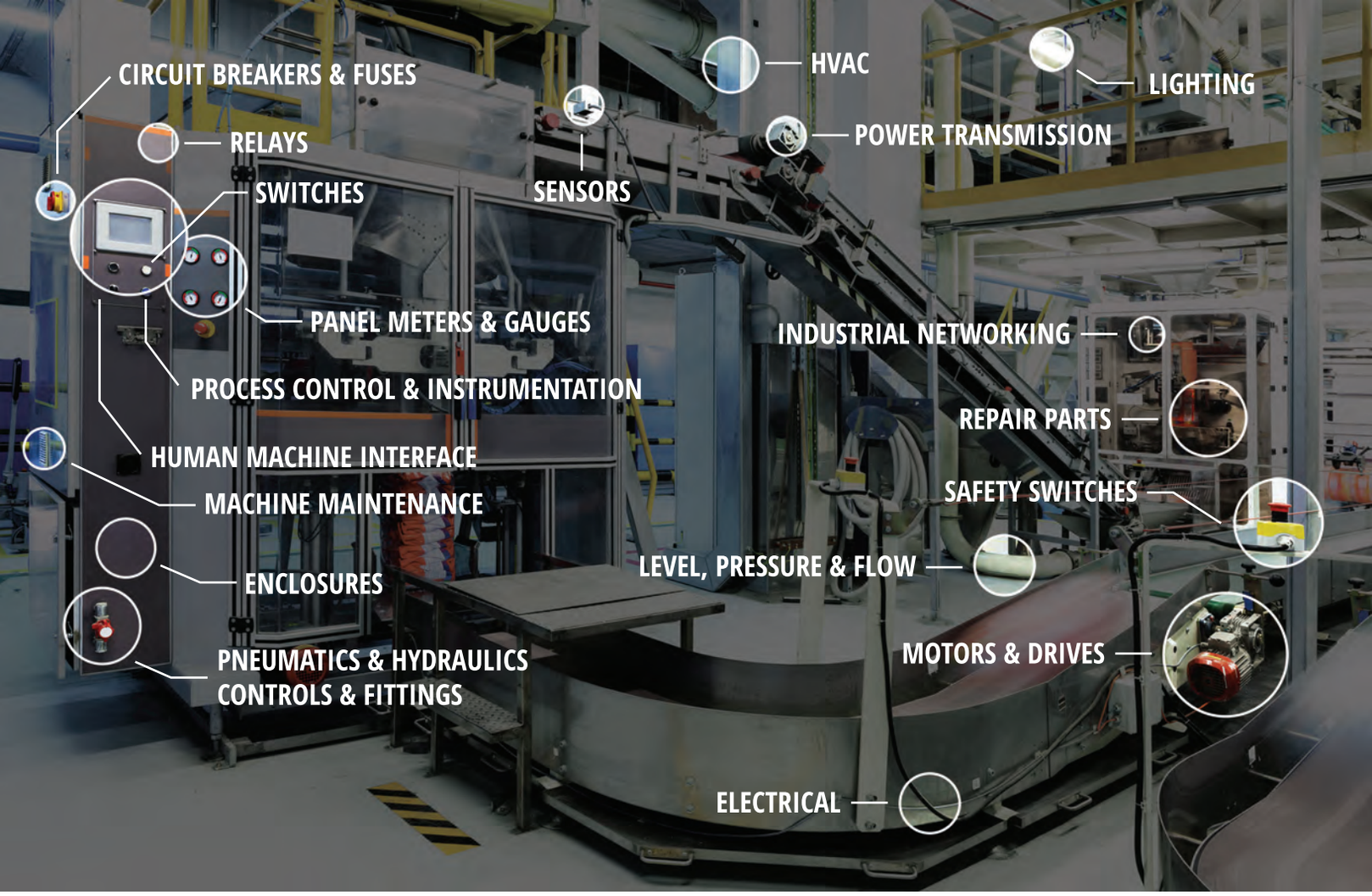

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