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MAY 2020

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On the cover – May 2020

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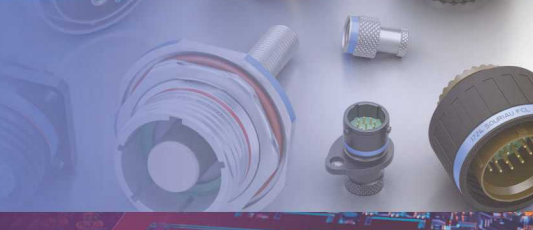
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Editor's Word



The day my supply chain stood still

A few weeks ago, my wife heard a radio appeal by a local nurse asking if owners of 3D printing cells could help manufacture face visors for medical staff.

My machine was on tick-over, so I joined a WhatsApp team and started making. To start, I took a base design published by Prusa and redesigned it to get the print time under 60 minutes.

Then I tackled the three row BoM: a reel of PLA; 250-micron acetate sheet; and 25m of button elastic. The PLA and acetate were delivered next day. The acetate was cut/punched and attached to the printed headbands. Semi-finished visors were stacking up, awaiting their elastic rear headband.

Regarding the elastic, the button version (which has formed slots) is slightly unusual. My local haberdashery had closed so the only option was mail order. Most were offering very long lead times, in some cases months, while others were selling very short lengths, at very high prices.

Eventually I found some UK stock on two to four-day delivery. On day four I still hadn't received a dispatch notification. The reply to my question was interesting. It hadn't been dispatched because the carrier hadn't picked it up. I offered to pay extra for next day but was told the carrier network was suffering and the delivery date was unknown. Ultimately, we swapped the button elastic for elastic bands.

It's not called a 'supply chain' for fun. It's there to remind us that every chain is as strong as its weakest link.

Jon Barrett

In Brief

Tune in to audio parts

TT Electronics has added ten new product families to its professional audio portfolio including five rotary potentiometer families, four slide potentiometers families and one encoder series. The parts suit applications found in the professional audio industry, including electric guitars, amplifiers, mixers, drum machines, synthesizers, DJ equipment, recording studio controls and audio/visual equipment.

www.ttelectronics.com

Complimentary access to Covid-19 insights

BSI is providing open access to the Covid-19 section of its Supply Chain Risk Exposure Evaluation Network (SCREEN) tool. The global supply chain intelligence system includes valuable information for companies to anticipate, quickly respond to, and avoid supply chain disruptions. The Supply Chain Risk Insights 2020 report notes the outbreak has highlighted global supply chain fragility, where one faulty link can cause extensive disruptions.

screen.bsigroup.com/Covid19/

Unlimited length flexible PCBs

Trackwise Designs has acquired Stevenage Circuits, the UK-based designer and manufacturer of short flex and rigid printed circuit boards. The deal lets Trackwise increase production of its Improved Harness Technology (IHT), a proprietary roll-to-roll manufacturing process that eliminates traditional size limitations for flexible printed circuits. Applications range from aircraft and industrial to automotive and medical.

trackwise.co.uk

Manufacturing hit hard

Commenting on recent PMI data Make UK's chief economist, Seamus Nevin, said: "A PMI score of 47.8 amidst the ongoing Covid-19 outbreak is a sign of just how hard manufacturers have been hit. Some firms have switched to making products that are vital to the national attempt to stop the spread of the virus; a testament to why backing manufacturing is so important."

www.makeuk.org



Global power distribution agreement

Mouser Electronics has extended its global distribution agreement with Advanced Energy to distribute Excelsys Technologies products. Mouser is now stocking Excelsys low-voltage power supplies.

Xsolo ultra-compact, single-output power supplies provide 500W in a convection-cooled chassis or up to 1,008W in an enclosed, fan-cooled chassis. Offering an output current range of 10.5 to 42A and an input voltage range of 85 to 264VAC at greater than 92 per cent efficiency, the supplies suit industrial, communication and test applications.

UltiMod series devices are modular switch-mode power supplies that consist of AC input front ends (powerPacs) and single and dual-output modules (powerMods). The powerPacs are available in two versions: the UX4, which delivers up to 600W and can be populated with up to four powerMods, and the UX6, which delivers up to 1,200W and can be populated with up to six powerMods. Typical applications for the UltiMod series include medical equipment, industrial machines, test, printing, telecommunications, audio, and broadcast equipment.

eu.mouser.com

Supporting FPGA-based BoMs

Avnet Abacus has extended its distribution agreement with Molex to include the BittWare field programmable gate array product range. Products are based on FPGA technology from Xilinx, Achronix and others.

Avnet Abacus's senior director product marketing, Hagen Goetze, said: "Avnet Abacus, a leading design-in distributor offering a high level of technical expertise, has built up a strong, successful collaboration with Molex over the years. We are now taking on BittWare FPGA accelerators. Key areas we will address with the BittWare product range are data centres, instrumentation and NVMe storage."

Molex' sales director distribution Europe, Paul Keenan, added: "We have been impressed with Avnet Abacus' successful record in working with Molex, in particular their excellent track record in finding and winning new projects for Molex solutions across our portfolio. We look forward to growing our business in Europe by leveraging the outstanding technical knowledge, customer focus and attention to detail that the Avnet Abacus team consistently demonstrates."

www.avnet-abacus.eu

Pan-European partnership for core business

Acal BFi has announced a new pan-European partnership with magnetic supplier Magnetec. The agreement provides Acal BFi's customers across Europe with access to an enhanced portfolio of high permeability common mode chokes, with nanocrystalline cores and the direct design and integration support of Acal BFi's expert engineers.

Magnetec's common mode chokes feature a proprietary nanocrystalline alloy material, Nanoperm, a material designed to deliver a unique combination of high permeability and low losses at high frequencies. The material is made into a range of core shapes and sizes by Magnetec. With this high permeability performance, products need less copper wire in their designs, thus reducing copper losses, component size, weight and material costs. This makes these chokes ideal for demanding applications in confined spaces.

Magnetec's head of sales, Michael Lühmann, said: "This agreement with Acal BFi provides customers access to our market-leading nanocrystalline components with total support for every aspect of their design, from specification to integration, from Acal BFi's technical experts."

www.acalbfi.com



Getting connectors to market

Harwin has increased its presence across EMEA by adding Powell Electronics to its network of distribution partners. This partnership covers Harwin's hi-rel connector products including the Gecko, Datamate and M300 ranges. Value-added needs, such as cable assembly, are also covered. Products will be available from stock or on short lead times.

Harwin's head of European sales, Gavin Darling, said: "We know that our customer base will benefit enormously as we strengthen our supply chain by engaging with Powell Electronics. The company's growing reputation here in Europe, following its 70-years' of success as a distributor in North America, speaks for itself."

Powell Electronics' European applications manager, Andy Brayford, added, "Harwin is very well-known in the marketplace for its innovative hi-rel connector components. This distribution deal represents a huge boost to our line card, complementing our existing offerings perfectly. We're looking forward to making inroads into exciting new application areas."

www.harwin.co.uk

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Interpower® manufactures reliable state-of-the-art electrical cords & cord sets for global markets. These cords and cord sets are made in the U.S.A. and available in various lengths and colours while customised to your specifications—cords and cord sets tested during and after manufacture.

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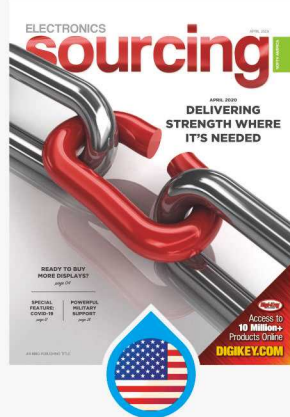
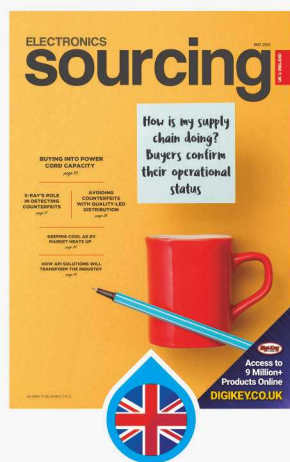
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COVID-19 ES News

View current
editions online

www.electronics-sourcing.co.uk



Prioritisation of critical sectors

As a specialist in temporary power and temperature control systems, Aggreko remains operational across the UK and Northern Europe.

Managing director, Chris Rason, said: "From treating people in healthcare facilities and developing potential vaccines through to ensuring the provision of essential utilities and food supplies, many of our customers play a vital role in helping the current situation across the globe."

"Over recent weeks we have been preparing our business and taking immediate measures to ensure we are able to prioritise equipment for the following sectors: healthcare, utilities, food, beverage and pharmaceuticals."

"Our quality, health, safety, service and environment team has rigorously reviewed all our processes to ensure our business can safely and effectively facilitate any jobs relating to the current Covid-19 situation."

www.aggreko.com



Supplying cable assemblies for medical devices

Several German manufacturers are producing devices which patients and doctors depend on in the coronavirus pandemic. Harting has aligned its internal processes to supply these medical device manufacturers as quickly as possible. The current high and short-term requirements, plus the maintenance of the associated supply chain, present challenges. At Harting, securing the supply of the required components takes priority.

All manufacturing, storage and delivery functions are secured by separation in space and time, plus a multitude of hygiene measures. Where expedient and sensible, employees are already working from their home offices. In addition, the company started to ramp up its stock levels weeks ago to respond to any supply chain disruptions. Specially formed back-up teams serve to safeguard key areas when necessary.

A corona task force and a pandemic team coordinate all necessary measures.

Harting Technology Group CEO, Philip Harting, said: "We are experiencing something that is absolutely unprecedented in this form. One thing is certain, we are doing everything we can to protect our employees and help our customers wherever possible."

www.harting.com



Task force prioritises ventilator production

Anglia Components has formed a Covid task force to coordinate and allocate available inventory and FAE resources to support customers designing or manufacturing ventilators and other vital medical equipment.

Anglia's CEO, Steve Rawlins, said: "At Anglia, we are committed to supporting all of our customers, we are especially doing everything that we can to get the design and production of essential medical equipment ramped up as quickly as possible, giving our amazing NHS staff the tools that they need to save lives."

"Since responding to the call for help issued by the Department for Business, Energy & Industrial Strategy we have already supported several customers in ramping up production quickly on medical ventilators and other critical products."

Anglia holds AS9120 aerospace accreditation and can provide full lot traceability back to the original manufacturing batch.

www.anglia-live.com

Identifying Covid-19 hotspots early

Nordic Semiconductor has announced US connected health specialist, Kinsa Health, is using data from millions of Nordic nRF52810-based Bluetooth smart thermometers in the US to help combat the spread of the Covid-19 virus.

Anonymized data from the Kinsa App has enabled Kinsa Health to produce a temperature heat map of the US (called the US Health Weather Map) that could be used to identify potential Covid-19 hotspots and help government agencies and healthcare organisation in their on-going battle against the virus.

Kinsa Health CTO and VP of engineering, David Gal, said: "We selected Nordic for many reasons. Nordic's documentation is the best in the Bluetooth market bar none, which is vitally important for any medical device manufacturer. Nordic's legendary technical support is simply incredible. Nordic helped us with everything from tuning antennas to customisation of firmware to passing Bluetooth SIG qualification testing. We couldn't have done it without them."

www.nordicsemi.com



Powering on with battery supply

GS Yuasa batteries are key components for a range of critical power and emergency back-up infrastructure. They provide essential stand-by power and energy storage for applications including telecoms, security alarms, uninterruptible power supplies and renewable energy. The company will remain open to service these requirements.

To comply with the latest government recommendations, all office and field-based employees who can now work from

home are doing so. Stricter hygiene and site access measures have been introduced alongside a split shift policy within GS Yuasa's distribution warehouses—limiting personnel numbers and the risk of potential virus transmission.

All factories worldwide are operating as normal with a minimal risk of disruption at this stage.

www.yuasa.com

Covid-19 cyber security threat

The Covid-19 outbreak is forcing millions of employees to work from home. This means countless organisations are faced with a unique challenge: how to keep as many business-critical functions running as possible whilst maintaining adequate security.

Veridium's CEO, James Stickland, highlights that this is posing the largest-ever cyber security threat of recent times. He believes it has shone a light on technology, forcing enterprises to innovate, however, some companies are placing their business at risk by taking shortcuts on security measures.

Stickland said: "What makes this situation so difficult are the timeframes. Where

typical changes of this scale are planned, researched, deployed and tested over months and even years, the UK now has just weeks to overcome some very real problems.

"Software based authentication that can be delivered remotely will be key to improving cybersecurity for home workers. More and more organisations are realising the benefits of taking a multi factor biometric approach to security, which can efficiently safeguard sensitive employee and customer data whilst future-proofing their business."

www.veridiumid.com



molex

Improved stock of Molex products Rutronik increases Molex warehouse stock by 50%

Good news for connector designs:

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- USB
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- KK
- PicoBlade

For more information, contact us via
Marko.Milosevic@rutronik.com





Availability of ventilator mass air flow sensors confirmed

Posifa Technologies is continuing to ship production quantities of its mass air flow sensors, which are a key component for ventilators and other medical equipment.

Posifa Technologies' president and CEO, Peng Tu, said: "We are making this announcement to proactively reassure our medical customers who have begun to ask for confirmation that production and delivery of our mass air flow sensors is continuing as normal. With our PMF2000 and PMF4000 manufacturing based in Taiwan, we are happy to confirm that production of these vital components is proceeding without any interruption and with normal lead times for delivery."

Solid-state MEMS air flow sensors eliminate the need for a surface cavity or fragile membrane on the sensor die, making the sensor resistant to pressure shock and clogging from water condensation or dust particles while providing superior accuracy and repeatability.

posifatech.com



Serving critical medical equipment manufacturers

TTI is maintaining its European distribution centre fully operational for its customers, many of whom are manufacturing medical and other essential equipment during the current global crisis.

Regarding workforce safety, TTI is operating in full compliance with all guidelines and directions mandated by Governments and local authorities. TTI is continuing to support customer supply chains with many vital components required by manufacturers to produce much-needed ventilation, medical and other essential equipment. There is currently no internal delays or backlog with receiving and shipping customers' orders.

TTI's EMEA president, Glyn Dennehy, said: "We are always extremely proud of the entire TTI team but in particular during this unprecedented time. We would like to thank them for their unwavering commitment to ensuring that we meet all our customers' needs and as we have realised, supporting equipment supplies for frontline healthcare across the world which continues to save lives. The TTI leadership team globally is monitoring the situation tightly to ensure the absolute safety of employees and an uninterrupted service to customers to the very best of its capabilities."

www.ttieurope.com

Keeping medical PCBs flowing

Würth Elektronik CBT produces printed circuit boards for the manufacture of intensive care and mobile ventilators.

Managing director sales and marketing, Thomas Beck, explained: "Thanks to our three production sites in Germany, we can supply ventilator manufacturers with PCBs in a wide range of technologies at short notice. We are in a position to accept orders at short notice, produce them smoothly and deliver them reliably. As one of the leading PCB manufacturers in Europe, Würth Elektronik CBT thus makes a valuable contribution to securing the supply chain in this medical emergency."

In the three German plants in Niedernhall, Rot am See and Schopfheim all types of PCBs are manufactured in three shifts—from basic technologies to complex HDI printed circuit boards and sophisticated flex-rigid boards.

To ensure production at the German plants remains secure, strict protective measures and hygiene regulations were introduced and implemented for all employees weeks ago.

www.we-online.com

Fourth survey on Covid-19 impact

ECIA has been conducting surveys of member manufacturing and distributor companies to gain an understanding of this fluid situation.

Despite the exponential growth of Coronavirus around the world, this survey shows a major jump in positive expectations regarding the impact on the ability of companies to supply customers on time. There is a large shift toward 'no impact' and 'minimal impact' in all three component segments with the largest share of responses falling in these categories.

ECIA chief analyst, Dale Ford, explains: "As the Coronavirus transforms from a China-centric challenge to a global pandemic, the impact on the world electronics supply chains and markets has shifted. The results of the latest ECIA survey show that depressed end-market demand due to widening quarantine orders in major economies is significantly reducing pressure on the electronics components supply chain. Participants in the electronics components industry are now faced with the challenge of balancing the supply/demand environment in a world plagued with uncertainty and fear."

www.ecianow.org

Micron dedicates \$35M support

Micron Technology has announced plans to commit \$35 million to help those disproportionately affected by Covid-19. The company will launch a new Micron Foundation \$10 million relief fund, increase employee gift matching, and introduce financial assistance for team members through grants. Micron will also provide in-kind support by accelerating payments to small business suppliers, and donating facilities and supplies for emergency medical response.

Micron's president and chief executive officer, Sanjay Mehrotra, said: "Micron is prioritising the health and safety of our team members and partners, and the well-being of the communities in which we operate. As the scale of the pandemic becomes more apparent, we are immediately accelerating our efforts to provide funding, resources and support to those most impacted by this health crisis."

As part of its plans to offer greater community resources, Micron will provide up to 300,000 protective masks to local health officials and make Micron facilities available as additional capacity for overflow patients if hospitals become overwhelmed.

micron.com

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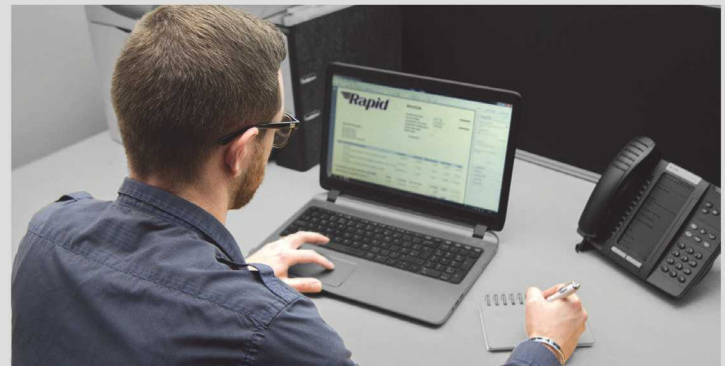
We'll inform you when the stock first arrives at our site in Colchester, at which point the agreement period will start*.

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We will invoice you when we deliver your goods, with a final invoice for the last delivery with any remaining stock.

4. We'll keep track for you



We will send you a monthly update informing you of the balance of stock and the period left. We'll also give you some advanced notice for when the agreement will end.



*Our long term stock agreements are non-cancellable but we will always endeavour to help you with any challenges you have regarding changes in customer demand. Agreements can be renewed.

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Buying into power cord capacity

In this article, Interpower emphasises the importance of product quality and service level when sourcing and purchasing power cords for domestic and international markets

Q What significant changes has the power cord market experienced over the last 20-years?

In North America, high volume power cord customers have, for the most part, either moved manufacturing to China or switched from North American to Chinese suppliers. There are few low mix, high volume electrical equipment manufacturers left in North America and even fewer that source their components in North America. Today, electrical equipment manufacturers operating in North America are low volume, high mix operations that make high quality, high performance equipment. Applications include medical devices, scientific instrumentation and test/measurement instrumentation. Order sizes are smaller but more frequent than 20-years ago.

Q How has Interpower adapted to these changes?

Interpower has integrated vertically and now makes cords that meet all of the world's cord standards, while also making its own cable. Interpower operates a customer-focused manufacturing model that achieves same-day shipments of standard items, one-week manufacturing lead times of cords that must be made to order, and no minimum order. This allows customers to purchase exactly what they need, while maintaining minimum inventory levels.

Q Regarding pricing, how have cheaper foreign power cords impacted sales and how have you responded?

Interpower experienced declining sales over the past ten years while gaining

market share. We have competed successfully with foreign vendors that offer lower prices by improving service and responsiveness while maintaining a very high quality level. High quality and outstanding service is important to manufacturers of quality equipment and Interpower has staked out a strong position in that market sector.

Q What are the differences between the power cords made in China compared to Interpower cords?

There are some quality Chinese cord manufacturers, but the differentiating feature of most Chinese cords is their low price. To achieve low prices, manufacturers cut corners on quality and only accept large orders manufactured with significant delivery times. Interpower's cord manufacturing process



We have competed successfully with foreign vendors that offer lower prices by improving service and responsiveness while maintaining a very high quality level

Copper wire and insulation material are made in the USA



starts with the cable itself. We have optimised our manufacturing system to produce the cable we need to meet customer power cord requirements and do so quickly. All our cords and cord sets have approvals in all the countries they are used in. Also, Interpower cords are tested for continuity and short circuits and then hi-potted at 2,500VAC. Resistance of ground is measured at 25A. Finally, all cords are visually inspected to eliminate any with sink marks or other visual imperfections.

Q Coronavirus is causing major disruption to international supply channels. Does made in the USA mean 100 per cent availability to readers globally?

All components used in manufacturing Interpower cords, with the exception of one plug-bridge, are manufactured outside of

China. Most remaining parts including copper wire and insulation material are made in the USA. We ship small quantities from stock on the day we receive the order and anything that we have to manufacture is ready for shipment in one week.

Q What percentage of Interpower's power cords are for international applications compared to North American use?

Interpower's power cord sales are approximately 50/50 international v North American.

Q How do you see the power cord market over the next 12-months in the US and international markets?

Interpower sees the market in the next twelve months as stable to slightly weaker than it was in 2019.

Q What advice would you give to *Electronics Sourcing* readers looking to source power cords?

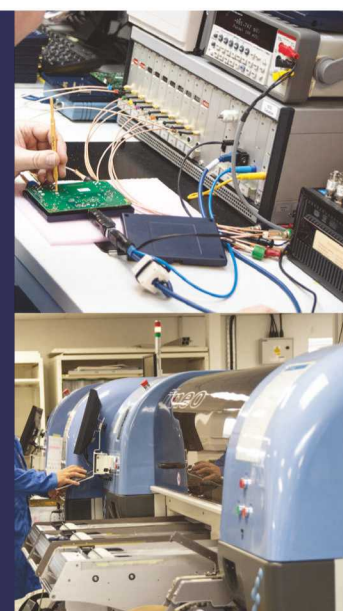
Determine how critical price, quality and service levels are in your operation. Service levels would include fast and certain delivery times, no minimum order, quick and accurate information on requirements of test agencies in various international markets. If your objectives are quality and high service levels, contact Interpower.

www.interpower.com



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Riding the supply chain wave

Jon Barrett reflects on his own supply chain challenges and invites seven contract manufacturers to share theirs

In the April issue of *Electronics Sourcing*, as the impact of Covid-19 started to bite in the UK, we did the only thing we could given the time available. We published the Government's ventilator design specification; a directory of contract manufacturers with the requisite skills and equipment; and comments from manufacturers about their readiness.

For this issue we invited seven contract manufacturers to offer their experiences, thoughts and advice regarding managing supply chains at this stage of the pandemic.

As the pandemic unfolds it appears to be sending a waveform along the supply chain. As the wave moves in time, it is impacting different parts of the supply chain in different ways. For specific industries the wave will have a unique length and amplitude.

From my experience, today, the peak of the wave seems to have reached the carriers. On page three of this issue I explain how my bill-of-materials for a 3D printed face shield was impacted by a carrier. In this issue, manufacturers state how component deliveries are becoming more erratic and

expensive. A glance at social media sees manufacturers searching for local stock due to slow international deliveries.

Undoubtedly, carriers will adjust supply to meet demand and the wave will move along the chain again. Where to next, I'm not sure. What makes this such a challenge is that the response to Covid-19 impacts supply, demand and labour: everything you need to run a business.

Regardless of what the World Health Organisation wants, there is no generic, global plan. Every country is doing



As the pandemic unfolds it appears to be sending a waveform along the supply chain

what it thinks is best for its society. Thus, the ability to accurately manage the reintroduction of demand, supply and labour doesn't seem realistic.

If this is the case, the wave will wash back and forth along the chain, losing amplitude all the time, until the surface is smooth again. It's probably time to grab your surfboard and prepare for the ride.

Information is paramount

M-Tek's Frederick Kayrouz describes the challenges and changes the company is experiencing as Covid-19 unfolds

Movement and flow of components from manufacturers to distribution centres and franchises worldwide has diminished due to reduced transport capacity. Although various suppliers have adapted their warehouses operations to comply with government guidance to minimise the risk of spreading the virus, with compatible staffing levels, a reduction in transport capacity is reflected by longer delivery timelines. This could impact future stock levels and component availabilities.

Downstream information flow has been a paramount

improvement noticed across the entire supply chain. Manufacturers and distributors have invested considerable efforts to raise awareness. Our purchasing and procurement teams receive regular status updates explaining how component manufacturers are managing the impact and maintaining business continuity. This includes: the percentage of their workforce working from home; risk reduction assessments; supply chain monitoring; and optimisation of global production capacity. This has, in turn, allowed our teams to adapt. Our sourcing teams are in a better position

to insulate our customers and business from the impacts of the crisis.

There has been a business transformation trend across manufacturing which emphasised supply chain resilience. As we progress through Covid-19, the vulnerability of a dependency on global supply chains has been highlighted. We are all witnessing and actively taking part in a transformation which will lead component manufacturers, distributors and franchises to reassess their strategies regarding what material is sourced,



Frederick Kayrouz, SGM, M-Tek

where geographically and from whom. JIT concepts, procurement functions, supply chain simulation and supplier risk management are all being challenged and are yielding to decisions based on business operating mode changes, plus current, future supply versus demand forecasting and logistics constraints.

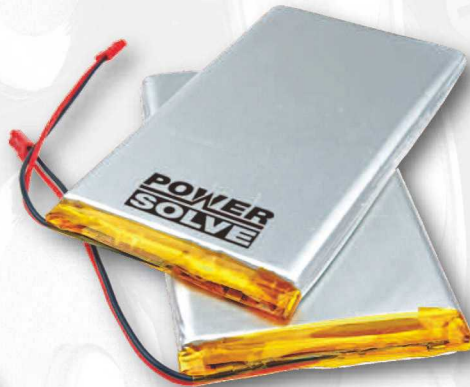
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Close supplier partnership

Simtek EMS buyer, Nikki Johnston, describes how the company sources fully traceable stock to allow continuous production of essential medical electronics

In the current unpredictable climate, the measures implemented by Governments of most countries have greatly affected the electronics supply chain. Simtek EMS has experienced at least one major overseas manufacturer closing its order books to new requests for the foreseeable future to cope with the backlog of existing orders.

This news caused stock at distributor warehouses to diminish, resulting in customers like ourselves quickly placing orders to secure sufficient stock to maintain production, plus building a buffer to

mitigate the uncertainty when components will be replenished due to extended lead times.

Simtek EMS has also sought stock from new suppliers. On a positive note, distributors have been proactively notifying us of any manufacturers' changes immediately, allowing us to take necessary actions. This close supplier partnership has enabled us to work together to identify and obtain available free stock with guaranteed full traceability allowing continuous production of our essential medical electronics.

Executing a just-in-time business model means that on-time deliveries are critical. The company has been impacted by some delays, but production schedules have adopted a level of flexibility. Overall, delays have been felt throughout the supply chain from supplier production backlog and courier transit service to certificate documentation retrievals.

Having the technology to work from home and communicate with distributors has proven vital during this period, ensuring essential co-ordination and planning for the present time and future months.

From a buyer's perspective a useful tool to enable smooth planning of new orders would be regular spreadsheet updates of stock availability at distributors which is tailored to customers' regular ordering activities/requirements.

In summary, working together with a degree of flexibility and understanding we will persist through the challenges.

www.simtekems.co.uk

Supply chain questions answered

Circuit Solutions offers answers to supply chain questions, post the Covid-19 outbreak

Are there any restrictions or delays on certain components?

Many manufacturers and distributors have prioritised medical products. Delays are either as a result of: the above; a glut of orders for a large quantity of base parts used to manufacture ventilators; or that many Far East-based manufacturers only have 60 per cent of their work force back full time.

How are distributors relaying their status?

Most distributors have Covid-19 statements displayed on their websites. These generally included

information regarding capacity, working hours, practices and delivery information. Email update are also being used.

Are deliveries being impacted?

International couriers are making less shipments at present partly due to increased costs and partly due to less workers. As an example, one distributor advised they will now charge all customers carriage as 'a Boeing 747 of cargo used to cost \$400,000, today this is over \$1.3m and rising'.

What more could distributors do to help?

It would be useful if distributors could share factory stock levels and lead times on parts that are not medical priority status. Distributors are aware of most manufactures' factory stock. Sharing this would shed the load on people quoting if the buyer had visibility. There is also the idea that a direct ship option would cut down lead times.

Are buyers working from home and what procedures have changed?

Most office staff are working from home, while production staff are in the factory. Circuit Solutions operates



Circuit Solutions' purchasing team

a VPN which lets anyone working from home connect to the systems remotely. The obvious difficulty is resolving any issues or problems face-to-face with other team members.

www.circuitsolutions.co.uk

Avoiding disruption

Texcel Technology's purchasing manager, Joanna Mason, explains how the proactive nature of key distributors is helping keep production lines moving

Joanna explained: "It has been testing times for everyone at Texcel Technology, with supply lines stretched somewhat. As of end of March we have seen deliveries being slightly impacted, but negligibly so far. PCBs were the first hit, but our factories in China are back to between 76 to 85 per cent factory staffing levels and Texcel had already pre-stocked due to the Chinese New Year.

"We are now seeing rising transport costs from Asia due to demand, and the Covid-19 virus is starting to hit Malaysia and the Philippines with lockdowns and limited production capability for both ICs and MLCCs. Deliveries are

moving out to 50-weeks and costs escalating. Our local UK suppliers have been less affected but are now having to manage with reduced staff and this is starting to cause some delays.

"Some of our key distributors have been proactive and offered to send in parts earlier, and have extended the credit terms for those lines, so we have security of stock without tying up cash. We are also seeing weekly notifications from suppliers on their manufacturing position and activities/ business continuity plans relating to Covid-19.

"We are of course monitoring the open order books very

closely and are expediting or resourcing parts where needed, to avoid disruption to our customers."

www.texceltechnology.com



Texcel Technology's purchasing manager, Joanna Mason



Some of our key distributors have been proactive and offered to send in parts earlier

Continuing to meet customers' needs

FermionX' managing director, Dan Crothers, explains how the company's adept purchasing team is managing supply challenges



FermionX' managing director, Dan Crothers

FermionX, like many other businesses, has had to adapt quickly to the changes and restrictions put in place across the UK, as well as coping with the strain that global measures have put on the supply chain.

As a business, we couldn't be prouder of how our team has adapted to this new style of working. The changes have enabled us to continue to meet our customers' needs and do our bit to ensure continuity in our operations and keep the electronic manufacturing industry running.

We understand the resource strain put on our suppliers,

with many operating from home and with reduced production capacity during the lockdown measures. We have a fantastic supply chain and purchasing team who are adept at managing these global supply challenges and are working hard with all our customers and suppliers throughout this period.

In general supply is good. We are seeing most orders fulfilled with no shortages but have experienced the occasional lead-time delay. For the most part, notifications around these delays have been strong so we have been able to plan production efficiently.

We've experienced significant increases in airfreight prices; in some cases costs have increased by 400 per cent and often change daily. This adds further pressure to pricing and stockholding and fosters continued flexibility in our supply chain coordination to maintain a competitive edge for our customers.

We've been regularly reviewing all our stock and working with our customers to identify component alternatives for greater supply chain leveraging.

www.fermionx.com

Protecting staff, customers and suppliers

Electrica's materials director, Mike Nield, explains the measures the company has deployed to ensure it remains fully operational for medical production and more

Electrica is currently fully operational, albeit with fewer people on the premises, as the company follows government guidelines regarding home working and social distancing.

The company is committed to protecting its staff, customers and suppliers and has introduced measures to help. Customer and supplier visits have been cancelled or changed to Skype calls. Employees who rely on public transport are being collected and dropped-off by private taxis. Staff are working two metres apart and break times are staggered. All employees able to work from home are doing so. Electrica has always

encouraged home working and all buyers and engineers can log-in remotely and work as if they were in the office.

Electrica's quality management system is based around the design and manufacture of Class III medical devices so we are ideally placed to offer manufacturing services for ventilators and have registered our intention to help. Operating in a clean room environment, offering full batch traceability and the capability to manufacture to IPC-A-610 Class III puts Electrica in a position to help.

These are testing times for any supply chain:

with increased lead times, currency fluctuations and transportation delays amongst other issues. Electrica has increased its safety stock levels on critical components and is providing forecasts to suppliers to enable them to put the necessary stocks in place. A team is dedicated to expediting orders and closely monitors all deliveries, requesting courier tracking details where possible.

Buying in different currencies is something being considered due to the unstable stock markets. This should help maintain stable pricing to our customers moving forward.



Electrica's materials director, Mike Nield

What I don't want to see is companies increasing prices unnecessarily. I have come across this recently and, when challenged, it can't be justified.

Remember, we're all in this together.

www.electrica.co.uk

Challenge accepted

Nemco explains the major role it is playing in the manufacture of vital ventilators and the fight against Covid-19

During the past few weeks Nemco has seen an unprecedented demand from the medical sector for PCBAs and cable assemblies destined for ventilator builds. In parallel, the company has been working closely with Ventilator Challenge UK to ramp up further production to meet the Government's requirement of 10,000 ventilators for the NHS.

Under the strategic guidance of purchasing manager, Christine Stanley, the remote working buying team set about its number one priority to source all required materials for this project. Time was of the essence as Nemco was understandably working within very tight timescales. The team quickly

utilised both existing and new supply channels to locate and procure the required materials. In many cases this involved locating 'pockets' of material from across the world to ensure it could meet the overall demand and keep the production lines running and project on track.

Procurement within contract manufacturing is never straight forward and in this instance was made a little more challenging since the vast number of suppliers were also working remotely. Likewise, the team was sourcing high quantities of very specific components. Nemco faced multiple frustrations with materials being confirmed by suppliers and later not shipped because

stock was directed elsewhere. Supply and demand is understandable but when the purpose is to get vital equipment to the right place quickly, it is a double blow.

Countless emails and numerous late-night phone calls with suppliers helped Nemco on its journey. The contribution of Nemco and the wider materials supply chain has played a major part in the manufacture of these vital ventilators and the fight against Covid-19.

www.nemco.co.uk



Nemco's purchasing manager, Christine Stanley

X-ray inspection's role in detecting counterfeits

Following last month's introduction to counterfeit detection, Cupio's MD, Andy Bonner, focuses on the contribution made by x-ray inspection

High resolution x-ray inspection goes beyond optical imaging, letting users look inside incoming components and compare them with images from known good components. Components which appear identical from the outside will often have internal differences if they are from a different manufacturer or product line. Components can be inspected while still sealed in their shipping materials, making them physically and commercially easier to return if found to be counterfeit. Anomalies in lead wires, die sizes and positions, and truncated pins can all be identified.

A recent development by Nordson Dage adds a real time-saving dimension to the technology. This comprises an x-ray reel handler which allows an entire reel of SMT components to be checked in one inspection session. This is an important mode of protection, as counterfeiters typically use good components for the first few positions on the tape, while all the rest are counterfeit.

X-ray inspection allows non-destructive investigation of structures within components that cannot be inspected optically. For example, it can show bond wire attachments and layouts within semiconductor device packages. It can be used for devices such as area array packages, chip scale packages and flip chips. The only alternative is to open the component for internal inspection which renders the part unusable and may also remove vital clues to its origin.

While it may be difficult to justify purchasing an x-ray inspection system solely for counterfeit detection, machines already installed for production quality control can be used.

The Nordson Dage Explorer One, for example, offers high image quality, with an ability to see features as small as two microns. It allows operators and occasional users to perform inspection quickly, easily and with minimal training. Goods-in and production staff can make efficient use of its capabilities.

Another possibility is the Assure QuickCheck, which can be used for checking packed parts trays to check if they are full, or to check the configurations of sealed products. This combats 'countercheating', where a shipment of boxes may only have 20 items per box, instead of 50 as claimed. As each box would have to be opened and checked individually without x-ray, this is an essential inspection tool where boxes are to be routed directly into stock.

Like the Explorer, both operators and occasional users can achieve results quickly, and with minimal training. The system can be automated.

By comparing suspect incoming shipments with known good samples, goods-in staff can apply the benefits of x-ray inspection technology to counterfeit detection just as readily as their colleagues in manufacturing do for production management and quality control.

Alternatively, inspection activity can be subcontracted to third-party inspection and test specialists. These suppliers can become part of the manufacturing supply chain, operating in either batch or volume mode.

www.cupio.co.uk

Nordson Dage Assure QuickCheck x-ray inspection system



Let's get competitive on the world stage

Teddington's MD, James Henderson, explains how the Coronavirus outbreak is exposing problems that UK industry faces daily

Technology improvements in electronics manufacturing mean SMEs like Teddington can compete with low-cost manufacturing sectors. However, SMEs have limited buying power which means an efficient supply chain is required to remain competitive. Efficiency means buying components cost effectively and minimising lead times.

Recent projects and purchasing exercises with a Far East manufacturing partner have provided Teddington with invaluable information and highlighted a fundamental problem. Specifically, when calculating the costs of a manufacturing run, while actual manufacturing cost was comparable, component costs were, on average, 50 per cent less in the Far East. This means volume production will never be competitive, regardless of factory efficiency.

Typically, UK-based manufacturing companies provide value-added services to make the option more attractive. Examples include: reduced lead times, local

engineering services, smaller ordering requirements and better payment terms.

Most components are manufactured overseas whether we like it or not. We have seen lead times grow steadily with some parts now at nearly a year lead time. While this can be partially mitigated by using intermediary suppliers, it fundamentally introduces risks which are not taken freely and impact prices and availability.

Now factor in the Coronavirus outbreak. We had good visibility of coming restrictions. China was starting to lock down and suppliers were warning of increased lead times so Teddington decided to hedge its bets. This was an opportunity for the UK supply chain to show how good it can be.

With projects on the go and PCBs in development which needed building prior to factory shutdowns, Teddington placed orders on UK and Far East suppliers. Although doubling up on parts, we aimed to improve

our chances of receiving the vital components in time.

We were disappointed. Items from China arrived within a few days while the considerably more expensive UK sourced parts arrived after another nine-days. Although the Coronavirus had levelled the playing field, the service we achieved through our UK supply chain was not as good as one on the other side of the world.

I have no doubt UK suppliers were doing their best and operating as competitively as possible within the constraints UK business allows. It boils down to a clear problem. Once overheads are accommodated, the fabric of UK business is too expensive to support a global manufacturing base.

There is no simple fix. A starting point could be industry working together. Let supply chains open their books and expose the costs that prevent the UK from achieving what it is capable of. Then lobby to get it fixed.

teddingtonsystems.co.uk



Teddington's MD, James Henderson, with the new Pillarhouse Pilot 29 selective soldering machine



With projects on the go and PCBs in development which needed building prior to factory shutdowns, Teddington placed orders on UK and Far East suppliers



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Stay strong, be proactive

In this article, ALR Services' sales director, Michelle Hunt, described the impact of Covid-19 on the UK PCB manufacturing sector and offers some practical advice

Purchasing PCBs has not escaped the impact of Covid-19. It was initially felt when Chinese New Year was extended by two weeks which meant lead-times were extended and the UK quickly hit capacity. As we move into the next phase of fighting this disease, there will be an impact on the UK PCB manufacturing industry, with some facilities already operating on reduced staff levels.

Buyers must also remember that many flights have been grounded which could have an impact on shipping PCBs in from China. Some shipments may be held up for a few days.

Continuity of supply is going to be a key element of your business's success: best advice is to be as proactive as possibly.

Prioritise queries from suppliers to minimise delays. Efficiency is the key to prevent lost manufacturing time. Also, take time to check in with your supply chain to ensure each company has a robust plan to ensure continuity of supply and find out what it is.

Order as far in advance as is practicably possible to create a buffer to protect your lead-times to your customers. Likewise, communicate with your PCB partner regularly to ensure open orders information is up to date

and re-schedule assembly where necessary. The more notice your PCB partner gives you, the more you can plan and reduce the impact on your reputation, your relationships and your cash-flow.

Utilise your PCB partner's expertise and develop a relationship that feels like you are working for the same company. Don't be tempted by 'too good to be true' offers on rapid lead-times and rock bottom prices. Do research.

Ask for recommendations and compare quotes to ensure they are like-for-like.

Keep your supply chain informed of any changes to your business which may result from the impact of Covid-19, such as operational hours and the telephone numbers for remote workers.

Plan for longer lead-times for specialist materials as these will be in high demand. Order more than needed and weigh up the cost of under ordering.

Consider exchange rates and the impact on overall purchase cost and re-visit pricing regularly to avoid getting caught in a negative equity situation that could cost you a contract or even your business.

Be cost-saving savvy and look at ways to manage costs for you and your customers. Use your PCB partners' expertise and ask them for recommendations.

Make sure your service goes above and beyond. Customers need to trust you. If Covid-19 plays havoc with deadlines, it will be how you deal with it that sets you apart. Always ask yourself, have I done the best possible job. Finally, always keep perspective. Keep smiling, stay focussed and be strong. We are all in this together.

alrpchs.co.uk

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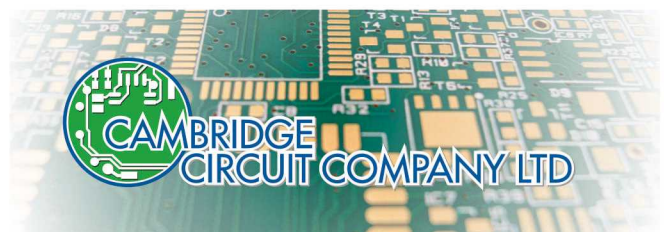
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John Denslinger is a former executive VP Murata, president SyChip Wireless, and president/CEO ECIA, the industry's trade association. His career spans 40 years in electronics

Procurement: 2020 reboot

John Denslinger argues that in the post Covid-19 electronics manufacturing world a heavy burden will fall on procurement to help pick up the pieces and restore order

Procurement • By John Denslinger

While medical teams, financial institutions and governments continue working tirelessly on issues, the forecast ahead for procurement is almost as daunting. Faced with the aftermath of shelter-in-place and similar decrees, the great American industrial reboot is about to begin.

Containing the spread among citizens took precedence over business as usual. Yet for many of us, that decision ripped apart global supply lines, the life blood of our industry. Left in the wake were closed businesses big and small; employees asked to work remotely or temporarily laid off; and while e-commerce flourished, daily person-to-person commerce vaporized. Supply chains once considered reliable, almost invincible, unraveled. Surreal is an understatement! Now the burden falls on procurement to pick up the pieces and restore order.

The post-virus world will have its challenges as many industries, manufacturers and suppliers vie for needed resources. The resumption of business will not be smooth, and neither will the job of procurement. There will be countless problems to solve. Perhaps the first glaring one is component shortages, late deliveries and lack of alternatives. Unlike capacity issues that stymied supply in 2018, this time a number of new factors are at play. For example, not every supplier will restart at the same time. That consequence could delay flow of essential raw materials to some. It would be wise to assess each supplier's start up plan paying particular attention to country of origin. Be alert to newly designated virus hot spots, as well as, that locale's tendencies on constraints. The situation could change overnight, so nonstop monitoring is suggested.

The virus also exposed one other vulnerability not usually a concern: employees, people, labor. With so many individuals sidelined by shelter-in-place directives, the workforce will likely trickle back unevenly. For those companies who resorted to massive layoffs, the road back may be spasmodic. On the other hand, employers retaining core competencies throughout the downturn should experience moderate to seamless restarts. In either case, be cognizant that employees will also need time to recover. Many will need to overcome the personal trauma inflicted by the crisis. Furthermore, each must now adjust to new conditions, work rules and employment policies in a post Covid-19 environment. HR fatigue may take an early toll on productivity.

There are some helpful resources available. As mentioned last month, ECIA continues surveying manufacturers and distributors on Covid-19 impact. The third update compiled by Dale Ford, chief analyst, is now available. Also, Robin Gray, ECIA COO & general counsel, posted ECIA's efforts to make sure the electronic industry (manufacturers, distributors and corresponding supply chain) is designated essential and thus exempt from current and future shelter-in-place orders. This might be extremely important should there be a Covid recurrence.

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Prevention is better than cure

Antistat explains why the damage caused by electrostatic discharge can be costly, then introduces the products purchasers can buy to solve the problem

Electrostatic discharge (ESD) can damage sensitive electronic components, resulting in failures, reduced reliability, increased rework costs or latent component failures. The cost of in-house failures can be significant, while cost of a single in-field failure can be astounding. Whilst it is difficult to attribute specific failures to ESD damage, companies can minimise or prevent possible damage and reliability problems by storing, assembling and handling equipment under electrostatic safe conditions.

Regarding ESD packaging, antistatic bags and static shielding bags are the biggest sellers. Most standard product lines are sold in packs of 100. Case quantities and bespoke options can also be provided.

Pink antistatic or poly bags dissipate static charge to ground, keeping static charge from building up on the package or device. Pink poly's resistivity is in the dissipative range and they have no shielding ability. A static field or discharge occurring outside bag will penetrate the bag and damage electronics inside. Their primary use is to package support or processing materials such as nuts and bolts that will be in close proximity to static sensitive devices within an ESD protected area (EPA).

Shielding bags provide similar dissipative and antistatic properties to pink poly bags but add a metal shield to stop static from entering the bag. A four-layer construction guards against charges inside and outside the bag, while being semi-transparent for easy content

identification. Static shielding bags are silver and typically used for transport and storage outside an EPA.

Moisture barrier bags protect electronics from both moisture and static damage. Bags can be vacuum sealed. They are available in different thicknesses depending on the moisture and vapour transmission rate required. To verify dry packaging methods are not compromised during storage and transportation, humidity indicator cards and desiccant sachets can be used.

ESD packaging also includes a wide range of such as Corstat conductive corrugated board, ESD storage bins, waffle trays and custom component tubes. Corstat boxes offer a convenient and safe way to store and transport static sensitive devices due to its conductive coating providing Faraday cage protection and the antistatic foam which provides ESD-safe cushioning to protect the box contents.

Antistatic mats and ESD flooring are effective methods of controlling electrostatic discharge within the EPA. Matting slows down and controls discharge, allowing static electricity to transfer safely to ground. It also protects the surface of sensitive devices from wear and tear. Different colours and textures are available, and matting can be cut to size.

The primary means of protecting ESD susceptible items is to provide a controlled ground path for ESD sensitive items. There is a wide range of ESD personnel grounding

wrist straps, sole and heel grounders, ESD plugs and bonding points and other grounding accessories in addition to the tools to facilitate this.

www.antistat.co.uk



Pink antistatic bags dissipate static charge to ground



Shielding bags stop static entering



The primary means of protecting ESD susceptible items is to provide a controlled ground path for ESD sensitive items

Buyers' guide to aerospace purchasing

This article offers readers best practice advice on sourcing components for aerospace applications

When purchasing electronic components for aerospace applications extra care must be taken to mitigate and manage supply chain risks. Supply chain compromises can come in many forms: counterfeit products; inadequate record keeping; accidental damage; and others. Sometimes, engaging with new suppliers is discouraged. However, it is often unavoidable and there can be significant benefits to broadening your supply chain such as enabling new services, products and capabilities.

Accreditation is usually the easiest thing to check when engaging with suppliers. AS9120B is the latest revision of the aerospace specific quality standard for electronic component suppliers and is a superset to ISO9001:2015. AS9120B covers a range of potential supply chain compromises such as: proper component handling procedures; traceability; counterfeit avoidance; and more. To maintain accreditation, an annual surveillance audit is required by an authorised independent third party, with full re-certification every three-years. A valid AS9120B certificate should usually be the minimum requirement for any supplier in the aerospace sector.

Other schemes tied to aerospace can provide additional accreditation such as JOSCAR (Joint Supply Chain Accreditation Register). Memberships can provide extra levels of reassurance since they are independently accredited. Knowing you have an accredited supplier is reassuring, but it is important to continue auditing all suppliers regularly to ensure they maintain a high standard. Just because your favourite supplier had a clean bill-of-health three years ago, it doesn't mean it does today.

Traceability is often mentioned but easy to overlook. The history of a component detailing lot numbers, shipment references and production dates may be required. It's not uncommon to see a query more than a decade after a product was shipped. It is vital to know where parts come from, if they are new and whether shipping was direct from the manufacturer or their authorised distributor. Documented traceability should always be available. If documentation is not available, it should be investigated fully as this may indicate an issue with the manufacturer, distributor or product.

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Obsolescence is a fact of life. For commercial, technical or legal reasons, a manufacturer may stop producing a component. In a worst-case scenario, this could stop your whole production line. A change in a specification or raw materials shortages, resulting in extended lead times, could have a similar effect on production. In these circumstances, parts may not be available from the manufacturer's approved supply chain. To maintain production, it may be necessary to consider product originating outside the usual chain.

This is potentially a high-risk situation. Any buyer should take significant care to ensure that parts have a good pedigree because the traceability chain is broken. If this type of sourcing is not an in-house competence, it is appropriate to assign a specialist third party. Ensure that robust anti-counterfeit and qualification processes have been applied appropriately to the specific situation and product.

For a non-critical component originating from an otherwise accredited source, the minimum level of inspection required will be in accordance with AS6081 (or other relevant standard). This covers visual inspection and de-cap and x-ray for die inspection. This is followed by 100 per cent testing of all devices at an AS9100C accredited test house to confirm they meet the electrical specification exactly per the original manufacturer's datasheet, thus confirming authenticity.

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Ready to fly

Rhpoint Components explains how automotive resistors can make the grade in NewSpace applications

Harsh environments seen in aerospace applications include extreme temperatures, varying pressures, high levels of radiation and the threat of impact. The majority of aerospace applications rely on component manufacturers defined, in Europe, by European Cooperation for Space Standardization. Companies must only use these defined component manufacturers due to their strict manufacturing processes and rigorous testing. This can impact choice due to the limited options available, such as component size, specifications or even manufacturer. It can also create second sourcing issues.

For the NewSpace sector, where not all these harsh conditions are as important as others, compromises may be possible. For example, it may be possible to use off-the-shelf parts, at significantly lower cost, but still provide high reliability.

Regarding resistors, there are only a handful of approved ESCC4001 manufacturers. Each resistor series and manufacturer listed offers something different such

as resistance, sizes and power rating. This can limit possibilities, in some cases leaving just one option. With limited options and high levels of testing, these parts can be expensive and have long lead times. Costly components and long lead times are not an issue for mission critical applications. However, some end products may not need this level of reliability confirmation.

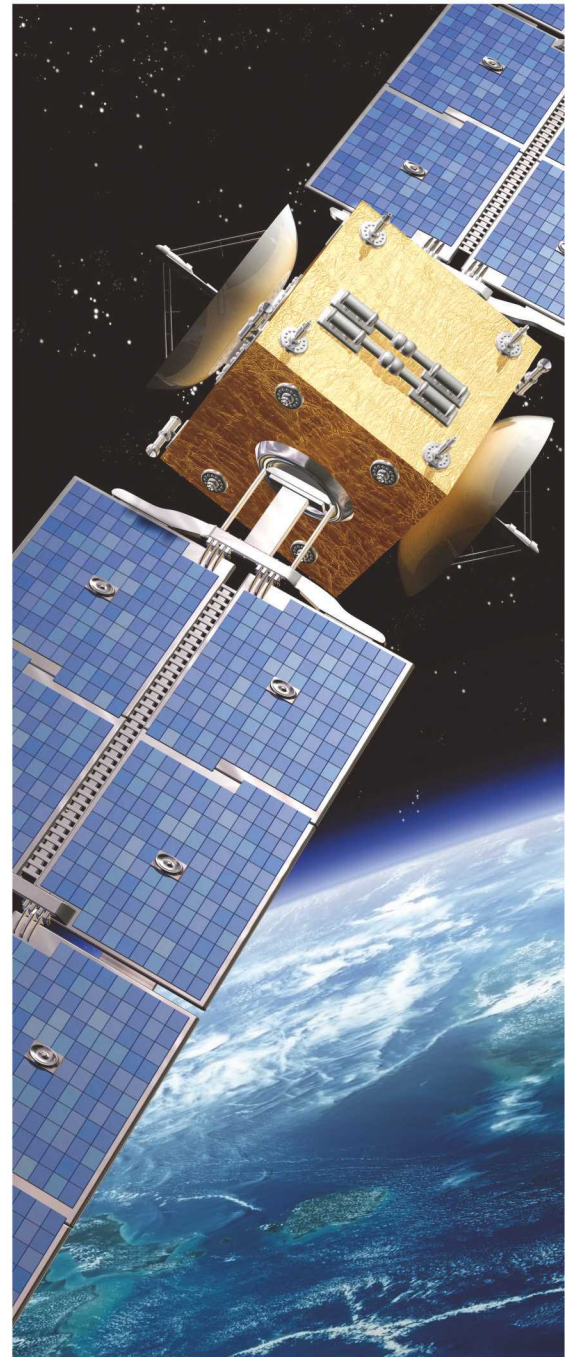
In instances where a trade-off between risk of failure and component cost can be made, automotive-grade and commercial off-the-shelf components are a great alternative. Due to the automotive sector's demands, automotive-grade components offer high reliability, are often more readily available and can be vastly cheaper. As an alternative to specialised space approved parts, it may be possible to use a wider range of component offerings.

Using automotive-grade counterparts to ESCC4001 specified resistors, can be an effective option, since these components have already proven their ability to 'fly'. Some automotive-

grade components meet the highest requirements of the AEC-Q200 automotive qualification but are not considered as equally reliable regarding the ESCC4001 specification. They often have the same production steps and are made of the same materials except for the termination finish. Space approved parts have non-RoHS compliant terminations due to the lead content.

Depending on the risk evaluation in the mission profile of NewSpace equipment, a highly qualified automotive-grade component could meet these requirements. If the automotive standard is not sufficient, but cost needs to be reduced, manufacturers may try to close this gap with reliability data of automotive-grade parts by offering individualised qualification services. Commercial off-the-shelf components could be tested for quality and reliability at an additional cost, but not fully to an aerospace approval.

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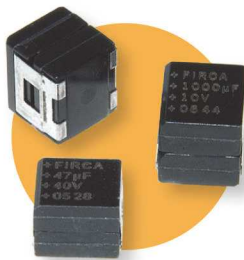


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Avoiding counterfeit components with quality-led distribution

Charcroft's Debbie Rowland explains making quality central to every part of the distribution process avoids the risk of counterfeit components entering the supply chain

The risk of receiving counterfeit components is a constant challenge in the electronics industry and procurement professionals now have higher levels of concern. Over the recent period of extended lead-times and allocation, buyers had to look to different channels to secure delivery. Lack of component availability led companies to consider sourcing components from the grey market. The grey market grew and increased the threat of receiving counterfeit components.

Vigilance is critically important and assessing the supply chain and processes used by suppliers plays a vital role in eliminating counterfeit components. The potential consequences of receiving and using counterfeit parts are significant for OEMs and CEMs. In some sectors, such as aerospace, defence and space, failure is not an option. Counterfeit parts which are not fit-for-purpose could be commercially damaging and a major safety risk. Sourcing components from approved, franchised distribution channels provides the confidence that components are valid, accurate and fit-for-purpose.

Planning for counterfeit avoidance

Every distributor supplying commercial, industrial or high-end sectors should have a plan which protects against supplying counterfeit

components. The plan must address the balance between accuracy, vigilance and commercial viability. The plan must cover every eventuality and worst-case scenario to ensure counterfeit components are not inadvertently introduced into the supply chain.

As an approved supplier to major OEMs and CEMs in the industrial, defence and high-end sectors for 40-years, counterfeit

elimination has been central to Charcroft's business model. The model is based on a strong reliance on quality-driven processes including defining and adhering to rigorous quality policies and procedures which govern every transaction, every day. Actively encouraging this culture of quality resonates throughout the company. It is not limited to the quality department but applies to every team. Each employee must take



Charcroft Electronics director,
Debbie Rowland



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ownership of quality to create a viable management system which is embedded in each distribution process.

To minimise the risk from counterfeit components, a series of defined tasks maintains the absolute reliability of the sourcing process. One of the most important tasks is to ensure staff are fully trained and aware of the potential impact of counterfeit components.

All staff receive compulsory training and awareness of counterfeit components is covered in the key commercial training programme. Additional intensive training, specific to identifying and avoiding counterfeit components, is given to each member of the quality department. Members of the quality team are approved to act as Designated Supplier Quality Representatives (DSQR) and attend customer-specific training to ensure they are approved by the customer to perform this role. Prioritising quality in every Charcroft team provides a solid

foundation on which to develop further protocols.

Added certification to franchised components

Certification to AS9120 delivers a widely adopted and standardised quality management system for the aerospace industry. This qualification, in addition to JOSCAR certification, are integral to Charcroft's ability to supply to the aerospace industry. These accreditations reinforce an ongoing commitment to quality and to supplying components which are used in critical applications.

The most common way to minimise the risk of counterfeit components is for customers to source devices from franchised manufacturers. On very few occasions, it may be necessary for Charcroft to fulfil a customer's vital requirement by purchasing parts outside of a franchise agreement, but not from the grey market. The protocol for these situations ensures parts are flagged up and the purchase

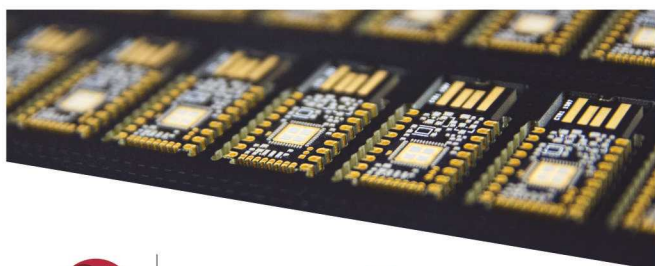
is authorised by a director. The parts are stored separately in a designated area and kept separate from franchised stock. All parts, whether from franchised manufacturers, or acquired with special authorisation, are subjected to rigorous, multiple testing prior to shipment to the customer. Tests include checking the component's body and markings, plus checking accompanying documentation. All returned franchised parts are subjected to rigorous checks before being released back into stock. This ensures security at every stage of the distribution cycle.

DSQRs and document archive

The introduction of the DSQR programme enables one member of staff to act as a named and approved representative to work on behalf of a customer. The DSQR personally checks each shipment before it leaves Charcroft's warehouse. These checks are intensive and senior managers may also check the parts in addition to checking the supporting documentation and accreditations. Supporting a customer with a named DSQR is an integral part of the quality process which enables the customer to have absolute confidence in the validity of the components that are supplied.

For many critical applications, the need for full traceability means each part must be accompanied by correct and accurate documentation. By storing supporting documents indefinitely, Charcroft's archive gives customers the ability to have full traceability of each part after the components have been supplied. The process also ensures that a Certificate of Conformance is printed on every despatch note. This includes the name and address of Charcroft and the customer, the manufacturer's name, part number and quantity and the customer's internal part number. The archived information can also include the date code and lot code if these are provided by the manufacturer and required by the customer.

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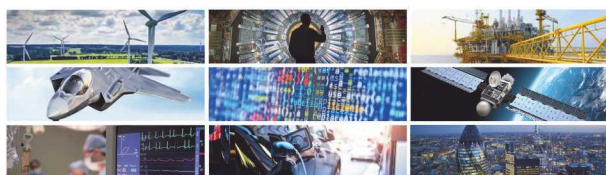
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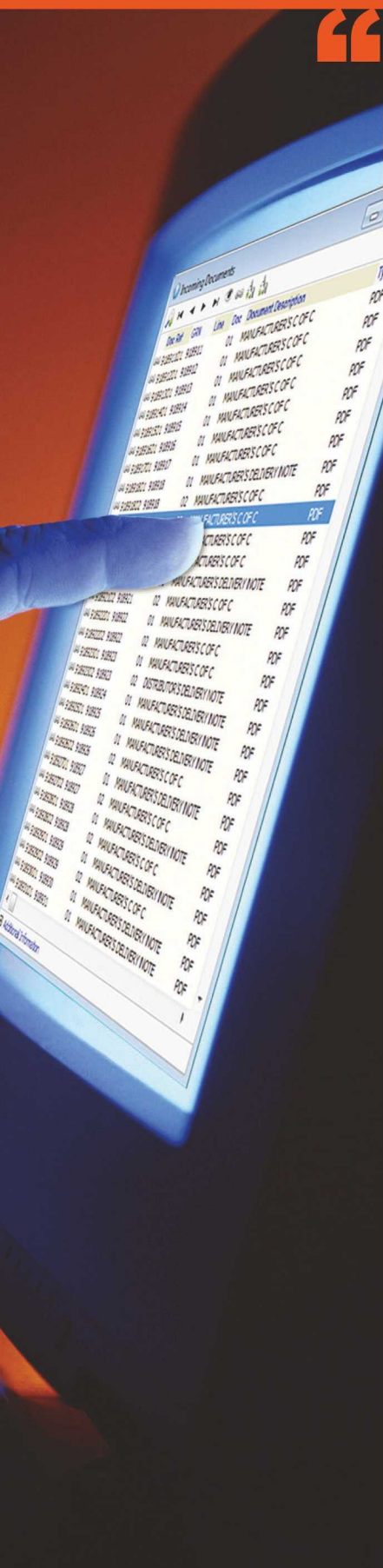
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Each part must be accompanied by correct and accurate documentation



Verification Plan and Report (DVPR) process, each element of the distribution process is under continual assessment. Training is renewed each year for quality personnel and accreditations are renewed and reassessed regularly. In-house auditing also helps ensure the infallibility of the systems. Continual reviews enable utmost integrity to be maintained and prevent counterfeit components from entering the supply chain.

This quality-led approach to counterfeit avoidance enables OEM and CEM customers to have full confidence in every part that is supplied.

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Connector selection and purchasing considerations

Contour guides readers through the steps involved in choosing and purchasing connectors

When choosing connectors, they should surpass the application's requirements in both physical and commercial terms. Overlooking critical issues at selection stage, especially for harsh environments, can impact schedules and costs. Thus, having a specification as soon as possible is vital.

The specification should cover the application's environmental conditions including: operating voltages (signal and power); shielding/EMI requirements; IP rating, mating cycles, polarisation/latching requirements, vibration and bending; plus other special considerations. Once an outline specification is decided, look at narrowing down the selection. Remember, there will be several possible solutions which will need further evaluation.

Size wise, modern connectors are typically smaller in design than older solutions. However, a larger connector may be beneficial if, for example, it is connected in the field by non-skilled personnel. In this case a more robust design helps ensure correct connection is always achieved. Pin count, pitch, construction and finish are other considerations.

Availability is important, so look at the manufacturer's lead times (including shipping). Understand these time frames, plus the lead times given by the various distribution channels. Consider if a connector is available globally and has local technical support. Obsolescence can be a headache so check the manufacturer's website to ensure a product is 'active'.

Ask your cable assembler for

advice. They can use their experience and economy of scale to offer the best price. Where possible state that 'fit, form and function' equivalents can be used but always ask for specification sheets and request approval from the relevant technical team prior to production. Potential benefits of equivalents include reduced lead times and cost reductions.

IP rating is an essential consideration. Will the connector be subjected to occasional water, submerged in water or exposed to a wash down process? In an IP67 connector, empty pin positions will need to be blanked off. Many manufacturers offer sealing caps when the connector is unmated.

Wire selection to suit the de-rated voltage requirements is also key. Where possible choose UL wire type numbers as these are well

defined across a multitude of suppliers, culminating in tri-world supply sourcing which can help reduce lead time.

Regarding Covid-19, ensure the manufacturer is operational and check the current lead time. Allow additional time for current logistical challenges. Ask for a supplier's Business Continuity Plan (BCP), plus their Covid-19 policies for added assurances.

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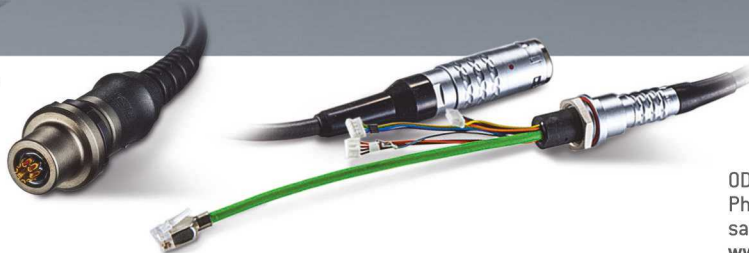
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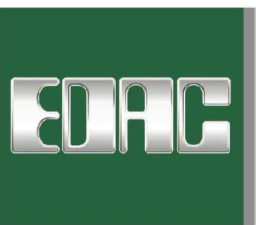
Murrelektronik outlines the hallmarks of motor connectors and introduces three of its connector technologies designed to suit multiple motor types

Perfect contacts, a good seal and environmental resistance are basic requirements for all connector types. Motor connections require additional features including wide connector cross sections, performance in a compact design and integrated anti-vibration locking mechanisms ensure the connector stays tight when exposed to strong vibrations.

Murrelektronik's MQ15-X-Power range is designed to provide a low-cost connection to asynchronous and three phase electric motors up to 7.5Kw. The new M15 connection technology offers quick and easy motor connectivity with reverse polarity protection for asynchronous motors up to 7.5kW. The connector has three power contacts rated at 630V AC/DC up to 16A, PE and two auxiliary contacts 63V AC/DC up to 10A. It is available shielded and unshielded.

Over-moulded plugs seal the connector to IP67 (when mated) and eliminate the risk of wiring errors. The M20 bulkhead option means connectors can be mounted on the motor terminal box and tightened using the back nut. MQ15 X Power suits applications where quick and easy disconnection and re-connection is required.

Murrelektronik states its M23-Drive range is an established standard solution to connect servo motors. This range claims to offer the most powerful eight pole M23 connector on the market. With 630V AC/DC, 28A per pin for the power contacts and 300V AC/DC 8A for the signal contacts, the connectors suit high performance drives and servo motors. The 360deg shielding ensures low interference emissions.



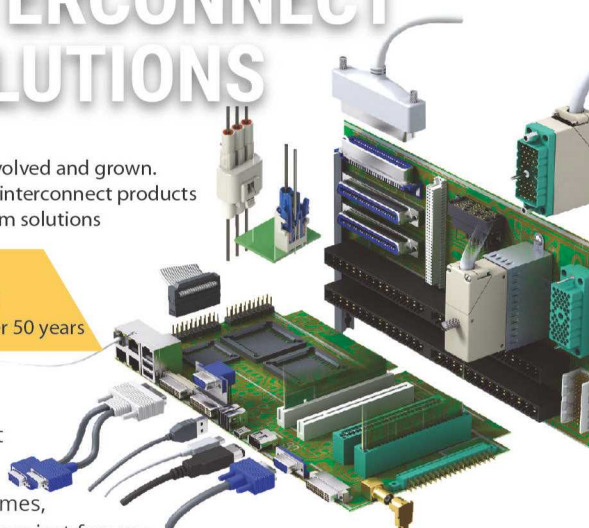
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Connectors

The M23 connector features a locking mechanism that ensures sealed connections even when exposed to oils and lubricants. Flexible corrugated conduit for cable protection can be anchored to the connector by the integrated push-on conduit connection. Original Siemens cables are an additional benefit of this range.

Completing the range, the M12 Power connector is claimed to be the most compact and powerful five pole M12 connector on the market. The compact design of the L coded connector, together with a 63V AC/DC, 16A per contact rating, suits high current, low voltage applications such as linear drives, brushless DC and stepper motors.

The five core PUR cable has a wire cross section of 1.5 mm². Flexible corrugated cable conduit can be anchored via an integrated push-on connection. The range includes: M12 Power connectors to open ended wires; cables with M12 Power male and female connectors; bulkhead connectors and adapters.

Murrelektronik UK applications engineer, Craig Cookson, said: "Murrelektronik's expansion into motor connectivity is offering huge advantages compared to existing methods. Primarily,

the three new product lines are compact and easy to use. They are already proving to be the best on the market and have demonstrated that we are listening to the needs of our customers when developing new products.

"We are already seeing a vast amount of interest from customers involved in machine building and materials handling. Interesting projects include connectivity to asynchronous motors, servo motors and stepper motors."

www.murrelektronik.uk

M23-Drive is an established solution for servo motors



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Keeping cool as EV market heats up

New report examines current methods and future trends for the thermal management of electric vehicles

As the electric vehicle market grows there is increased need for effective thermal management. Keeping heat under control leads to improved charging, performance, range, longevity and safety. A new report from IDTechEx covers aspects of thermal management for electric vehicles including the batteries, motors and power electronics.

High profile battery related fires from well-known automotive manufacturers does little to instil confidence in potential consumers. With this in mind several new regulations have been proposed relating to safety aspects unique to electric vehicles. The likely outcome of this being that manufacturers will be required to halt thermal runaway at the individual cell level and warn the vehicles occupants, giving them at least five minutes to exit the vehicle once a thermal event occurs.

Several factors must be considered when designing an electric vehicle for safety, from materials used in the

battery pack construction to thermal runaway prevention and early detection. Several companies are designing methods of stopping thermal runaway between cells including flame retardant encapsulants, interweaved products and phase change materials. Effectively dissipating heat from the battery module or pack to a heat sink is also important and usually carried out using a thermal interface material. This is another area where manufacturers have adopted several strategies including gap pads, fillers and conductive adhesives.

Every manufacturer has its own methodology to thermally manage their batteries with no clear consensus on the most effective design. Companies like Tesla are set on their patented water-glycol coolant lines which snake their way between the cylindrical cells in the pack, whereas Nissan and Toyota are committed to air cooling.

Active battery cooling with fluids keeps a vehicle cool in conditions where it is

stationary but the batteries are in high demand (eg during fast charging). It also allows batteries to be raised to optimal temperature in cold ambient conditions. These are significant advantages but come at the expense of weight, complexity and cost.

Despite these caveats, IDTechEx has observed a market shift towards liquid or refrigerant cooling and foresee this trend continuing into the future, especially following the rise of charging with 350kW sources, with the amount of liquid or refrigerant cooled batteries exceeding 500GWh by 2030.

In addition to widely adopted technologies, other emerging alternatives include immersion cooling and phase change materials. These technologies are gaining modest traction, especially for more specialised markets like construction. The report appraises all these cooling methods in addition to the players utilising them.

The electric motor is the unifying component of an



There are multiple battery cooling methodologies



Every manufacturer has its own methodology to thermally manage their batteries with no clear consensus on the most effective design



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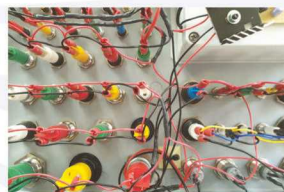
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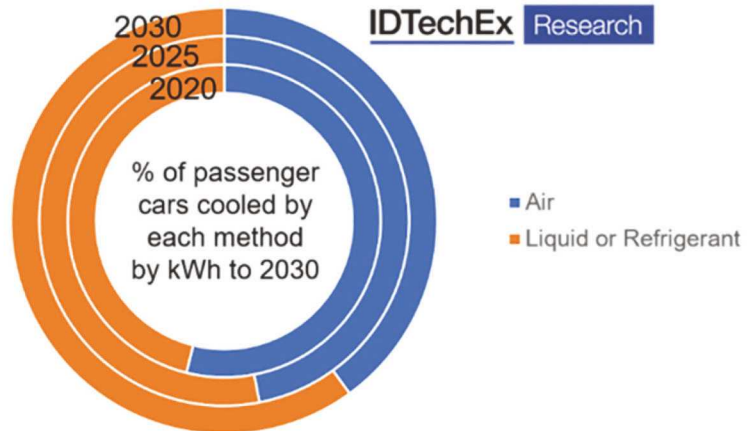
electric vehicle and more demand is being put on them regarding performance during extended use. Most manufacturers use motors containing permanent magnets. These magnets can be denatured and rendered useless above a critical temperature and also need effective thermal management.

Even motors without permanent magnets still require cooling to improve performance and reduce overheating neighbouring components. Methodologies adopted typically consist of air, oil or water-glycol cooling. Several manufacturers use the same coolant circuit for their batteries and motors. This reduces the number of components and fluids, while simultaneously allowing excess motor heat to warm the batteries or passengers in cold conditions.

In addition to batteries and motors, power electronics also have to deal with significant heat. The way wire bonds and soldering is carried out, plus the material used, impacts the performance and longevity of the power electronics. Several OEMs are shifting towards advanced substrates and even eliminating the thermal interface material altogether.

IDTechEx's report, *Thermal Management for Electric Vehicles 2020-2030*, covers the above topics through extensive research including primary interviews with companies in the field. The report covers the strategies used by major OEMs, emerging technologies and market forecasts.

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Air v liquid cooling



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Distributors' e-commerce tools provide critical information and insight to buyers

Some e-commerce tools can help buyers manage component obsolescence and reduce supply chain risk



James Carbone

Most electronics distributors offer purchasers a range of online e-commerce tools to help them find parts to make the purchasing process easier and more efficient. However, there is no one-size-fits-all solution because the kind of tools that buyers need varies depending on the volume and mix of parts that are required.

Some purchasers need a robust suite of e-commerce tools that can handle and track multiple bills of materials and provide real-time information about lead times, prices, and product change and end of life notices. However, other buyers just need a tool that allows them to cut and paste a bill of materials into an online shopping cart.

For example, Integra, a distributor based in Anaheim, Calif., has limited e-commerce tools for buyers. "We have what we call a quick BOM which allows customers to come to our website and upload their bill of materials," said Mark Baker, director of business development for Integra, which sells passives, discrete semiconductors, connectors, switches and other components.

"A member of our inside sales team then goes through the BOM and fills out a spreadsheet for the customer and sends it back within 24 hours with information about the lead times of the parts, cross references and the availability of

the parts that we have in stock and what we don't." Such a tool is what many of Integra's customers want.

However, many other purchasing professionals and engineers need a wider range of more complex purchasing tools that can handle a number of BOMs, cross reference the manufacturer's part numbers to a customer's part numbers, identify a part number when the exact number is not known by a customer and provide quick access to product attributes.

"Some organisations will integrate Mouser's application programming interface (API) so they can build Mouser's price and availability into their own corporate tools," said Hayne Shumate, senior vice president, Internet business for Mouser Electronics. He said the tools are available in 20 languages and list quantity-based pricing in many currencies.

Mouser's BOM tool has an order history application that keeps track of all past orders whether they came in through Mouser's website, phone, email, or EDI. Parts previously purchased can be added to a cart to reorder directly from history, said Shumate.

Identifying supply-chain issues

Mouser's tool can also help

customers identify and manage component obsolescence and other supply chain issues in its BOM tool and in its project manager, shopping cart, search results and product pages, he said.

"We do get daily signals from many suppliers regarding life-cycle and risk of products," said Shumate. "Some of this is automated, but the best information from some suppliers comes through the regular meetings and calls we have with them and understanding their plans for product direction," he said.

By working with suppliers, Mouser can reflect their product evolution decisions through the "badges on our site that indicate product life-cycle status and through links that direct customers to replacements for obsolete products," said Shumate. However, the tools will not have decision-making information if a buyer is "trying to determine if he will be able to source 100,000 of a part every month for the next 36 months," he said. Mouser's primary focus is keeping inventory on the shelf for design engineers.





Waterproof distributors for tough environments

Binder has increased the applications for its snap-in 720 Series of miniature circular connectors with the launch of 4- and 6-way distributors. These will prove useful in environments where several devices are connected from a single supply line.

Applications include control, measurement, monitoring systems, lighting systems, distributed heating systems (including stadium seating and greenhouses) and data logging equipment.

The 720 Series comprises low-cost plastic bodied connectors featuring a quick and simple snap-in locking mechanism, protected to IP67 when mated. Binder designed the 720 Series specifically for use in applications where a simple waterproof connection is needed in harsh environments.

The distributors feature three or five gold plated contacts rated up to 7A at 250V (5A at 125V). Standard colour is black.

www.binder-connector.co.uk

Rethink cable management

TTI is now offering TE Connectivity's new P-shaped clamp with separate locking features. The clamp was developed to simplify the installation of cable management systems and the subsequent fitting of cable harnesses. The approach should reduce overall manufacturing costs by making it quicker and easier to install cable management systems, especially in confined spaces.

P-Clamp is designed for use in the defence, aerospace, space and industrial sectors. TE has introduced ten sizes to cover the range of 21 cable diameters defined in the AS21919 standard.

TE's P-Clamp is made of two parts, moulded in PEEK, which are hinged together. Thus, the clamp can be mounted to equipment earlier in the assembly process, before any secondary structures restrict access. A cable harness can then be run into place on the P-Clamp mounts and secured by swinging the locking mechanism into place. No tools are needed to lock the two parts together or to unlock the clamp to adjust the cable harness' position.

Applications include commercial aviation, military, aerospace, industrial, marine, rail and automotive.

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- The connection module VM-Pro 8-8 Class FA IP67 offers transmission properties up to Class FA acc. to ISO/IEC 11801 and is suitable for installation and patch cables with 8 wires.
- Shielded and unshielded cables with solid and stranded conductors of AWG27-22 type and outer diameter of 5.5 - 9.0 mm can be connected with the VM-Pro 8-8.
- The mechanical stability, the insulated structure and the protection against external influences enables versatile use for laying and repairing cables in building, residential and industrial building cabling.
- The IP67 connection module is shielded, insulated by the plastic screw glands, safe from manipulation and enables reliable strain relief.
- Suitable for PoE+ acc. to IEEE 802.3at.
- Temperature range from -40°C to + 70°C.
- Reconnectable up to 4 times.
- Assembly requires no special tools and is completed in a few steps.

www.telegaertner.co.uk/contact

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Welham Green, Herts. AL9 7JE E-Mail: sales@telegaertner.co.uk

Aerospace connectors: it's all about choice

Lane Electronics' Nick Wheeler explains that weight, contact density and stringent adherence to standards are key to aerospace connector systems

Today's military and commercial aircraft platforms contain massive amounts of electrical and electronic systems. From managing the engines and monitoring vital airframes to communications capability, these systems must guarantee failsafe operation.

Each system demands different types of connector systems, all designed to meet stringent aerospace standards. Lane Electronics can supply, from stock, many of the connector solutions used in airborne and ground-based aerospace systems including circular and rectangular connectors, plus RF connectors and cable assemblies.

The 8D/MIL-DTL-38999 series takes precedence for airborne applications thanks to their compact bodies, high density layouts and secure vibration-proof threaded coupling. Shell materials including aluminium, composite, titanium and stainless. Finishes include

RoHS compliant, black zinc nickel and zinc cobalt plating.

Different shell materials let engineers select the most appropriate connector for a specific application where, for example, weight is an issue. Here, the common shell material is composite being 30, 50 and 75 per cent lighter than aluminium, titanium and stainless respectively. Since these are used in their hundreds, serious weight saving is possible.

For ground support equipment, aluminium D38999 derivatives remain popular, while stainless provides reliable performance in high temperature propulsion applications. Another factor influencing choice is contact with nasty fluids such as JP5 and de-icing fluid.

D/38999 connectors are also versatile, with users able to specify contacts to suit applications. Through Lane Electronics, choice includes

signal, power, high power, coax, triax, quadax and Elio fibre optic. Lane holds large stocks of Souriau connectors for whom it is an assembling distributor.

For greater weight and space saving, Lane offers Souriau's micro38999 and 8STA series. Both are used in aerospace applications including aircraft cabin systems and UAVs. Despite their tiny size, both series provide D38999 capability.

Application potential is increased with 8D/38999 derivatives including: reinforced and hermetic sealing; easy assembly clinch nuts; and double flange versions which handle high vibration. To complete an 8D/38999 solution, Lane offers accessories including backshells and protective caps manufactured by UK-based Weald Electronics.

Moving to the rectangular connector format, applications include drones,

avionics, flight control, missiles, countermeasures and communication systems. Lane can provide connectors from Weald, Souriau, Positronic and Nicomatic. Certain criteria are common such as high reliability contacts under shock and vibration, reduced weight and reduced size.

Regarding RF connectors and cables, Lane supplies Huber+Suhner's connectors and cables which are used in applications across avionics including on-board communication and air traffic control. These provide the necessary high levels of reliability, weather resistance, low toxicity, power handling and low loss.

www.fclane.com



Power supply production in China starts to get back to normal

Supply of AC-DC converters and DC-DC modules should not be a problem for buyers as production of power supplies has resumed

Buyers can expect normal lead times, ample availability and falling prices for most power supplies for the rest of the year, despite the impact that Coronavirus has had on the overall electronics supply chain including power supply manufacturers.

As of early April, power supply production in China resumed and was ramping up. About 60-70 per cent of all power supplies are made in China, according to Mohan Mankikar, president of Micro-Tech Consultants, a power supply research firm based in Santa Rosa, Calif. Most power supply manufacturing in China is in Shanghai and Shenzhen, which is “pretty far away from Wuhan,” where the outbreak of Covid-19 originated, said Mankikar.

“Christoph Wolf, president RECOM Power, Inc., said RECOM operates one factory in Xiamen, China and two in Taiwan. “The Taiwan factories were minimally impacted. Our Chinese factory is almost running at full capacity, as the government lifted restrictions over there” he said in the first week of April. Wolf added RECOM’s bookings and billing were strong and lead times have not been affected. “However component availability for our factories may become an issue moving forward, because of restrictions in

other Asian countries where these components are made,” said Wolf. This could impact lead times in the future across the industry.”

Power supply manufacturing in China “may be OK, but it is not fantastic,” said Mankikar. The bigger issue is the impact that coronavirus is having on demand. Many companies have shut down, furloughing or laying off workers. With no income, sales of televisions, mobile phones, computers, etc have declined. That obviously means less demand for power supplies.

“You can make all the power supplies that you want, but if there’s nobody there to buy them it doesn’t matter,” said Mankikar. He said the overall impact of coronavirus on the power supply market will depend on the duration of the pandemic. “China seems to have recovered relatively quickly” but countries in other regions were still being ravaged by COVID-19 in early April and it was unknown when other regions would recover.

Recovery will happen

Despite the pandemic, the long-term outlook for the global power supply industry is positive, according to Mankikar. The switching power supply market grew from about \$30.1 billion in 2018 to \$31.6 billion in 2019, he said. Growth could

have been stronger, but inventory levels were high in the electronics supply chain.

“In 2018 a lot of our distributors invested in inventory,” said Wolf. “Some of them built up too much inventory, which led to fewer orders in 2019. But the point of sale level was slightly above 2018,” said Wolf.

The inventory has been worked off and bookings improved at the end of the year and prior to the COVID-19 outbreak, RECOM was expecting business to be better in 2020. “The outlook for this year was pretty good on growth side but that was pre-coronavirus.”

However, RECOM has a broad customer base which should help the company weather the storm. “Our customer base is diverse and power supplies are needed in every single application,” said Wolf. It has a strong presence in medical and industrial IoT.

“Our bread-and-butter businesses is DC-DC converters. That continues to be very strong, but the biggest growth that we see is on the AC-DC modules,” said Wolf.

RECOM and other power supply manufacturers may see some sales growth in 2020 despite of the pandemic. Micro-Tech



Christoph Wolf, president, Americas for power supply manufacturer **RECOM**



Our bread-and-butter businesses is DC-DC converters. That continues to be very strong, but the biggest growth that we see is on the AC-DC modules

Consultants is forecasting 1.1 per cent growth as sales rise from \$31.6 billion in 2019 to about \$3.2 billion in 2020. However, sales growth may end up being flat or down depending on the impact of coronavirus, said Mankikar. Longer term, Mankikar says annual sales growth for power supplies would be about 2.7 per cent from 2019 through 2024, he said.

Mankikar points out that power supplies, which include AC-DC and DC-DC converters, is a mature market. "It is one of the oldest electronics industries. It started in 1945 at the end of World War II and is now 75 years old," he said. It is mature and mature industries tend to have lower annual sales growth rates. The power supplies business is steady, but double-digit growth is highly probable. Low to mid-single digit growth is more likely.

While sales growth in power supplies is steady, sales from certain customer segments are higher than others and sometimes reach double-digit thresholds. For instance, some manufacturers that sell power supplies for LED lighting applications have grown 15 per cent in some years.

Consumer electronics, which includes mobile phones, desktop computers, laptops, accounts for about 30 per cent of power supply revenue and is the largest customer segment for power supplies, according to Micro-Tech Consultants. Power supply sales to the consumer segments tends to be in the low-single digits.

Transportation, which includes cars, trucks and trains, is the second biggest segment, representing about 20 per cent of power supply revenue, said Mankikar. Computing and office equipment, which includes servers, buys about 13 per cent of all power supplies as measured by revenue, he said.

In 2019, transportation was a key driver for power supply sales. Much of power supply demand in transportation is for "battery chargers used for electric vehicles in different locations," said Mankikar. Some chargers are used in cars and trucks, while others are used in public places such as charging stations. Some are used at residences and in office parking lots, and demand for them continues to grow, he said.

The mobile devices and chargers market is estimated to be the largest segment of AC-DC and DC-DC merchant power supplies, accounting for 29 per cent of total revenues of AC-DC and DC-DC market, according to researcher OMDIA. However, the market is high-volume, low-margin nature and its share is expected to drop to 23 per cent of the total power supply market in 2023 because of stagnant growth and falling prices, the researcher said. Mobile device and chargers market will have a five-year compound annual growth rate of -2.1 per cent from 2019-2023, according to OMDIA.

The 5G bump

A key driver for power supply sales growth is 5G infrastructure, but it may be a short-term driver. "With telecom you get a big boost as the infrastructure is built, but then growth flattens" once the networks are completed and all the equipment is place, said Mankikar.

The industrial segment continues to be an important segment for power supply manufacturers. "It is pretty stable. It grew about 2.5 per cent last year because it is a mature segment," said Mankikar. However, it may be negatively impacted this year because of the decline in the oil and gas industry as energy prices fall.

While industrial and telecommunications are traditional segments for power supplies, "new

applications for power supplies are always occurring and there's so much diversity in applications," said Mankikar. "There are smart speakers, artificial intelligence, machine learning applications and home and business security applications that continue to "pop up all the time and all of them require power supplies, he noted.

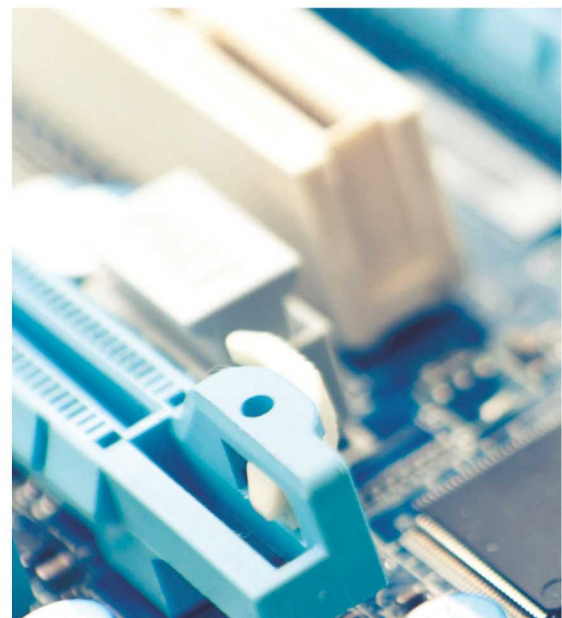
One application that has had strong growth in recent years is LED lighting systems. Many power supply manufacturers build LED drivers for such lighting systems. An LED driver is a self-contained power supply which regulates the power required for an LED or array of LEDs. Because LEDs are low energy lighting devices with long lifespans, they require specialised power supplies.

Wolfe said RECOM supplies LED drivers for some applications. "LED drivers are dominated by Asian suppliers. However, there are a lot of companies that make intelligent lighting controls and do a lot more than just controlling the lights. They are doing other IoT functions. That's where we're seeing the growth in the Americas," he said.

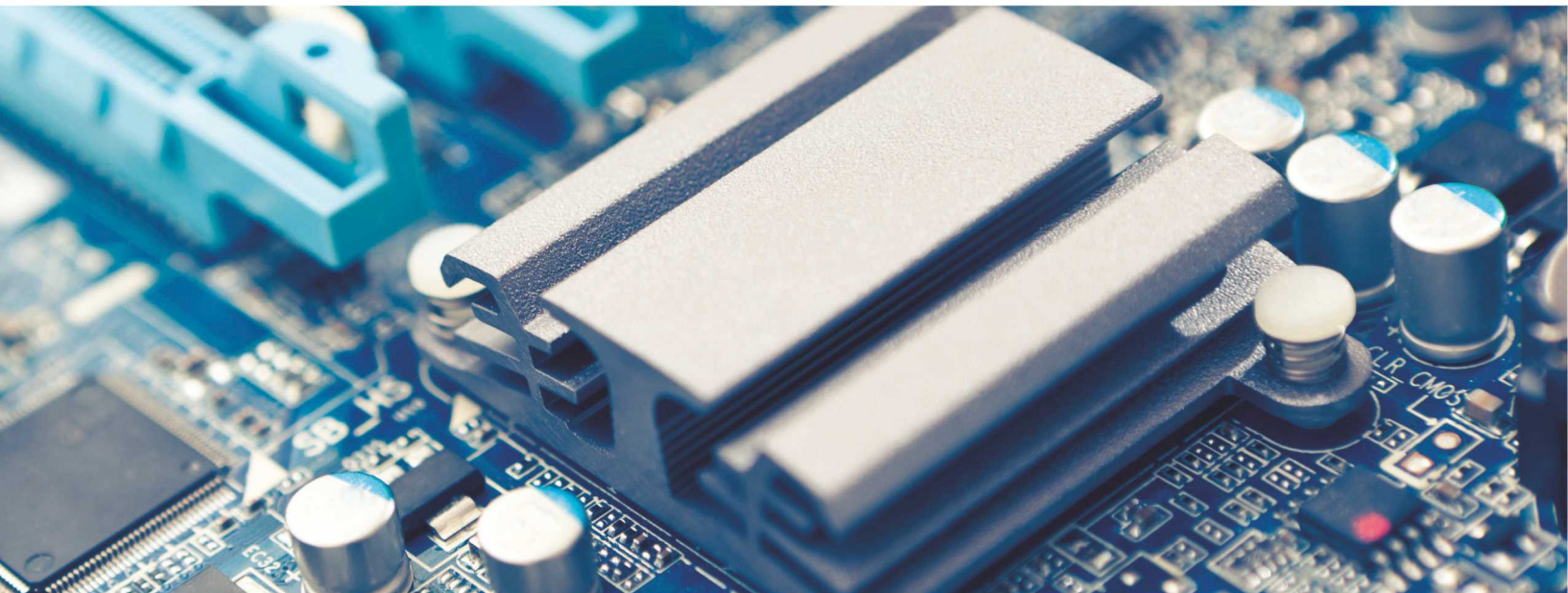
Manufacturers building power supply products for lighting systems manufacturers posted strong growth in 2017 and 2018, but business flattened in 2019.

The LED power supply segment was "going gangbusters in 2018 with a 15 per cent growth rate," but sales in the segment went down significantly in 2019, said Mankikar. "I don't know if it's a one-year deal or if it's a trend. There's a company called Mean Well which grew to a \$1 billion company in 2018. Last year its sales remained flat. It was a big surprise," he said.

A Chinese company called MOSO Power makes LED drivers. The company had sales of \$250 million in 2017,



I see the power supply market getting more and more consolidated, but it is gradual



\$190 million in 2018 and \$181 last year. It is unclear why MOSO's LED drivers sales have declined, said Mankikar.

However, it is likely that in the long-term, LED lighting systems will continue to be an important segment for power supply manufacturers. LED lighting is projected to be the fastest-growing application sector in revenue terms from 2018 to 2023, according to researcher OMDIA. The market for merchant power supplies in LED lighting application was about \$5.6 billion in 2018, accounting for 25 per cent of the total market. It is projected to increase to \$7.6 billion in 2023. LEDs will account for 31 per cent of the total power supply market in 2023, the researcher said.

Supply will meet demand

While there are many traditional and new applications for power supplies, the good news for electronics purchasers is there likely will be ample supply to meet demand for the foreseeable future. With adequate supply, buyers can expect short lead times and modest price declines through the rest of the year and probably longer.

There are many large, established power supply manufacturers such as Delta, Artesyn and TDK-Lambda, among others, as well as thousands of smaller power supply manufacturers. Some specialise in power supplies for certain types of product.

In addition, it's likely that new power supply manufacturers will go into business. "Power supply design is not that difficult and it does not need a lot of capital equipment," said Mankikar. "It's not that difficult to get started. You may not become a big company, but you can get into the business," he said.

However, while some new power supply companies will form, there could be some mergers and acquisitions over the next several years. While there has not been much consolidation with power supply manufacturers compared to other segments of the electronics industry, there are indications that may change.

"I see the power supply market getting more and more consolidated, but it is gradual" said Dinesh Kithany, senior principal analyst, wireless power supplies for researcher OMDIA. He noted that in 2017 the top 10

companies had about 42 per cent of all power supply sales. In 2019 that grew to 45 per cent and that percentage will likely continue to increase. One reason that the big are getting bigger is the top 10 companies are acquiring some smaller power supply manufacturers.

"There is a change in the power supply landscape occurring," said Kithany. The big players are buying smaller companies and I'm expecting more and more mergers and acquisitions to happen in the power supply market," he said.

"Larger companies may be active with acquisitions because they want to expand within the market, within the same sector, or expand into new applications," he said.

A power supply manufacturer that doesn't supply much to the medical equipment or solid-state lighting industries may acquire a smaller company that does. Some small niche power supply manufacturers that are growing fast because of their narrow focus may be the targets of larger power supply manufacturers.



It's likely that new power supply manufacturers will go into business



DCDC converter suits rail and instrumentation

Components Bureau's new Autronic AER20-W and AER20-DW DC/DC converters are compact 20W power supplies designed for harsh applications. They suit railway applications with an input range of 18:1.

The products are galvanically isolated and have a sealed housing. A unique feature is the input range from 8.5 to 160V in a single device.

The AER20-W offers efficiency up to 88 per cent with the option of a heat sink. Temperature range is -40 to 85°C. With natural convection, the converter can be operated up to 67°C without derating. Protective functions include overcurrent and overvoltage. The converters can be controlled via remote on/off and feature 3,000VAC isolation.

Other specifications include: shock/vibration to EN 61373 category 1 class B; dry and wet heat according to EN 60068-2-1, 2, 30; and the EMC standard EN 50121-3-2 for rail vehicles (with external filtering components), plus railway standard EN 50155.

www.componentsbureau.com



Hung up on enclosures

OKW has added a new wall holder to its Connect range of wired enclosures, enabling devices to be stored safely and securely when not in use.

The holder suits wired or wireless remote control for applications such as medical, IoT/IloT, robotics, machine controllers, network technology, building services systems, safety engineering, measurement and control.

Accommodating all three sizes of Connect (76 by 54 by 22mm, 116 by 54 by 22mm, 156 by 54 by 22mm) the holder features a recess for plug-in connections. It can be mounted on walls, machines or other flat surfaces using three screws.

The holder is moulded from UV-stable ASA+PC-FR (UL 94 V-0) in two standard colours: off-white (RAL 9002) and black (RAL 9005).

Other accessories for Connect include: holding clamps for rails; cable gland kits with kink protection and integrated strain relief; enclosure end parts; and self-tapping screws for PCBs.

OKW can supply Connect customised on request. Services include CNC machining, lacquering, digital/screen/tampo printing or laser marking of legends and logos, decor foils, EMC shielding, installation and assembly of accessories.

www.okw.co.uk

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How API Solutions will transform the electronics industry

Digi-Key Electronics' API Champion EMEA/APAC, Stephane Ratelet, encourages manufacturers to investigate how APIs can smooth their purchasing processes

If you haven't heard of an application programming interface (API), you soon will. I expect API solutions to be the most disruptive electronics market innovation in the next five to 10-years. Whether you realise it or not, you're already using APIs. Simply put, an API is a machine-to-machine connection. Every time you visit a modern web page, you are interacting with a remote server's API.

An API is not the first digital connection designed to make the purchasing process more efficient, but the customisation available with APIs make them a popular choice for procurement executives. Digi-Key found 70 per cent of companies it surveyed are exploring machine-to-machine connections. That's because with an API, a business can streamline existing processes and introduce automation, producing an immediate return on investment (ROI) across the entire enterprise.

API solutions allow purchasers to quickly get a price without having to compare every website. With Digi-Key's API solution, pricing is updated in real-time and prices can be honoured for 30-days by generating a digital quote. With these reduced hard costs of product prices, plus soft costs of time spent on invoices, quotes and returns and the cost of stock, it's clear: companies who utilise API solutions can expect significant cost savings.

In Europe, where taxes are high and companies need

to stay competitive if they want to remain in the region, the savings that result from utilising API solutions are especially attractive. Digi-Key already has 200 to 400 active API customers in Europe.

With the advent of digital technology, prioritising which tasks should be digitalised and which require people is becoming an important route to cost savings. Employees become more efficient, spending time on what they are most valuable for.

API solutions also improve accuracy. With the accuracy of a fully digital solution, the entire supply chain benefits. Again, with Europe's highly competitive environment, utilising solutions that improve accuracy and thus result in greater customer satisfaction should be a priority.

API connectivity can be implemented in three different ways, depending on a company's size and needs. Customers can implement API via their own internal resources; by subcontracting to an external developer team; and by using one of the third-party software solutions from Digi-Key's list of qualified partners.

Digi-Key's API solutions are free to use and interested customers can download a free eBook and try out the free ROI calculator, which shows how much they can save in one year by implementing Digi-Key's price, availability and ordering APIs. Customers who have utilised the calculator have seen an

average of fifty thousand to one hundred thousand dollars in cost savings by implementing API solutions.

In our increasingly digital world, data and speed of information are king. As a result, finding ways to harness digital solutions like APIs for cost savings is critical. I encourage you to learn how API solutions could benefit your business and improve your operational efficiency: you simply can't afford not to.

www.digi-key.co.uk

Digi-Key's API champion, Stephane Ratelet



Customers using the ROI calculator have seen fifty thousand to one hundred thousand dollars in savings

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	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	Buffer Stock Facility
CABLE ASSEMBLY & HARNESSING											
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	N/A	50	1,500+	Y
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	97%	50	1,500+	Y
CIRCUIT PROTECTION											
Boums	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,000	N/A	0 €	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,000	N/A	0 €	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	35,000	N/A	0 €	67%	50	1,500+	Y
DISPLAYS & LEDs											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ENCLOSURES											
Bud	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	80%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Hammond	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	12,500	N/A	0 €	100%	50	1,500+	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	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											
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ABRACON	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	91%	50	1,500+	Y
ECS	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	99%	50	1,500+	Y
Epson	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	59%	50	1,500+	Y
Geyer Quartz Technology	Geyer Electronic UK Ltd	01794 329341	www.geyer-electronic.com	N	N/A	N/A	£0	100%	6	50+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikkey.co.uk	Y	500	£250,000	0	100%	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	67%	50	1,500+	Y

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Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	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	Buffer Stock Facility
ICs & SEMICONDUCTORS											
Altera	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,600	N/A	0 €	60%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	9,500	N/A	0 €	83%	50	1,500+	Y
Atmel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,700	N/A	0 €	58%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	84%	50	1,500+	Y
Broadcom	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	80%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,400	N/A	0 €	63%	50	1,500+	Y
Diodes Incorporated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,600	N/A	0 €	98%	50	1,500+	Y
Exar	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	95%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	90%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	42%	50	1,500+	Y
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	97%	50	1,500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,100	N/A	0 €	97%	50	1,500+	Y
Infineon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	66%	50	1,500+	Y
Intel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	87%	50	1,500+	Y
Intersil	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,900	N/A	0 €	50%	50	1,500+	Y
ISSI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	98%	50	1,500+	Y
Lattice	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	69%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	11,200	N/A	0 €	67%	50	1,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	12,600	N/A	0 €	91%	50	1,500+	Y
Microsemi	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	40%	50	1,500+	Y
NXP	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,900	N/A	0 €	91%	50	1,500+	Y
ON Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,100	N/A	0 €	87%	50	1,500+	Y
Power Integrations	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	90%	50	1,500+	Y
ROHM Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,400	N/A	0 €	55%	50	1,500+	Y
Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,500	N/A	0 €	96%	50	1,500+	Y
Skyworks	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	93%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	99%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	36,900	N/A	0 €	41%	50	1,500+	Y
Toshiba	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	100%	50	1,500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
ATP, Innodisk, APRO Kingston	Simms International Plc	01622 852 848	www.simms.co.uk	N	1000+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	16%	50	1,500+	Y
Amphenol	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	25,600	N/A	0 €	53%	50	1,500+	Y
Anderson Power Products	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,900	N/A	0 €	82%	50	1,500+	Y
Delphi Connection Systems	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,300	N/A	0 €	67%	50	1,500+	Y
FCI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,300	N/A	0 €	94%	50	1,500+	Y
Glenair	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,900	N/A	0 €	76%	50	1,500+	Y
HARTING	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,700	N/A	0 €	31%	50	1,500+	Y
Harwin	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,200	N/A	0 €	79%	50	1,500+	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	0049 (0)89 520 462 110	www.mouser.com	Y	6,100	N/A	0 €	99%	50	1,500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100%	6	38	Y
JAE Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,200	N/A	0 €	32%	50	1,500+	Y
Kycon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	99%	50	1,500+	Y
LEMO	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,900	N/A	0 €	65%	50	1,500+	Y
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	16,900	N/A	0 €	75%	50	1,500+	Y
Neutrik	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	12,000	N/A	0 €	99%	50	1,500+	Y
Polanco	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
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,200	N/A	0 €	69%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	30,900	N/A	0 €	40%	50	1,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	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	Buffer Stock Facility
OBSOLESCENCE / HARD TO FIND											
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£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
	SeSemi Electronics LTD	01264 731009	www.sesemi.co.uk	Y	2800	N/A	£100	N/A	3	12	Y
OPTO ELECTRONICS											
Avago Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	8,200	N/A	0 €	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	22,500	N/A	0 €	74%	50	1,500+	Y
Dialight	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	9,800	N/A	0 €	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,800	N/A	0 €	99%	50	1,500+	Y
VCC	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,000	N/A	0 €	92%	50	1,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	99%	50	1,500+	Y
PASSIVES											
AVX	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	70,700	N/A	0 €	58%	50	1,500+	Y
Bourns	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	49,500	N/A	0 €	98%	50	1,500+	Y
Coilcraft	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	10,400	N/A	0 €	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	33,000	N/A	0 €	65%	50	1,500+	Y
EPCOS / TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	31,000	N/A	0 €	74%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	94%	50	1,500+	Y
Kemet	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	135,800	N/A	0 €	93%	50	1,500+	Y
KOA Speer	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	107,900	N/A	0 €	82%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,800	N/A	0 €	50%	50	1,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	67,300	N/A	0 €	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	21,600	N/A	0 €	47%	50	1,500+	Y
Ohmite	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	17,300	N/A	0 €	99%	50	1,500+	Y
Panasonic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	67,900	N/A	0 €	69%	50	1,500+	Y
Taiyo Yuden	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	6,400	N/A	0 €	82%	50	1,500+	Y
TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	25,300	N/A	0 €	85%	50	1,500+	Y
TT Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	32,800	N/A	0 €	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	13,900	N/A	0 €	99%	50	1,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	119,800	N/A	0 €	76%	50	1,500+	Y
Würth Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	63%	50	1,500+	Y
Yageo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	45,300	N/A	0 €	99%	50	1,500+	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	0049 (0)89 520 462 110	www.mouser.com	Y	1,400	N/A	0 €	94%	50	1,500+	Y
Cincon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,500	N/A	0 €	60%	50	1,500+	Y
Cosel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	11,800	N/A	0 €	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,900	N/A	0 €	100%	50	1,500+	Y
Mean Well	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	75%	50	1,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,200	N/A	0 €	93%	50	1,500+	Y
RECOM	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	23,300	N/A	0 €	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	98%	50	1,500+	Y
SL Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,100	N/A	0 €	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,600	N/A	0 €	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,400	N/A	0 €	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,300	N/A	0 €	70%	50	1,500+	Y
ams	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	78%	50	1,500+	Y
Bosch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	94%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	15,500	N/A	0 €	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	N/A	50	1,500+	Y
Omron	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,700	N/A	0 €	N/A	50	1,500+	Y

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	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	Buffer Stock Facility
Sensirion	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	N/A	50	1,500+	Y
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	70%	50	1,500+	Y
Apem	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,500	N/A	0 €	84%	50	1,500+	Y
Carling Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	87%	50	1,500+	Y
CHERRY	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	200	N/A	0 €	77%	50	1,500+	Y
E-Switch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	94%	50	1,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
Grayhill	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	84%	50	1,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	98%	50	1,500+	Y
NKK Switches	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	94%	50	1,500+	Y
Omron	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	68%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	98%	50	1,500+	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
THERMAL MANAGEMENT											
ADDA	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	59%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,200	N/A	0 €	99%	50	1,500+	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	0049 (0)89 520 462 110	www.mouser.com	Y	2,900	N/A	0 €		50	1,500+	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	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	86%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	93%	50	1,500+	Y
Digi International	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	200	N/A	0 €	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	99%	50	1,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	85%	50	1,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	36%	50	1,500+	Y

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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
AWS Electronics Group	01782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	430	11	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£10m	Essex/SE	100	7	AS9100 Rev D, ISO9001:2015, ISO 14001:2015, UL, CCC, IPC-610-G Class 3	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
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£11m	UK & Far East	72	3	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	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
DJ Assembly	01904 436 456	www.djassembly.com	£1.25m	North Yorkshire	15	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610-F class 3, ISO14001, ISO 13485, UL	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electricalimited.com	£1.75m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y
Electric Technicians Ltd	01202 897722	www.etuk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	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
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC-J-STD-001, IPC 7711/7721, BS EN 61340-5-1 (ESD)	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	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
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iiew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	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
Key-Tech Electronic Systems	01592 597711	www.key-tech.co.uk	£5m	Scotland	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711,	Y	Y	Y	N	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£15.9m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, 5C21	Y	Y	Y	Y	Y
Speedboard part of NOTE	01753 746700	www.speedboard.co.uk	£11.5m	UK/EU/China	1,050	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001:2008, IPC-A-610 Class 3/WHMA-620/ISO14001-2004/IPC-7711/7721	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
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, IPC-A610 Class 3	Y	Y	Y	Y	Y
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£100m	Havant, UK, USA, Mexico, China, Malaysia	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	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
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	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
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

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie. Board, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal 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	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	Y	Y	Y	Y
DK-Daleba Printed Circuits	01992 510000	www.dk-daleba.co.uk	B/M/R	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	4-30	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	Y	Y	Y	Y
GSPK Circuits Ltd	+44(0)1423 321100	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
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2015, IPC-A-610	SML	Y	4-30	Y	F/R	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2008, ISO 14001, EN9100:2009, UL, JOSCAR	SML	Y	4-44+	Y	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01889 583627	www.tatecircuits.com	B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	Y	Y	Y	Y



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