

ELECTRONICS

JANUARY – ANNUAL EDITION 2021

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## 2021, A YEAR OF SUPPLY CHAIN INNOVATION

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## On the cover – January — Annual Edition 2021

2021, a year of supply chain innovation

## Editor's Word



### 2021, a year of forced innovation

I suffer from an addiction to technical innovation. I was born to identify engineering problems and try to design solutions. The upside is that I love every minute, of every challenge. The downside is that any form of innovation can be exhausting, time consuming and expensive, plus there is no guarantee of success. It typically takes me 10 iterations to get close to a solution I'm happy with.

Thus, I understand exactly why some distributors shy away from supply chain innovation. They likely have a loyal customer base, established linecard and stock on the shelf. Why fix what isn't broken? Then along comes a global pandemic. Customers cancel orders, suppliers close factories and stock levels fall. Suddenly there is a problem to solve.

Supply chain shocks are typically localised, short duration and navigable. Likewise, systems and process quickly return to equilibrium after the disruption has been removed.

2021 feels different. The duration of this pandemic seems to have given companies long enough to learn how to conduct business differently. Every distributor I have spoken to thinks there will only be a partial return to what we used to call normal.

The big differences will be how device manufacturers, distributors and OEMs communicate at a personal level and share both technical and commercial data. There is also the question of who holds stock, how much and where?

To cope with this, supply chains need a heavy dose of innovation: like it or not. Many distributors are well down this road already. Don't get left behind.

*Jon Barrett*

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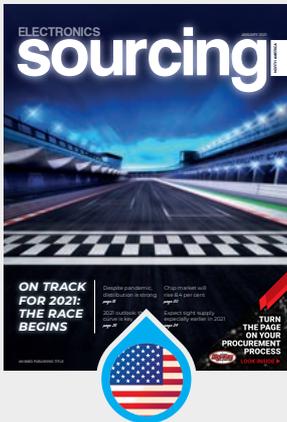
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## Connect to price, availability, ECCN and obsolescence information

CircuitByte has added DistiDirect support for Avnet's European companies in the latest release of its BOM Connector price calculation and purchasing tool.

CircuitByte's sales director, Kevin Decker-Weiss, said: "In addition to price and availability, the system will provide ECCN and obsolescence information and even a ROHS status. The fact that we were able to connect all the Avnet European companies at once represents a major increase in functionality for DistiDirect in our new 8.16 release and will be highly appreciated by our BOM Connector user base."

Avnet EMEA's vice president digital, Brian Wilken, added: "With CircuitByte and BOM Connector, we have entered a new phase of connecting to customers automatically through a proven platform. We are pleased that CircuitByte sees us as a real differentiator on information breadth and quality."

[www.avnet.eu](http://www.avnet.eu)



## Portfolio includes memory, microcontrollers and more

Rutronik is now the distributor for the entire product portfolio of the former Cypress Semiconductor Corporation. Infineon Technologies and Rutronik have expanded the existing franchise following the acquisition of Cypress by Infineon. The agreement covers the entire EMEA region.

Infineon Technologies' Mathias Roettjes said: "The expansion of the existing agreement is a logical and important part of our successful cooperation with Rutronik. It allows us to expand our sales network and at the same time offer our customers even better support in meeting their system requirements."

The added product portfolio includes memory, microcontrollers, sensor, Bluetooth and WiFi technologies. For Rutronik, the expansion of the franchise represents an optimal addition to its existing product range, especially for its presence in the automotive, industry, motor control and lighting market segments.

Rutronik's director product marketing semiconductors, Thomas Ulinski, said: "We can now offer our customers even more optimised 360-degree solutions that they need for their applications. The expansion of the portfolio also helps us consolidate our position as one of the leading distributors of active, passive, wireless and electromechanical components."

[www.rutronik.com](http://www.rutronik.com)



## Up and to the right

ECSN predicts the UK and Ireland electronic components market will be flat in the first half of 2021 in the range two to four per cent, with a mid-point decline of 0.5 per cent. In its provisional guidance for the second half of the year the association predicts that sales revenues will grow modestly to give an outcome for the full year in the range zero to 6.5 per cent, with a mid-point of 2.7 per cent growth on the previous year.

The association's chairman, Adam Fletcher, remains confident that the trajectory for the electronic components markets in the mid-term is up and to the right: "I predicted that any growth is likely to adopt a hockey-stick shaped curve towards the end of 2020 and into 2021 and in my opinion this curve has now simply shifted by a further 12 to 18-months, due primarily to Covid-19 but also to the uncertainty over Brexit and the US/China trade war, which is delaying the roll-out of 5G, but is also a reflection of a weakness across many market sectors, particularly civil aviation, which is likely to remain slow until 2023, and automotive, which is only just beginning to return to growth.

"On the plus side, the medical sector is experiencing strong growth along with the military/avionics and cloud computing/high performance computing sectors. The industrial sector is now also showing growth signs for 2021."

[www.ecsn-uk.org](http://www.ecsn-uk.org)

## More value-added services

Gresham Worldwide has added power electronics and display technology specialist, Relec Electronics, to its operations. The acquisition will bolster the Group's presence in the UK and Europe while augmenting its manufacturing base and specialist product lines.

Relec's managing director, Peter Lappin, said: "Joining forces will provide Relec with additional resources to offer more value-added services to our blue-chip customer base while increasing sales coverage and market reach for our innovative supply chain partners.

"Working with other Gresham Worldwide companies will also create opportunities for Relec to increase sales of its innovative power and display technology solutions into defence, marine, aerospace and telecommunications markets."

Gresham Power Electronics and Relec will continue operating in the UK as stand-alone businesses, with a joint management committee comprised of representatives from both operating subsidiaries and the Gresham Worldwide executive team. Peter Lappin will remain as managing director and the entire Relec management team has committed to remain with the company.

[www.relec.co.uk](http://www.relec.co.uk)

# tioga

25 years of manufacturing excellence



Derby based Tioga Limited, founded in 1996, has developed into one of the UK's leading Contract Electronic Manufacturers.

Offering a broad spectrum of electronic assembly, the heart of Tioga's manufacturing facility is based in Derby right in the centre of the UK in a beautiful listed railway building. The site has been custom converted and fully refurbished into a modern, extensive and sophisticated plant housing state of the art equipment.

Tioga's expansion continues with the addition of 12,000 sq ft manufacturing space...



Our core competencies far exceed just manufacturing; this encompasses design, engineering support, global procurement and supply chain, manufacturing, test, configuration, warehousing and distribution. In short, we are able to take on board the management of customers' products in their entirety.

Keep checking our website to view our new Corporate Video coming very soon.

[www.tioga.co.uk](http://www.tioga.co.uk)

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- Full Turn Key Solution / Boxbuild
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# Capacitors: a delicate balance of supply and demand

*Mouser Electronics' vice president of EMEA marketing, Graham Maggs, explains how authorised distribution smooths the waters of capacitor supply and demand*

For more than 20 years, the requirement for capacitors has been growing exponentially as the use of technology increases globally, especially considering MLCCs. The annual growth rate for MLCCs has been at least 10 per cent per year, with global annual shipments in the trillions: yes trillions. This gives an idea of the market's size and helps explain why this particular product area often experiences supply issues. When the market rises, it seems that MLCCs are always the first component that goes into short supply and, as a result, lead times extend.

So why does this continue to happen if we can already predict high demand?

There is an ever-increasing demand for MLCCs, especially in the automotive and telecommunications sectors: 5G infrastructure, smartphones, electric vehicles and autonomous driving are all highly dependent on MLCCs.

Reacting to continued demand, most capacitor manufacturers increased production capacities in 2019 by expanding their footprint and adding new equipment. However, demand was unexpectedly lower than predicted. As a result, they reduced their output and workforce size. The challenge

for them now is re-staffing their factories with people with the necessary skills, which is causing a lag in production uplift. This is of course without considering any of the effects from the ongoing global pandemic.

For capacitors, because they are used in such high volumes, it is a delicate balance of supply and demand. A small increase or reduction in demand in the capacitor world, could equate to millions of units. Considering the volume of units being discussed, making accurate predictions and manufacturing preparations becomes difficult. If we add in any additional socio-economic factors, such as a global pandemic for example, it is easy to see how the delicate balance can be disturbed.

Looking at this year in particular, many capacitor manufacturing facilities are having to implement staggered shift patterns to maintain social distancing. Production levels are also being affected when key staff members need to self-isolate. Staggered shifts and self-isolating are also affecting the rest of the supply chain, causing a global supply chain challenge, too.

What does this mean for 2021? This is where the importance of a distribution

partner is even more critical. Well-stocked distributors can help provide stability and reduce fluctuation. Mouser focuses on offering inventory that is available and ready to ship same day.

There's never been a more important time to buy from an authorized distributor. Purchasing professionals who need to source components like MLCCs will discover benefits including a strong inventory position, efficiencies, security and convenience.

[www.mouser.co.uk](http://www.mouser.co.uk)



Mouser Electronics' vice president of EMEA marketing, **Graham Maggs**



**A small increase or reduction in demand in the capacitor world, could equate to millions of units**

# Heavy investment in equipment and training

DVR explains how its desire to innovate to meet customers' expectations is driving constant investment in production systems and staff training

As a leading UK-based contract electronic manufacturer, DVR responds to customer demand with a proactive approach and investment in equipment and services. The company prides itself on its professional bespoke facility that it believes is its best-selling tool.

DVR invites customers to its Basildon-based facility not as a necessity but a demand. The company's commitment to its customers is so driven that it believes the facility must reflect the attitude of the workforce.

This is why DVR is heavily investing in new equipment and employee training. Over the last few years DVR has invested millions of pounds in new machines and equipment, including a new wave solder system, x-ray inspection, 3D AOI, selective soldering and now conformal coating.

It is important to grow and keep pace with modern manufacturing methods and technologies. As component technologies are constantly changing, then the technology required to manufacture, fit and inspect

devices becomes more critical and precise. DVR has never feared keeping pace with modern methods of electronic assembly. This is achieved with a proactive attitude and desire to innovate to meet customers' expectations.

[www.dvr-ltd.co.uk](http://www.dvr-ltd.co.uk)



*Is your electronic contract manufacturing partner meeting your expectations?*

*If the answer is no, what is missing in the relationship, quality, delivery, service or cost. These are some of the key components often missing when choosing the right electronic contract partner.*

**Look no further!**

*DVR Ltd is now established as one of the leading electronic manufacturing services in the UK.*

## **Some of the Services available at DVR.**

- In-house design for manufacture.
- 25K sq. ft. of manufacturing.
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- Soldering techniques that include wave and selective soldering.
- 3D AOI Inspection.
- X-Ray Inspection.
- Cabling, potting and conformal coating.
- Test and test set design.
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**DVR**  
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**IPC**



# Capacitors: popular and in demand

*Readers ask why capacitors are often the first component type to experience shortages when the market rises. We asked Anglia Components' CEO, Steve Rawlins, for clarification*

Your readers are absolutely right, capacitors, traditionally tantalum and in more recent years ceramic MLCCs, are almost always the first to be hit when there are shortages. Some of the reasons behind this can be specific to capacitor technology, but others relate to the market structure and long-term trends.

Tantalum and MLCC capacitors are widely used and extremely popular components. As markets rise, so does demand. High volume consumer electronics like games consoles, phones and tablets can contain thousands of MLCC chip capacitors. There are some potential alternatives to both MLCC and tantalum, especially low ESR polymer capacitors. However, these often require circuit redesign and are larger and/or more expensive on a like-for-like cost basis but can lower overall system cost in some instances.

The supply chain for tantalum has an added vulnerability because tantalum is mined in a limited number of locations which happen to be in some of the more unstable parts of the world.

When shortages arise, available supplies are inevitably routed to the largest volume customers.

This is the market we're in right now. High volume users in the automotive and consumer sectors are ramping up quickly. New consoles are coming up and demand for 5G is kicking in.

There are now only three or four large manufacturers of tantalum chips. While there are many more MLCC manufacturers the main global production volumes are controlled by the top five manufacturers. Given the miniscule margins on such devices, they need to manufacture billions to amortize their production costs and return a profit. Essentially, they service the industrial market when they can. It simply isn't economic to build sufficient capacity to support peaks, only to mothball it when demand drops.

To make matters worse, high volume users don't actually use the same devices as most industrial customers. This is true for capacitors, resistors and the like. To reduce their products' size and cost, mobile phone manufacturers are continually moving to smaller devices and are now set up to place 01005 (0.4 x 0.2 mm).

The sizes most of our customers ask for (0603 and 0402) are legacy products as far as many passive manufacturers are concerned.

They are sold at a premium and only produced when there is spare capacity. The larger sizes consume more raw materials and production anyway, creating an active disincentive for manufacturers to produce the larger sizes. It is no surprise that manufacturers are increasingly reluctant to commit scarce capacity to produce larger sizes given the relatively small demand that remains.

As manufacturers discontinue or reduce production of larger size chip passives, component users need to explore their options to ensure they aren't caught out by shortages and unworkable lead times. They should consider moving to smaller sizes such as 0402 and 0201 for current and new designs if they work within necessary voltage and value requirements.

[www.anglia.com](http://www.anglia.com)



Anglia Components' CEO, Steve Rawlins



**Tantalum and MLCC capacitors are widely used and extremely popular components**

INCAP

# INCAP

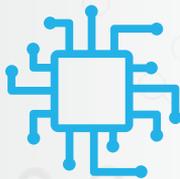
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# Long-term availability of GaN products

**Rochester Electronics** has established a long-term authorised source of supply for Ampleon's first generation GaN portfolio

**A**mpleon and Rochester Electronics have announced the expansion of their exclusive partnership to include a more diverse product portfolio. Rochester can now extend the supply of Ampleon's first generation GaN portfolio of high-performance RF transistors to customers worldwide.

Earlier this year, Ampleon transferred its VDMOS inventory and associated product wafers to Rochester. Since then the partnership has become stronger, now enriched by the transfer of Ampleon's first generation GaN discrete wideband amplifiers to Rochester. This transfer includes GaN inventory and die and the authorisation to distribute and license to manufacture.

Ampleon's VP global sales, Kees Schetters, said: "Following the success of our previous strategic transfer, we are delighted that Rochester succeeded in the tender process which enables us to transfer inventory and associated wafer for our first generation of RF high power GaN portfolio to them.

"It's clear that all of our customers are looking for long-term availability of these devices, and this seamless transition from Ampleon to Rochester makes it easy for them, to not only access the authorised stock, but they can also take advantage of

Rochester's on-going ability to build from wafer.

"We have been providing best-of-breed RF solutions and services along with Rochester's first-class infrastructure, industry knowledge and commitment. We are sure our customers will continue to receive the same standard of service as they have come to expect from Ampleon."

Rochester Electronics' director supplier development, Robert Maycroft, added: "This is a great opportunity to strengthen our on-going partnership with Ampleon. Not only do we share a common purpose, supporting customers with uninterrupted supply of top-class devices, we understand how important it is for them to know the products they are investing in are certified, guaranteed and 100 per cent authorised by the original manufacturer. This partnership will offer customers peace of mind whilst providing a continued source of the GaN product portfolio."

The first generation of Ampleon's RF high power GaN devices continue to provide solutions for radar, industrial, medical, and scientific industries. GaN technology is extremely rugged and provides a low thermal resistance making

them ideal for high-speed and high-power switching applications such as jammers, plasma generators, L-band radar systems, EMC testing, broadband general-purpose amplifiers, commercial wireless infrastructure and more.

Rochester Electronics and Ampleon have partnered to provide their customers an extensive portfolio of 100 per cent authorised, traceable, certified and guaranteed long-term support solutions since Ampleon was formed.

Rochester Electronics is the world's largest continuous source of semiconductors, 100 per cent authorised by over 70 semiconductor manufacturers. As an original manufacturer stocking distributor, Rochester provides an extensive range of end-of-life semiconductors and broad range of active semiconductors and, as a licensed semiconductor manufacturer, Rochester has the capability to manufacture over 70,000 device types.

Rochester offers a range of manufacturing services including design, wafer processing, assembly, test, reliability and IP archiving providing single solutions through to full turnkey manufacturing, enabling faster time-to-market.

[www.rocelec.com](http://www.rocelec.com)



Ampleon's GaN product family



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## WE KEEP THINGS MOVING.

As an authorised distributor, Rochester Electronics provides the world's most extensive range of end-of-life (EOL) and broadest range of active semiconductors to keep the medical, defense and infrastructure industries moving worldwide.



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# Purchasing tools at your fingertips

Mouser's VP of EMEA Customer Service, [Graham Munson](#), and VP Marketing EMEA, [Graham Maggs](#), offer readers a tour of the company's Customer Resource Centre

Mouser Electronics' new Customer Resource Centre is designed to help customers take advantage of the company's online purchasing services and tools through one centralised hub that contains everything necessary to optimise the purchasing process.

Customers simply click the name of the desired tool and then view or request what they need. From the Centre, customers can: access and learn how to view or track orders; request technical support and data sheets; or place orders via API or EDI through order automation. Mouser's order automation helps customers reduce their workload by providing enterprise resource planning (ERP) systems such as simple API integrations, PunchOut solutions and more sophisticated electronic data interchange (EDI) integrations.

Mouser's VP of EMEA Customer Service, Graham Munson, said: "Mouser continually assesses and improves the online resources that we offer to help buyers and engineers manage their product specifications and purchasing. We are very excited to make this new Customer Resource Centre available on our website for customers as we continue to make it our mission to

provide best-in-class service around the world."

Productivity tools including the Forte intelligent BoM tool which quickly validates part numbers, product availability and price, and recommends alternative products to reduce design and product lifecycle risks. The tool also provides a Risk Evaluator feature based on a unique relevancy engine that analyses partial part numbers and descriptions to suggest the best options for customers.



**Mouser continually assesses and improves the online resources that we offer to help buyers and engineers manage their product specifications and purchasing**

Another tool is the Price and Availability Assistant, which allows customers to easily check prices and availability on millions of semiconductors and electronic components. Using this tool, customers can drag-and-drop spreadsheet files or copy and paste order data (up to 200 part numbers) with up to three different quantities per part

number. For even easier online ordering, the Centre also provides a link to create a My Mouser account, which helps customers further save time by saving contact, payment, order and subscription information.

Mouser's VP Marketing EMEA, Graham Maggs, added: "With this centralised services hub, Mouser greatly improves and speeds navigation for our customers looking for resources to simplify their buying process, with the added bonus of alleviating much of the research involved on their part."

Maggs also hinted at the wealth of Conversion Calculators that can be found in the Technical Resource Centre, saying: "Every engineer will be glad to have something like this at their fingertips."

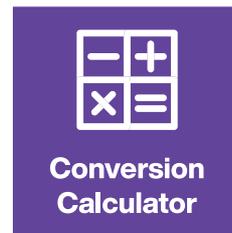
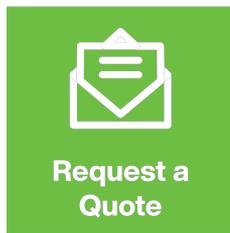
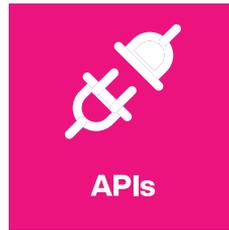
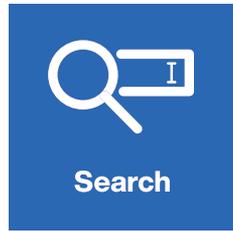
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Mouser's VP of EMEA Customer Service, [Graham Munson](#)



Mouser's VP Marketing EMEA, [Graham Maggs](#)



# Ordering made easy

Tools to search, check stock and purchase

---

[mouser.co.uk/servicesandtools](https://mouser.co.uk/servicesandtools)



# New Year: new fans and blowers

Against a backdrop of vaccine optimism, Micronel is starting 2021 by announcing new products designed to support customers' latest design and manufacturing projects

During 2021 Micronel will introduce several new product ranges starting with an extension and upgrade to its axial tube or duct fans. Compared to normal flat fans, Micronel's new D-Line Tube Fans provide much higher pressures, up to 940pa, while maintaining air flows up to 1,910lpm. They can easily force air through densely packed electronic systems, labyrinths, and along tubes in pressure and suction applications.

The fans feature a high-speed brushless motor designed to provide longer life and higher efficiency. An integrated BLDC driver offers plug and

run ease of use. Available in a range of voltages and modular sizes from 24 to 80mm diameter, the fans suit applications from portable battery products to industrial cooling and ventilation environments. The motors rotate up to 19,500rpm and can be controlled with dedicated set speed signal voltage or PWM. A tachometer output option provides speed and operation feedback. Options and accessories include flange mountings, guards, filters and customisation.

Micronel specialises in high performance blowers and fans designed to

meet special performance characteristics in industries including medical, electronics cooling, personal protection, packaging, gas analysis, laboratory, transportation, process control and more.

The company offers a choice of standard ultra-slim

fans, axial fans and high-performance high-pressure radial blowers from UK stock, while also providing technical design support for modified products and client specific designs.

[www.micronel.co.uk](http://www.micronel.co.uk)



MICRONEL MINIATURE FANS AND BLOWERS

## POWERING AIR TO FIGHT COVID-19



Micronel high pressure medical blowers and turbine products are being deployed in a variety of critical COVID-19 related medical and scientific equipment requiring precise air movement of some kind in the fight against the virus. Applications such as Breathing therapy, Ventilators, Respirators, Personal Protection, ICU Hospital beds, Air Purification, Disinfection, Air sampling, Laboratory, Diagnostic and Test.

### D481P

Versatile and cost effective, high power, in-line fan!



### U51DL

Super compact, powerful blower with medical quality!



### U65HN

Top range: Highest speed, most dynamic behaviour!



### U85MX

Most powerful blower, where highest pressures are needed!



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### RJ45 mounting modules feature secure ground

Stewart Connector has released a DIN rail RJ45 mounting module, commonly used in industrial networking applications.

The module is designed for easy tool-less mounting and RJ45 jack installation. They include removable side covers, RJ45 dust cover, window label and installation instructions. The removable side covers allow installation of multiple modules in a single row. They also include a ground spring to ensure a secure ground connection to the DIN rail when using RJ45 shielded keystone jacks.

Designed for industry-standard 35mm width DIN rails, the modules accept shielded and unshielded keystone RJ45 jacks with a maximum width of 17mm. They are compatible with Bel's Cat5E, Cat6 and Cat6A keystone jacks.

[www.belfuse.com](http://www.belfuse.com)

What's new



49 years in PCB industry

# GLOBAL PCB SUPPLIER

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## Distributor and Supplier Focus

# Dream it, build it



RDS offers a range of displays and embedded computer solutions and also brings customers' ideas to reality. The company designs, prototypes, tests and manufactures everything in house and to the highest standards. If buyers need a part, screen, board or cable

RDS understands, and can help. RDS is ISO 13485 qualified to design and manufacture complete systems. If customers have an idea, project or just need a solution, RDS is ready to help.

[www.review-displays.co.uk](http://www.review-displays.co.uk)

## Talk to us we will have a solution!

RDS brings together technical expertise in displays, embedded systems and IoT platforms to produce custom products for a host of applications. We can build complete systems from design through to manufacture including all certifications on time and on budget.

*Our production is ISO13485 approved so if you need extra capacity building medical sub assemblies we can help*

Innovative design and manufacture of IoT platforms and devices.



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### Hybrid capacitors resist vibration

Kemet has launched three hybrid aluminium polymer capacitor series: A780, PHA225, and PHH225. These AEC-Q200 qualified capacitors are designed

to offer a combination of highly conductive polymer technology and liquid electrolytic material in a hybrid design, resulting in outstanding electrical performance for automotive and industrial applications.

This launch aligns with the growing vehicle electrification product market, driven in part by a rising need for 48V architecture in mild hybrid electric vehicles (MHEV).

One of the benefits of A780 series capacitors is withstanding heavy vibrations (up to 30g), meeting the design requirements for automotive powertrain and industrial applications, including engine control units, DC/DC converters, 48V inverters for MHEV, switched-mode power supply and computer voltage regulator modules.

The PHA225 and PHH225 with an axial and radial crown design offer the same combination of highly conductive polymer and liquid electrolytic material as the A780 series. These capacitors can withstand temperatures up to 140°C.

[www.kemet.com](http://www.kemet.com)



### Supply suits additive manufacturing applications

TDK has announced the addition of a 48V, 83.3A 4kW output power supply to TDK-Lambda's TPS series. The supply operates from an industrial three-phase input. It can automatically run from 400, 440 or 480Vac nominal delta or WYE inputs, without wiring changes or the need for large, costly step-down transformers. This industrial grade power supply is ideal for applications including test and measurement, semiconductor fabrication, additive manufacturing, printers, laser cutting and RF power amplifiers.

Standard features include: output voltage and current programming; AC fail; DC good and dropped phase warning signals; configurable remote on/off, 12V 0.3A standby voltage and a PMBus interface.

Excluding the output busbars, the unit measures 107 by 84.4 by 335mm, suiting 2U racking systems. It weighs 4kg and offers a typical efficiency of 92 per cent. It can start up at -40°C, operate at full load in ambient temperatures of -10 to 50°C, and deliver 55 per cent load at 70°C.

[www.emea.lambda.tdk.com](http://www.emea.lambda.tdk.com)

## Distributor and Supplier Focus

# Cables and connectors for when it matters

From 48-hour delivery for off-the-shelf parts, to designing application specific custom connectors, PEI-Genesis is trusted by customers operating in harsh environments

As a leading global provider of engineered connector and cable solutions for harsh environments, PEI-Genesis supplies customers in aviation, energy, military, industrial, rail and medical.

Sometimes there are no second chances. Whether it's a battle tank crossing tough terrain, medical ventilator keeping someone alive or a passenger aircraft flying

over the Atlantic, cable and connector reliability is critical in harsh environments.

PEI-Genesis parts are export compliant, meeting AS9100D and ISO 9001:2015 quality standards; and RoHS, REACH and Conflict Mineral environmental standards. The company is also pushing industry to do more.

If a buyer needs an off-the-

shelf connector, PEI-Genesis has 116,746,010 parts in stock on a 48-hour lead time and no minimum order quantity, thanks to the company's highly automated process.

If the part required is bespoke, customers can partner with PEI to design a custom connector to meet an application's needs.

[www.peigenesis.co.uk/ESEU](http://www.peigenesis.co.uk/ESEU)



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# Electronics in a circular economy

Retronix explains how its component recovery service is offering benefits from tackling e-waste to recovering high value components in aerospace applications

**E**-waste is now the fastest-growing waste stream in the world. For example, 1.46 billion smartphones were sold in 2017; comprising approximately \$110 component value per phone in retail; leading to raw material recycling equalling approximately \$11.5B in cost savings. Current forecasts indicate there will be approximately \$62.5 billion in e-waste annually.

During these unprecedented times, with many companies in uncharted waters and significant pressure on supply chains, achieving maximum efficiency and value at each stage of the manufacturing process is an important goal. One question is what happens to high value devices on scrap, damaged or obsolete boards?

Everyday millions of dollars of brand new and high value components are scrapped by manufacturers because they are attached to faulty/obsolete PCBs. If these components could be safely removed, companies would save money in recovered scrap, provide much needed 'allocated' components and reduce the amount and cost of landfill. It would also seriously damage the counterfeit industry, by reducing its raw material supply.

Retronix' circular vision for electronics offers an answer. At the manufacturing stage: re-integrate high value components from fallout back into the supply chain. For life extension: re-condition, re-fresh, test and verify components for aftermarket

care and future sourcing. Regarding end-of-life and re-sourcing: recover from scrap, prepare for re-use, test, validate and verify for integration in refurbishment and manufacturing stages.

In one case study, a space sector company had boards valued over €65,000 each. While testing these boards a fault was discovered. Since the boards were designed for a space application, they all had to be scrapped. A new revision of the board was manufactured to ensure the fault was cleared.

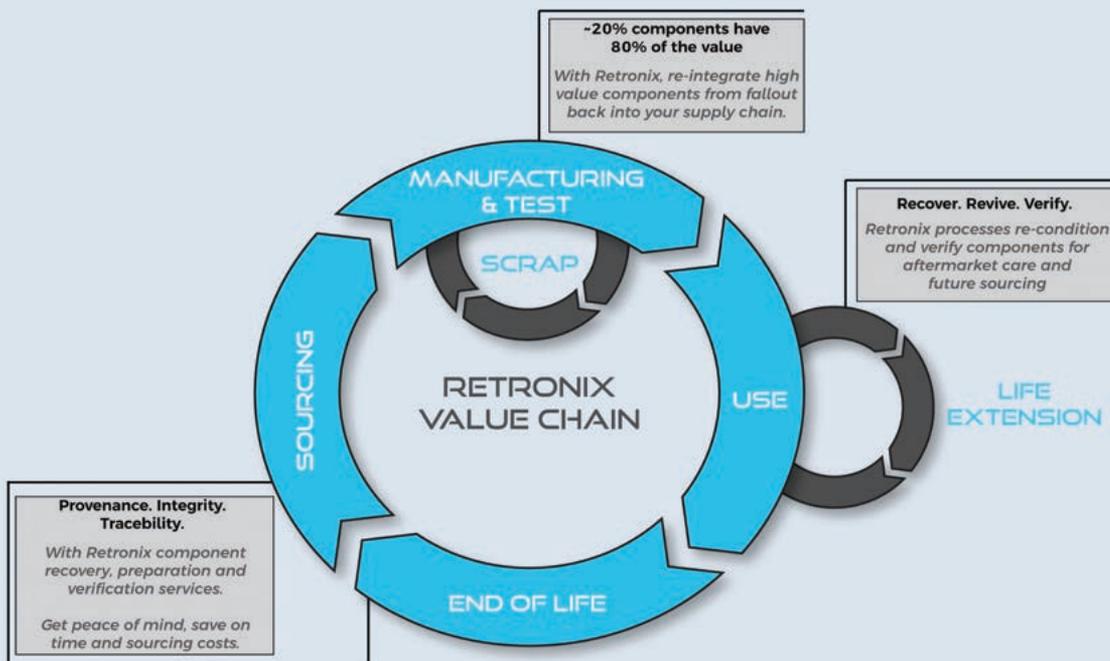
The problem was all these faulty boards housed a new, perfectly functional, unused Xilinx Kintex part worth over €43,000 each: all about to be scrapped just because they were on a faulty PCB.

Retronix used its precise and safe component recovery service to recover the high value part from the faulty boards. There was no room for error because of the component's overall value and critical application.

Retronix successfully recovered, laser re-balled, tested (electrically and mechanically), vacuum packed, sealed and shipped the parts to the customer.

[www.retronix.com](http://www.retronix.com)

## CIRCULAR VISION FOR ELECTRONICS



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- 1.B) TIN WHISKER MITIGATION
- 1.C) GOLD EMBRITTLEMENT SOLUTIONS

### 2) LASER REBALLING

- 2.A) APPLICATION SPECIFIC BALLING

### 3) IC TESTS

- 3.A) VISUAL INSPECTION
- 3.B) XRF TEST
- 3.C) 3D XRAY INSPECTION
- 3.D) SOLDERABILITY TEST
- 3.E) ELECTRICAL TESTING
- 3.F) KEY FUNCTIONAL TESTING
- 3.G) FLASH MEMORY TEST
- 3.H) DECAPSULATION
- 3.I) HEATED SOLVENT TEST
- 3.J) IONIC TESTING

### 4) UPSCALING

### 5) OBSOLESCENCE SOLUTIONS

- 5.A) SAFE COMPONENT RECOVERY
- 5.B) CIRCULAR ECONOMY SOLUTIONS

### 6) PCB SERVICES

- 6.A) PCB REWORK
- 6.B) PCB REPAIR

### 7) IC REWORK

- 7.A) SPECIALISED REWORK

### 8) PCB MODELLING

.....AND MORE.

# Looking forward to a better 2021

Anglia's CEO, [Steve Rawlins](#), sees 2021 as a strong year with growth driven by a variety of UK sectors including medical, healthcare, access controls and smart buildings

As we start 2021 the electronic component market is experiencing a recovery. There remain issues, including exiting the EU. Many customers have expressed concern about customs checks, duties and additional freight costs. Anglia has continued to invest in inventory throughout 2020, we hold all our inventory in the UK and maintain a very high level in proportion to the size of our business. This puts us in the best possible position to buffer UK customers against any short-term disruption.

We've also made in-plant stores an economic and practical option for many more customers with Anglia 80/20. Once implemented customers just scan out stock and pay as they use it, we handle the replenishment automatically at no additional cost with no up-front capital commitment, giving them a buffer in their warehouse.

The crucial thing is to look to the future. Anglia has continued to invest since the start of the first lockdown and some of these enhancements will be industry firsts. Expect news on these investments soon. We have also developed new lines to offer customers a comprehensive solution and stay abreast of new technologies and markets as they become mainstream.

Anglia has always been a relationship business. The lockdown opened new ways of maintaining those relationships such as meetings via Teams or other platforms. Face-face meetings will return in time but I

expect to continue using online platforms in parallel. Using these tools, our technical support and customer relationship development has continued strongly during the lockdown.

While high inventory levels help us support customers as lead-times lengthen, we are only as good as the



information we're given. We encourage customers to create a well-balanced forecast of their likely demand in 2021 and place orders against it certainly for Q1 to ensure that supply meets anticipated demand. By working closely together we can set up a sustainable, balanced level of inventory and hold it at a short, overland journey, eliminating the higher risks and costs of airfreight.

What to expect in 2021? Lead times are lengthening, the market is firming up, semiconductor fabs are filling and forecasters are predicting 11 per cent growth or more. This may sound surprising but the reasons aren't hard to see. Automotive electronics is now at about 90 per cent of pre-lockdown levels, 5G is ramping up and medical/healthcare related markets are still growing strongly. New gaming consoles are also soaking up manufacturing capacity and inventory.

In the UK, we can point to specific growth sectors. Medical, healthcare, access controls, smart buildings, social infrastructure and areas contributing to public safety and well-being are growing strongly. Covid has accelerated acceptance of new technologies by up to ten years. Projects are being dusted down and implemented.

We expect 2021 to be strong. Close relationships, transparency and thinking to the future will be key to mutual success. Those who invest and keep their nerve will bounce back quickly.

[www.anglia.com](http://www.anglia.com)



Anglia's CEO, Steve Rawlins

“““  
The crucial thing is to look to the future. Anglia has continued to invest since the start of the first lockdown and some of these enhancements will be industry firsts

## Efficient, thin and bright

Review Display Systems has launched a new low power 1.4in AMOLED display, designed to offer high brightness and contrast, deep blacks, great viewing angles, and a built-in touch screen.

The display supports 16.7 million colours at 320 by 360 and uses minimal power, ideal for long battery life in portable devices. The panel supports an SPI interface and comes with a hard coating polariser for durability. The AMOLED panel has an organic plastic layer of about 100 to 500nm: 200 times thinner than a human hair. The panel offers an integrated In-Cell touch,

meaning additional touch layers are not required, keeping the panel super thin. This thinner profile results in a light, flexible panel which is tough and long-lasting.

AMOLED technology is designed to offer super high contrast ratios with beautiful, true black and vibrant colours meaning any images are brighter and more vivid than existing IPS and TN panels. Response time and refresh times are faster, resulting in more fluid moving images.

[www.review-displays.co.uk](http://www.review-displays.co.uk)



## Neural networks for driver-assistance

Imagination Technologies has announced its IMG Series4 next-generation neural network accelerator for advanced driver-assistance systems (ADAS) and autonomous driving. Featuring a new multi-core architecture, Series4 delivers 600 tera operations per second (TOPS) and beyond, offering low bandwidth and exceptionally low latency for large neural network workloads.

Imagination Technologies' senior director artificial intelligence, Andrew Grant, said: "We believe the Series4 NNA to be the industry-standard platform for the development of advanced driver assistance and self-driving cars. Innovators are already tackling the task of creating the silicon that will support the next generation of ADAS features and autonomous vehicles. Any company or R&D team looking to be a serious player in automotive needs to be integrating this technology into their platforms now."

Imagination's low-power NNA architecture is designed to run full network inferencing while meeting functional safety requirements. It executes multiple operations in a single pass to maximise performance per watt and deliver its industry-leading energy efficiency.

[www.imaginationtech.com](http://www.imaginationtech.com)



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# Investing in UK manufacturing capabilities

FermionX responded to the pandemic by ploughing investment into its people, equipment and processes to support its customers and UK manufacturing



For 30-years, FermionX has offered local, secure, end-to-end integrated electronic manufacturing services on the UK's south coast. Services range from PCB assembly and sub-assemblies to fully integrated box-build, test and shipping fulfilment.

FermionX believes it is much more than a CEM and is proud to be playing their part in:

- **Getting live music back into mainstream**
- **Ensuring delivery of safe food products through food pathogen testing and temperature controls**
- **Developing testing kits to help combat the pandemic**
- **Protecting those working in the oil and gas industry in dangerous and volatile environments.**

The company is positioned in the small to medium volume space, providing electronic manufacturing solutions to customers that have a high mix and low to medium volume of electronic assemblies. Extensive PCB assembly capabilities support basic to the most complex designs, across a range of industries including automotive, medical, laboratory, aviation and oil and gas.

FermionX' team has an average of 10-years' experience and over the years has developed stringent process controls. The company consistently achieves the highest manufacturing standards and is renowned for PCB assembly regularly achieving over 99 per cent placement accuracy.

The company's Worthing, West Sussex facility features three Yamaha surface mount lines, enabling

prototype production through to volume manufacture. Committing to uniform surface mount technology equipment provides efficiencies in programming and flexible manufacturing as PCB assemblies can be optimised to available lines rather than specific machines.

Strategic and operational planning was impacted by the pandemic and more flexibility and enhanced automation was required to support partners with a broad range of electronic manufacturing requirements.

FermionX has invested in a new selective soldering system and vapour phase reflow oven. Investment in this technology reduces development and manufacturing time and ensures the route to market is smoother and quicker. Plus, further automation and process accuracy supports new business opportunities

the company has not been able to cater to before.

As a business, FermionX remains fully committed to keeping the UK electronics manufacturing industry moving; helping to recover lost ground and pick itself back up again after the challenges faced in 2020. The company is offering socially-distanced site visits, virtual tours and remote quality control audits to give partners peace of mind during times of uncertainty.

*To discuss your requirements, speak to their expert team today on 01903 524600 or email us at [sales@fermionx.com](mailto:sales@fermionx.com)*

*Or head over to the website to find out more about what we can offer you [www.fermionx.com/ecs](http://www.fermionx.com/ecs)*





We are proud to play our part in keeping the UK electronics manufacturing industry moving



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## Electronic Manufacturing Services

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**PCB ASSEMBLIES**  
**BOX BUILDS**  
**DESIGN**



# Investing in European connector distribution

Powell Electronics is investing in its European capabilities to support the interconnect needs of customers ranging from defence and medical, to transportation and agriculture

**F**or over 70-years, Powell Electronics has supplied electromechanical components for harsh environment applications such as defence, medical, energy, transportation and agriculture.

In addition to distribution, Powell also builds over two million connectors a year at its facilities. Trusted to build these parts by global leaders such as Glenair, Amphenol, TE, Conesys and others, Powell is also trusted by its global customer base to support their needs and evolve as those needs change.

The company aims to build to customers' needs and have a broad stock holding of finished parts. Powell's staff offer a broad knowledge and know the vendors well as many of them come from the manufacturers they serve. Powell supports customers' projects and many parts are built to specifications devised with the customers.

In Europe Powell has been linked for over a decade with global leaders in the agriculture market based in Netherlands. The company's next growth phase is happening with a new facility in Ireland: a stocking location addressing the EME market.

The company's investment is enhancing its partnerships with Glenair, Conesys and others, while allowing it to work closely with other partners such as Harwin and expand the Positronic relationship.

From relays, micro D, 38999, PCB connectors, cable, cable accessories and more, Powell looks forward to serving the European market for decades to come from its Ireland location chosen as it embodies the same ambition as Powell to be a dynamic business leader.

[www.powell.com](http://www.powell.com)

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**Drives for space constrained applications**

Smart Modular Technologies has introduced a new line of PCIe NVMe solid state drive Flash products designed for industrial embedded

applications. The BGAP520 family in M.2 1620 BGA package and small form-factor M.2 2230 single-sided module suits embedded systems with space constraints.

Smart Modular's director of Flash products, Victor Tsai, said: "At Smart we've developed state-of-the-art solutions for businesses that embed memory and storage into their technology. With these new products, designers can count on robust and ruggedized Flash memory solutions with unrivalled performance."

Specifications include: PCIe Gen3 x 4 support; NVMe v1.3 specification; M.2 Type 1620 BGA package standard; M.2 2230 module conforms to M.2 2230 S2-M module standard; TLC version available in commercial temperature from 30GB to 240GB; and pSLC version available in industrial temperature from 20GB to 80GB.

[www.smartm.com](http://www.smartm.com)



**Compact 500VDC relay suits charging circuits**

Omron Electronic Components Europe has announced a compact 500VDC power relay aimed at the pre-charge circuits in electric vehicle chargers, battery back-up systems for solar panels and other high current DC applications.

With a high switching capacity and high isolation, the G2RG-X suits inrush current control, for example to protect the peripheral circuits when storage battery charging is initiated, as well as in energy storage systems, inverters, servos, power supplies and UPS.

The 500VDC, 10A switching capacity is housed in a body measuring 13.5 by 29.0 by 26.5mm. The company states the performance is the result of its arc control structure and a 3.0mm contact gap. Further features include a high level of isolation, with an insulation distance of over 8mm and an impulse withstand voltage of 10kV between coil and contacts.

[components.omron.eu](http://components.omron.eu)

**How do you solve obsolescence issues and locate hard to find parts?**

The International Institute of Obsolescence Management (IIOM) has been helping companies to address the problem of obsolescence in long-life cycle industries since 1997, chapters are now operating in Germany, India, UK and USA. Its corporate members include asset owners & operators, manufacturers and obsolescence solution providers.

The short life-cycle of electronic components, driven by consumer markets, makes sustaining of long life-cycle systems increasingly difficult, but it is not just about electronic components – globalisation and consolidation of the supply chain, supplier bankruptcy, and new regulations such as REACH affect electrical and mechanical components and equipment as well.

By joining IIOM, you will be able to talk to experts from the electronics industry about how to implement obsolescence management best practice, to find obsolescence solution providers, and to recognise and develop the competence of your obsolescence experts.



**International Institute of Obsolescence Management**



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# Looking to the Future

Contract electronic manufacturer, **Nemco**, continues to invest in its people and technologies to support a customer base which reaches from aerospace to instrumentation

**D**uring the Covid crisis, UK-based contract electronic manufacturer, Nemco, remained fully operational and played a key role in the UK Ventilator Challenge, designing test equipment and manufacturing over 24,000 PCBAs within tight timescales. This was only possible through the hard work, dedication and cohesiveness of the Nemco team which quickly adapted to new working practices including split shifts, use of PPE and learning to adhere to social distancing guidelines.

Looking to the future, Nemco continues to strengthen its offering to existing and new customers. Built around

its core offering of PCB population, added value services such as e-mech assembly, GA assembly and full product build continue to see investment in both people and equipment.

From concept, through design, prototype, NPI and to volume production, Nemco supports customers operating in demanding markets including defence, aerospace, medical, laboratory equipment, scientific equipment, instrumentation and transport.

Accreditations include EN 9100:2018 (AS9100) Rev D Accreditation, ISO9001:2015, ISO14001, Cyber Essentials Plus, SC21 (Supply Chain

for the 21st Century) Silver Award and the company is also a member of the ADS group.

All services are located at Nemco's 60,000ft<sup>2</sup> manufacturing plant in Stevenage and customers can take advantage of any mix of services on offer. PCB population comprises six lines, both SMT and conventional. These are supported by test and inspection facilities including functional, ATE, flying probe, x-ray and automated optical. Automated conformal/silicone, acrylic and Certonal coating is also available.

E-mech and box build assembly is complemented

by wiring looms/harness production and full turnkey product build.

Design resources include electronic, PCB layout, mechanical and product. Other services include: materials and supply chain management; project management and NPI; prototype and pre-production support; Kanban and ship-to-line; and DFM, DFT and DFP

The company's cleanroom is ISO7. Regarding ATEX, QMS meets the requirements of ISO/IEC 80079-34:2011 and the ATEX Directive 94/9/EC.

[www.nemco.co.uk](http://www.nemco.co.uk)



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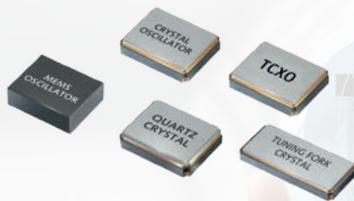
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# Bringing IoT products to life

Looking for support designing and manufacturing electronic products with wireless connectivity? Tap into [Corintech's](#) experience

With over forty years' electronics design and manufacturing experience, Corintech can support product developments from initial concept to final production. The company has seen a rapid increase in business for the design and manufacture of electronic products requiring internet connectivity. With analysts predicting a 20 per cent year-on-year increase in IoT endpoints, this business shows no signs of slowing down.

Each customer begins its Corintech journey with the customer support team, working to gain a comprehensive understanding of their unique requirements and how to best meet them.

Corintech's engineers then work with the customer throughout the design process, using their experience to add value at each stage of a project. This involves regular contact to ensure the product meets its specification.

The company's engineering team boasts specific experience in a range of wireless technologies including Wi-Fi, cellular, Bluetooth, NFC and sub-1GHz. Different wireless technologies offer various benefits and considerations for a design, including power consumption, range, speed of data transfer, coverage, costs and more.

Once a design is complete, Corintech can move it to

production with a range of flexible supply options. The company's global manufacturing facilities enable fast-turnaround UK production, plus cost savings via carefully controlled offshore assembly.

All operations adhere to AS9100 and ISO9001 and

each manufacturing stage is inspected by trained staff and automated inspection technology.

Corintech is proud to supply world-beating wireless and IoT products to customers in a wide range of industries.

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**ELECTRONICS**



# Supporting legacy applications

Force Technologies' managing director, Karen Salmon, explains how the company's independently audited processes underpin its EOL support services

Force Technologies is a solution house for end-of-life and hard to find semiconductor ICs. For over 30-years the company has been supporting legacy applications worldwide with a range of design, manufacturing and test services across all sectors and reliability levels.

Whether a customer is looking for a sustainably manufactured, tested or re-engineered solution, or simply looking to have a questionable product verified to AS6081 by an experienced team of engineers, Force is on hand to help.

The company prides itself on providing solutions to the highest quality standards. It is policy to meet customers' requirements and enhance their satisfaction with products and overall service by operating all processes under controlled conditions. Force is AS9100 Rev D accredited.

Based in Wiltshire, UK, Force works with a worldwide network of contracted strategic partners and independent representatives experienced in the support of commercial, industrial, military and aerospace markets spanning all IC semiconductor product

ranges including memory, microprocessors, FPGAs, linear, logic, analog, opto and discrete devices.

Force's in-depth knowledge of semiconductor devices and industry experience means the company can deliver cost efficient, sustainable and long-lasting solutions to maintain legacy applications. It also offers an independently audited commitment to excellence and customer satisfaction.

[www.forcetechnologies.co.uk](http://www.forcetechnologies.co.uk)



Force Technologies' managing director, Karen Salmon



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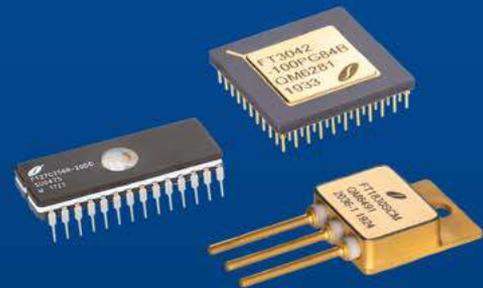


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# Off-the-shelf enclosures: redefining the rules



Hex-Box IoT Enclosure in an office environment

While 2020 had its challenges, **CamdenBoss** pushed ahead to strengthen its position regarding its people and products

**C**amdenBoss has appointed Mark Russell as technical director. He brings 30-years' experience in high tech industries and medical device manufacture. Likewise, the company has appointed Nick Branston as head of product development and Danny Pearson as head of manufacturing, showcasing their commitment to product development and world class manufacturing.

2020 saw further efforts to re-shore manufacturing,

alongside a strong line up of new products that set the standard for CamdenBoss and its off-the-shelf engineered solution enclosures.

UK manufacturing helps improve lead times, provides greater quality control and refines the supply chain when delivering important parts.

CamdenBoss used its 50-years' experience and UK engineering team to release market-leading engineered solutions, designed to tackle everyday issues

that product designers and installers face.

The Hex-Box IoT enclosure, released in November, redefines the rules of efficiency in PCB manufacture. Its hexagonal shape allows for an array of connections and air flow. When paired with the unique Circular Wall Mount Bracket, it provides an easy install with an inventive twist release mechanism.

The Easy Assembly Electronics Enclosure, also released in

November, has had record interest. The innovation of a low-cost box offering fast assembly and modern aesthetics, whilst being made in the UK, has been a huge success.

2021 is set to be a big year for CamdenBoss as it prepares for a monumental change in its history and manufacturing capabilities. Keep an eye on news outlets and social media for the big reveal.

[www.camdenboss.com](http://www.camdenboss.com)



## Complex applications require forward thinking designs

The latest UK manufactured, IoT ready enclosure solutions from CamdenBoss provide the tools for tomorrow's technology.

The Hex-Box IoT Enclosures, Easy Assembly Electronics Enclosures, 1500 Series Universal Smart Enclosures and Room Sensor Enclosures...

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Find out more at [www.camdenboss.com](http://www.camdenboss.com)

NEW

# Flexible partnerships

Andy Thwaites explores how the pandemic has emphasised the need for flexible manufacturing, making it critical for OEMs to engage with the right production partner

Covid-19 has turned world markets upside down and it is now more critical than ever that organisations engage with the right partner today and for the future. With demand often difficult to predict, combined with a volatile component market, achieving a reliable supply of products can be challenging to maintain and requires significant internal resource.

When we think of flexibility we often concentrate on flexibility of production and finished goods. However, other areas where the right partner can offer flexibility include engineering, supply chain, production and logistics.

With the right engineering support function in place, all aspects will be considered including component viability and longevity. At the NPI stage it is critical to assess

availability, lead-time and the often-ignored lifecycle of components selected for a design.

Setting up the right product fulfilment model at the outset is key stake in the ground to achieving the right supply. Collaboration on inbound logistics, through to the buffering of component stocks with your partner or supplier through a negotiated agreement, can be put in place. Optimised scheduling of your supply chain will often dictate how flexible you can be with your customers, so getting it right is paramount.

A good manufacturing partner will work with you on the supply chain to minimise the impact on your ability to ship products. However, a great partner will go above and beyond this offering multiple

fulfilment options, tailoring a service model to meet your unique business needs.

The long-term partnerships with customers we build at NOTE, understanding of projects and priorities, take into account every element of technical and commercial needs. A major part to achieving this is our customer-focused approach and close collaboration. Taking a holistic view of the business and market enables us to ensure our customers' inventory and lead-times are kept to an optimal minimum.

Key to this is our flexibility and responsiveness. With demand often difficult to predict, it is easy to get into the 'just in case' mentality where you order parts and manufacture too many goods just to make sure you cover your customer demand. With our Kanban system,

the just in case mentality is eliminated, and products are manufactured when required using a pull, not push model. Our well-engineered Kanban system self regulates by pulling lower-level build when demand dictates and conversely slows up when demand falls. This means we never waste your valuable resources.

This can be combined with build to order (BTO) and configure to order (CTO) services, where we Kanban at sub-assembly level and then manufacture finished product to order. This reduces lead times from months to weeks and reduces your inventory costs in finished goods.

So, the question is, do you have the flexibility your business needs?

[www.note-uk.co.uk](http://www.note-uk.co.uk)





# Moving industry forward with standardisation

ART explains how manufacturers can be confident of using the best and latest documents and standards to meet their process and quality requirements

Standardisation is a dynamic function of the electronics industry and is constantly evolving. Advanced Rework Technology works with IPC to continually move forward with improvements and best practices to support manufacturing. ART is proud to announce the release of many standards during 2020, with team members working as active IPC committee chairs and/or committee members.

IPC-A-610H, *Acceptability of Electronic Assemblies*, is the most widely used electronics assembly acceptance standard and designed as a post-assembly acceptance standard used to ensure electronic assemblies meet acceptance requirements. It was released September 2020.

Revision H for 610 features significant changes including: general update throughout the standard; removal of the target conditions following the steps in IPC/WHMA-A-620D; new criteria on wrapped terminals; ESD requirements and information moved to a separate appendix; and jumper wire criteria move from previous sections, into their own chapter.

IPC-A-610 is a must for inspectors, operators and those with an interest in acceptance criteria for electronic assemblies. As IPC-A-610 is developed in synergy with J-STD-001 and IPC/WHMA-A-620 users will see these documents updated and released in quick succession to each other.

J-STD-001, *Requirements for Soldered Electrical and Electronic Assemblies* is recognised globally for the criteria of soldering processes and materials. The new revision H has been updated to include the latest industry criteria with the introduction of guidance on the use of x-ray for through-hole solder connections. Released September 2020.

Revision H for the J-STD-001 includes significant changes including: introduction of appendix D-Using x-ray for Acceptance of soldered connection; new criteria for wrapped terminals; new section 8 Cleaning and Residue Requirements (IPC-WP-019B provides explanation and rationale for this new section); and removal of reference to the International Space Station. J-STD-001HS, *Space and Military Applications Electronic Hardware*

Addendum to J-STD-001H soon to be released.

In addition to the above standards, ART has worked with and supported the committees to release the following standards during 2020.

IPC J-STD-001GA/IPC-A-610GA, *Automotive Addendum to J-STD-001 and IPC-A-610*. Released February 2020. This addendum provides criteria to ensure the reliability of critical soldered automotive assemblies.

IPC-WHMA-A-620, *Requirements and Acceptance for Cable and Wire Harness Acceptance*. This standard describes materials, methods, tests and acceptance for producing crimped, mechanically secured and soldered connections and related activities relating to cable and wire harness assemblies. Released January 2020.

IPC/WHMA-A-620DS, *Space and Military Applications Electronic Hardware Addendum to IPC/WHMA-A-620D*. Released September 2020. This addendum provides additional criteria to IPC/WHMA-A-620D to ensure the reliability of assemblies that must

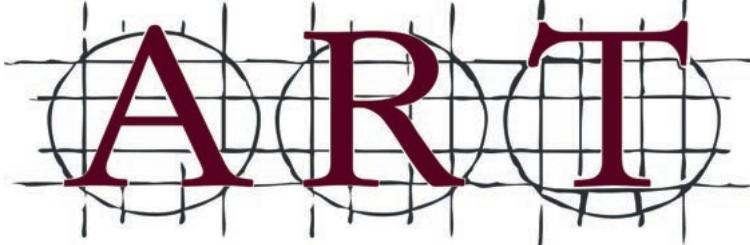
survive the vibration and thermal issues encountered in the military and space environments.

IPC-A-600K, *Acceptance of (Bare) Printed Boards*. Released July 2020. This document provides photographs and illustrations to address target, acceptable and nonconforming conditions that can be inspected either internally or externally on bared printed boards.

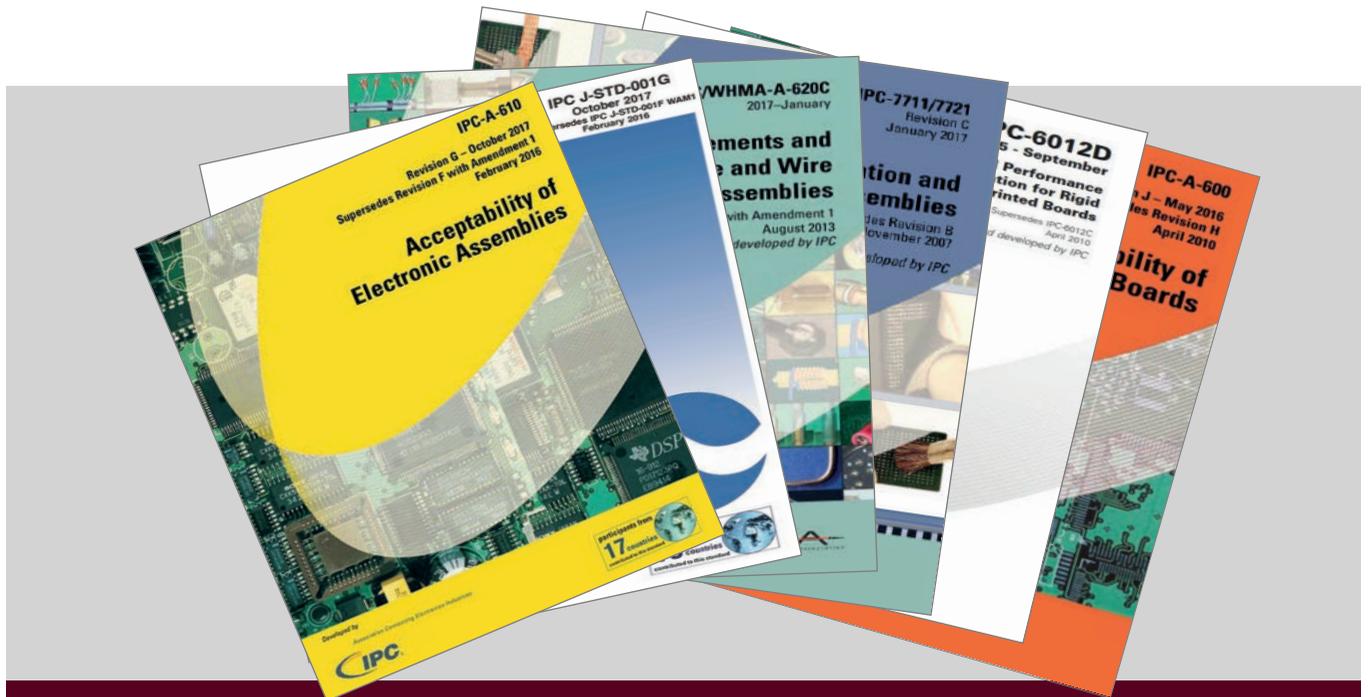
IPC-6012E, *Qualification and Performance Specification for Rigid Boards*. Released February 2020. IPC-6012ES, *Space and Military Addendum to 6012E*. Released April 2020. IPC-6012EM, *Medical Addendum to 6012E*. Released August 2020.

ART team members also sit on the technical training committees to these revisions to ensure the training courses offered by ART are accurate to provide the best possible training to the industry.

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As an Authorized Training Center, A.R.T Ltd can offer Certified Training to the IPC Standards listed below. A.R.T Ltd are the only training center in the UK able to offer CID PCB Design and IPC6012 training and Space Addendum training for J-STD-001 and IPC-A-620.



Acceptability of Electronic Assemblies



Requirements for Soldering Electrical and Electronic Assemblies



Repair Rework and Modification of Electronic Assemblies



Requirements and Acceptance for Cable and Wire Harnesses



Qualification and Performance Specification for Rigid PCB's



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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

# 2021 outlook: the curve is key

In this article, John Denslinger explores the impact of different recovery curves on 2021 growth projections for the electronics distribution and manufacturing sector

2021 Forecast • By John Denslinger

Presidential elections often introduce near-term forecast uncertainty but 2020 may be one for the record books. No one could possibly script a more confusing set of circumstances as we enter 2021. Will the government be a house divided? Will there be financial aid for individuals caught in the Covid downdraft? Will there be stimulus to keep America's small businesses operating? Will trade policies, tax rules and regulatory restraint abruptly change? Will Main Street ever be the same again? One fact is certain, the Covid hangover will continue.

On the macro level, US GDP in 2021 is projected at 3.8 per cent according to a Bloomberg consensus forecast. Interestingly, Goldman Sachs is more bullish suggesting 5.3 per cent GDP. The variance is related to one's view of the recovery curve. Goldman's is based on a V-shaped recovery, the most optimistic. Others seem based on U-curve, W-curve, reverse L-curve and probably some other shapes I missed. Regardless the recovery shape, the good news is the forecast stands robust and positive. Growth this year should be above average for the electronics industry.

While curve shape garners the most media attention, two forthcoming actions will ultimately determine which curve prevails. Simply stated: vaccines versus lockdowns.

Depending on the source referenced, the US is now in the second or third Covid wave as we enter 2021. Cases are rising, but testing is widely available with three day or less feedback. Death rates among all age groups have steadied at near flu-like levels, but dreadfully high. Unfortunately,

hospitalisation rates are still climbing and that is expected to remain at emergency levels. Let's assume everyone by now wears a mask in high contact areas, maintains proper social distancing, washes their hands regularly and quarantines when exposed. What's next? Once again, Governors are taking strikingly different approaches to safeguard citizens as this new wave approaches. Some see lockdowns as the main line of defense, but recent experience shows a marginal control of spread. It seems the only real solution is large scale vaccination, and that is well within the 2021 horizon.

The Covid mitigation options chosen by state Governors will impact 2021 outlook and results. That, in my way of thinking, sets up a direct correlation between the recovery curve shape and a 2021 Q by Q forecast. I would argue, a vaccine offers the best economic upside while persistent or intermittent lockdowns the least. The relationship can be summed up in the accompanying table.

The 2021 forecast for the electronics industry should easily blow by 3.8 per cent (the consensus GDP rate) given the solid demand fundamentals already existing in telecom, automotive and healthcare. With a V-shaped recovery, I foresee doubling the 5.3 per cent (Goldman Sachs projected GDP rate) as the real growth outlook for our industry, a strong year indeed.

The curve is key in 2021. Let's hope multiple vaccines are FDA approved soon, quickly distributed and show effectiveness among the general population. The fewer lockdowns, the better.

COVID-19 Mitigation Options	Expected Recovery Curve	Resultant 2021 Forecast	2021 Growth Outlook
Persistent Lockdowns	Reverse L-shape	Hockey-stick	Weak
Intermittent Lockdowns	W-shaped	Erratic growth by Q	Irregular
One-time Lockdowns + Vaccines	U-shaped	Best growth Q3 & Q4	Late steady
Mass Vaccination	V-shaped	Consistent growth Q on Q	Strong

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# On time, first time, every time success

IFPL CEO, [Geoff Underwood](#), outlines how adopting principles from a leading aerospace quality management system can bring benefits beyond the sector

In today's expanding markets of increasingly dynamic companies, maintaining a strong culture of delivering a quality product or service is more important than ever. It can be a challenge to ensure customers receive their expected level of quality, while also driving cost efficiencies to remain competitive.

Delivering on time, first time, every time is about more than just the simple integration of a quality process. It involves engaging with customers to meet their expectations, no matter how complex, from concept to delivery. It encompasses the commitment of a strong dedicated workforce and is developed from years of continually fine-tuning, adapting and learning to weave improvements into every aspect of the business.



**It can be a challenge to ensure customers receive their expected level of quality, while also driving cost efficiencies to remain competitive**

Quality plays a critical role, not only to sales, but also cost control, productivity, risk management and compliance. Recognising

that compliance to quality management systems and standards, such as the internationally recognised AS9100D standard, adopted by IFPL, lays the foundations for a confident and reliable reputation with customers.

AS9100D builds on the widely adopted ISO 9001 standard, and is the certification expected of companies that design, develop or provide aviation, space and defence products and services. Operating in line with risk-based thinking and the 'Plan-Do-Check-Act' principle encourages sustainable partnerships with customers not only within the aviation, space and defence industries, but any industry sectors where continuous improvement to delivery performance, counterfeit part prevention, full material traceability and increased customer satisfaction are valued.

With new companies emerging onto the markets daily, this brings a wealth of opportunities, but also introduces potential supply chain risks that need to be continually assessed. Understanding and controlling these risks, such as the detection and prevention of suspect counterfeit parts, is essential in mitigating against threats to product safety and performance, as well as reputation. Implementing an obsolescence management process and working closely with an established strategic network of

authorised and franchised distributors, manufacturers and contractors ensures full material traceability back to the original factory batch. This provides customers with assurance that they are receiving a product that is fit for purpose.

Customer satisfaction is the end goal of any manufacturing journey. From the outset it is important to engage and understand the complexities of each project, from design assistance, to build-to-print or full turnkey solutions. This requires a continually evolving measurement process to determine whether the customer's expectations have been met at every level, whilst acknowledging that the expectations on delivery may differ from those understood at the start of the venture.

Striving towards building relationships with stronger, quality focused companies, such as IFPL, will not only lead to reliable performance but on time, first time, every time success.

[www.ifpl.com](http://www.ifpl.com)



IFPL's CEO, [Geoff Underwood](#)



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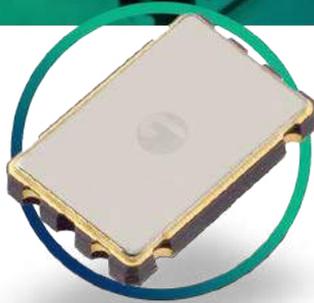
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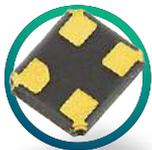
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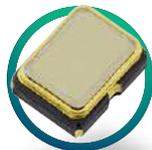
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## Distributor and Supplier Focus

# Knowledge, product and service count

ATC Semitec is leveraging its UK stock holding and technical experience to support its customers

For many manufacturers 2021 will continue to present challenges. Some are accelerating NPD projects which were put on hold, while others may be concerned about on-going component supplies post Brexit.

Claiming the position of the UK's leading temperature sensor distributor, ATC Semitec provides thermal component support to companies across a diverse range of markets.

As the e-vehicle, battery management and medical device markets focus on innovation, ATC Semitec's technical team offer customers in-depth technical advice. A call could save hours of website research.

ATC Semitec's MD, Rob Savin,

said: "When it comes to product supply and pricing, we are proud of the established relationships we have with our customers. Supporting them with sudden unprecedented increases in demand as a result of Covid, or during the recent worldwide component shortage, we were able to step in and keep their production lines going. It is all about building long-term partnerships."

Looking forward into 2021, when economic uncertainties and perhaps the logistics of supply may cause concern, ATC Semitec with its extensive UK stock holding and expertise in managing supplies from global suppliers, will help take the strain.

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# Medical connectors: best of care

In this article, ODU introduces its medical connector technology and experience offering standard and bespoke products to medical device manufacturers

As the pandemic focusses attention on medical electronics the resulting market growth is stimulating innovation and demand for connector systems to match specific needs. Consistent performance and reliability are crucial and ODU is working hard to innovate in these areas while meeting strict regulatory requirements.

As an example, ODU's Medi-Snap combines distinctive coding options with over

2,000 mating cycles and is available with both user-friendly push-pull locking and easy-to-release break-away function. It comes as a pre-moulded plug and play solution. Thanks to its plastic housing, this connector is up to 75 per cent lighter than comparable metal products.

IEC 60601-1 medical standard requires devices and components to provide patients and operators with maximum protection from electric shock. Increased

clearance and creepage distances fulfil the highest requirements. A whitepaper on IEC 60601-1 is available.

The new GA receptacle is characterised by its robust design. Additional sealing meets IP68, even when unmated, providing ingress protection from water and dust. Readers can learn more on pages 10 to 12 of ODU's new products brochure.

To support ever-faster medical equipment

innovation, suppliers need a wide range of standard products and a fast response when a customer-specific design is required. At ODU, all the company's technologies are under one roof, from design and development to volume production, making it possible to offer quality products at realistic prices.

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## ODU CIRCULAR CONNECTORS

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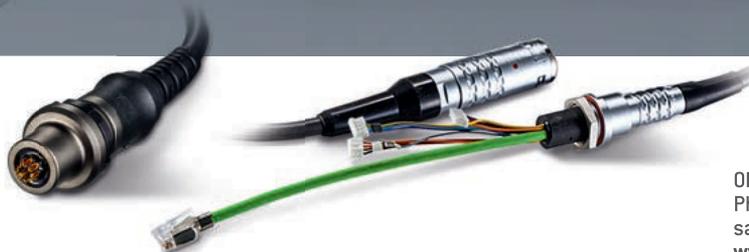
### SECURE CONNECTIONS WITH UNLIMITED APPLICATIONS

ODU circular connectors benefit from Push-Pull locking that secures the connection from unmating. Due to the robust construction and the reliable ODU contact technology, the high performance is maintained through thousands of mating cycles. The Push-Pull product range includes different versions that can be used in a large variety of applications.

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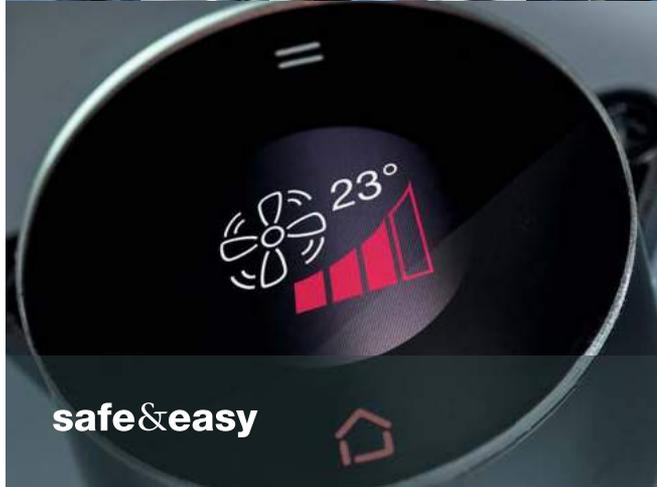
# Easing the machine interface

Using its experience in passive electromechanical components, SCHURTER is driving innovation in industries ranging from medical to industrial equipment

As a leading partner for passive electromechanical components, SCHURTER Electronics specialises in providing fuses, circuit breakers, connectors, EMC filters and input systems. The company is part of the global SCHURTER Group, an international innovator and manufacturer of electronic components and input systems and is certified to global standards. It offers solutions to various sectors including: aerospace, medical, industrial and agriculture.

With a strong focus on providing safe, clean power, SCHURTER's aim is to make the interface between human and machine ever easier. Based on customer requirements, SCHURTER Electronics develops, manufactures and provides value added services over a professional network of worldwide affiliates and distributors.

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# Switches deliver a history of reliability

E ECO switches and keypads are used in many industrial sectors including medical, communications, security and transport. Some of its thumbwheel switches are made to military specifications and, in fact, the company still gets orders for replacement switches to match those made in the 1970s and 1980s.

Alongside its switch line-up, which includes thumbwheels, strip switches and micro-dips, EECO also supplies custom made elastomer keypads, switched membrane keypads and elastomeric connectors. The company supplies

switches made in the USA by EECO Switch of California, which has been making electro-mechanical switches since 1947. The keypads are made in Taiwan by a group associated factory, for which it is a UK agent.

[www.eecoswitch.co.uk](http://www.eecoswitch.co.uk)



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ETL is a full service contract manufacturer. That means we offer a range of flexible options to meet the specific requirements of some customers. Some only need the skills from part of our portfolio, for instance surface mount pcb assembly, conventional through-hole technology, or special wiring looms. Others use all our services to benefit from a turnkey solution tailored to their exact needs.

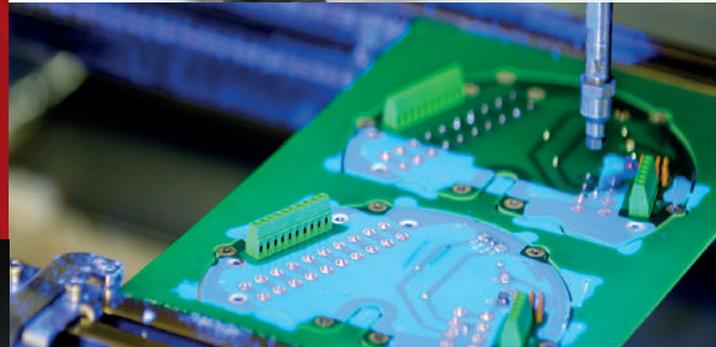
With modern facilities, comprehensive equipment and skilled workforce, we have an unbeatable combination of expertise, capacity and quality that has secured us great contracts, loyal customers and enviable certifications, including ISO14001:2004, ISO9001:2015 and AS9100-Rev D.

## Knowledge

ETL customers can call on an impressive bank of knowledge and expertise. We offer complimentary advice at all levels on procurement channels, design for manufacture, design for test, production processes, quality procedures, logistics and more besides. This ensures cost effective production, optimum product reliability and shorter development cycles.

## Capability

Our comprehensive full service covers a broad range of quality-certified capabilities. IPC standards are at the heart of all our production and test disciplines, and our staff training. We offer cable and harness production, mixed technology pcb assembly, test and inspection, automated selective conformal coating and full product or box-built - up to IPC Class 3 levels. We even include electro-mechanical expertise and metalwork in our turnkey services, while our dedicated project management solutions give customers a convenient single point of contact

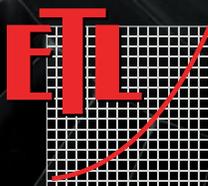


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## Quadband VCOs for microwave applications

Analog Devices has announced a series of quadband voltage-controlled oscillators (VCOs) designed to offer wideband capabilities without compromising phase noise performance. When used in RF and microwave environments, they offer a wider RF response and more frequency flexibility than narrowband VCOs. They also provide lower phase noise than traditional single-band wideband VCOs, while continuing to provide low current consumption.

The series offers ultra-wideband capabilities with fundamental frequencies ranging from 8.3GHz to 26.6GHz. In addition to providing

low phase noise, the VCOs do not generate sub-harmonic frequency tones. This combination of wideband capability and low phase noise is essential in many of today's high-end instrumentation, aerospace and defence applications.

Features and benefits include: integrated fundamental oscillators, resulting in no sub-harmonic tones being generated by any multiplication effects in the device; short switching time between VCO bands without voltage overshoot; and supply current as low as 60mA.

[www.analog.com](http://www.analog.com)



## Pyroelectric sensor delivers higher optical efficiency

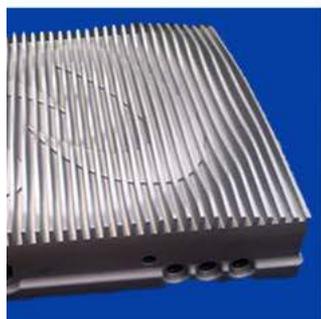
Pyreos has confirmed its ezPyro SMD Dual is shipping in prototype form for a new wider range of substances and benefits from all software and hardware components of the established Pyreos development ecosystem.

The product collocates two thin-film PZT pyroelectric elements separated by 1.6mm inter pixel distance (IPD). The small IPD means two channels can be measured by illuminating an area just 2.8mm across, making for an optically simple and energy-efficient design.

As well as being physically smaller the digital readout reduces system component count/cost and the integration of two channels further reduces cost and space. The IPD and reduced component count enables a physically smaller design which further saves solution cost and energy demand.

Pyreos' CEO, Andrew Wallace, said: "By extending our industry-leading dual-channel ezPyro SMD pyroelectric sensor, we deliver greater flexibility and choice to our customers. Compared to alternative pyroelectric and thermopile sensors, the ezPyro range offers higher sensitivity, faster response and switch-on, lower power consumption, more on-the-fly configurability, lower component counts and easier integration. Our unique technology allows inter-pixel gaps of around 10microns and this product is one more step towards even smaller detectors."

[pyreos.com](http://pyreos.com)



[www.gelec.co.uk](http://www.gelec.co.uk)



# Power to connect

As plans for a low carbon future accelerate, **Phoenix Contact** explains how battery storage is part of the solution

2020 was an unusual year for several reasons. One thing that became headline news was the impact our way of living is having on the environment. In April, with a full lockdown in place, we started to realise how cleaner the air was without cars on the roads and planes in the skies.

This was followed by big announcements to accelerate the shift to a low carbon future. Oil companies announced significant plans to accelerate investments into renewables. UK Government launched initiatives to power all homes with wind by 2030. Then the Government announced a ban of the sale of internal combustion engine cars and vans by 2030, five years earlier than expected.

So how does battery storage fit in to an all-electric society? Grid balancing is the ability to match supply and demand and is problematic as more unpredictable renewable energy is added. Battery storage offers a flexible solution which can be located close to energy production and respond extremely quickly when demand requires it. The popular image of battery storage is neat rows of shipping containers packed full of batteries. Look inside those containers and the picture is often not so neat.

We have recognised the need for improved connector solutions for battery storage applications that addresses the need for faster installation times and plug and play maintenance.

[phoenixcontact.co.uk/P2C](https://phoenixcontact.co.uk/P2C)



## The power to connect



The World is going electric, and at Phoenix Contact we understand the challenges faced by a drive towards a more sustainable electric future.

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Founded in 1983, QPE is a full-service electronic manufacturing and assembly company specialising in PCB prototyping, assembly, box-build and testing. With over 30 years' experience in the field, the company prides itself on its innovative, high-tech and high-integrity approach to versatile customer requirements.

Specialising in low to medium volume production batches, an impressive suite of state-of-the-art equipment and experienced and knowledgeable team consistently deliver SMT and PTH solutions. Since 2013, the organisation has made

significant investments into its equipment, technology and facilities, to maximise its innovative and high-technology solution offering.

Whether a customer requires a full turnkey package or specific support at a particular part of their process, QPE can provide bespoke solutions to suit their needs. Services include NPI/prototyping, material procurement, PCB assembly, AOI/X-ray inspection, functional and reliability testing, conformal coating, potting/encapsulation, final assembly/box build and distribution support.

The company operates across a spectrum of industries, so customers can rest assured QPE has the expertise, knowledge and experience to satisfy project requirements. Industries include: oil and gas, defence and security, life sciences, transport, communications and industrial.

[www.qpe.co.uk](http://www.qpe.co.uk)



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# Purchasing's role in board protection

*Rutronik's senior manager product marketing standard products and purchasing, Reza Maghdounieh, explains how circuit protection devices protect your wallet and reputation*

Did you know that without noticing, your daily activities can cause your body to charge with up to 10,000V. Even more surprising, discharges below 3,500V will go completely unnoticed. However, just 100V is enough to cause significant damage to sensitive ICs.

Thus, having the right ESD protection is important to protect your company's money and reputation. Often underestimated, is purchasing professionals' responsibility when it comes to selecting and purchasing protection components.

Finding the right protection device can be a challenging task for purchasing professionals. In today's market, there are many solutions and the number of protection parts can be overwhelming. Customer requirements, the speed of innovation, availability, cost, quality and issues beyond a purchaser's control, such as geopolitical challenges, need consideration. Purchasers who have a distribution partner helping them solve these challenges have an advantage. More than three-quarters of global companies take a systematic and comprehensive approach to getting themselves fit for the future.

The wide range of protection components purchasing professionals can choose from varies depending on the

application and the space their engineering department has provided. Purchasers in the automotive segment may be tasked with sourcing protection components for data lines, load-dumps, antenna ESD protection and more, while ensuring the components fulfill the industry's high requirements. While fuses and circuit breakers might be a solution for some industrial applications, TVS diodes, rectifiers or varistors may offer a solution to ESD protection as well.

More purchasing choice means more potential for cost savings and better availabilities to keep lines running. However, this also means more responsibility for the purchaser who needs to understand the advantages and disadvantages of a variety of protection components. Distributors who offer support to procurement and engineering departments can make sure the customer finds the right balance between technical and budget requirements. This may be through a field sales engineer who supports purchasers and engineers alike and understands the challenges both departments face.

Rutronik's field sales engineers have a technical understanding, making them an asset to a customer's design department, while appreciating a component's

cost and availability to also support purchasing departments.

It is important to work with a distributor which can offer qualified personal support, supply a variety of protection products and knows which will best suit a customer's application. This includes offering well-known manufacturers such as AVX, Vishay and Yageo, plus smaller specialized manufacturers such as Panjit or Diotec, all available at Rutronik.

Since circuit protection is an important topic for manufacturers, it has become an important matter for Rutronik as well. The company sells over 350 million TVS and ESD protection devices annually and also has a circuit protection team at its corporate headquarters whose task it is to provide technical and commercial support to customers. This includes monitoring lead times and prices.

Moreover, the e-commerce platform Rutronik24 is designed to make it easy to order small quantities online in minutes. Rutronik understands the responsibility that comes with being a purchasing professional for protection components and is determined to help customers protect their wallet, board and reputation.

[www.rutronik.com](http://www.rutronik.com)



**Rutronik's senior manager product marketing standard products and purchasing, Reza Maghdounieh**



**More purchasing choice means more potential for cost savings and better availabilities to keep lines running**

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# Let outsourcing take the strain

Outsourcing manufacturing removes the need to invest in expensive capital equipment. **Jaltek** does that for you by constantly upgrading its capabilities

To provide customers with up-to-date, efficient and cost-effective solutions, Jaltek is always reviewing its technology line-up which includes surface

mount equipment for volume production and a dedicated new product introduction line, all supplied by Blakell Europlacer. The multifunction SMT pick

and place platform is designed to provide the highest level of flexibility. The prototyping line and main production lines are completely compatible

allowing prototypes to seamlessly transfer.

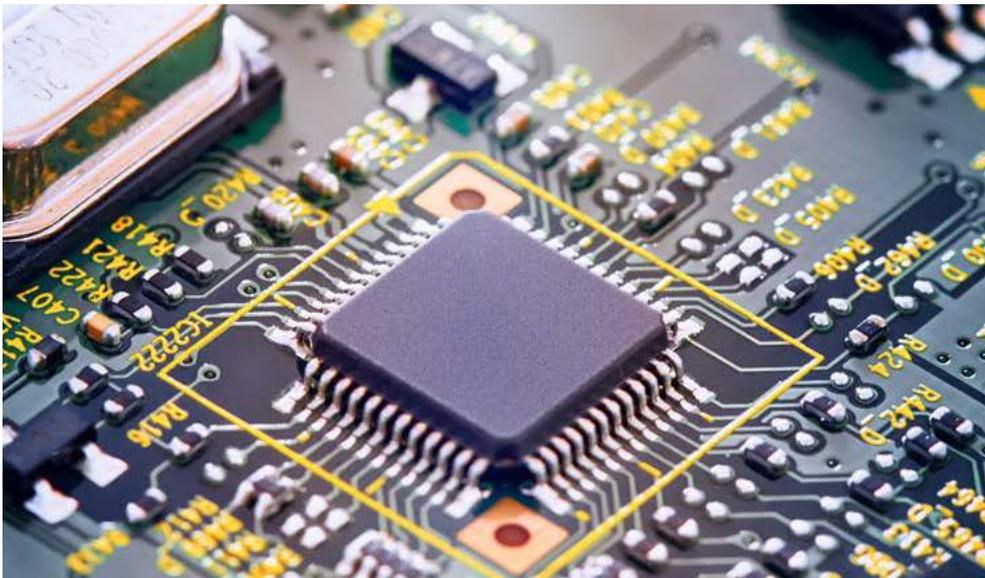
Jaltek's 2020 investments included: production, test and inspection kit; additional AOI and X-ray capability; a contamination testing machine (to monitor board cleanliness); and an automatic cleaning system. Also, the installation of a new environmental simulation test chamber, has allowed greater in-house temperature and humidity testing for critical products.



**Jaltek Systems**

Designing and manufacturing electronics for over 30 years

in [www.jaltek.com](https://www.jaltek.com)



The prototyping line and main production lines are completely compatible allowing prototypes to seamlessly transfer

Managing director, Steve Pittom, said: "Despite the challenges that 2020 has presented, due to the longevity of our strategy we have been able to continue to enhance our offering.

"We invest in our people as well as our equipment, we have expanded our team to support growing activity in design, engineering, project management and NPI. Our in-house training ensures all employees work to the industry's highest standards as per the Institute of Printed Circuits."

Business manager, Steve Blythe, added: "To support new levels of workload we have also recruited to our business development and account management teams. This continued investment allows us to work ever more closely with our customers on their design and assembly requirements adding as much value as possible. We deliver solutions through technology and partnership."

## Working with Customers to create history

Jaltek Systems is a leading AS9100 and ISO 13485 accredited UK contract electronics manufacturer with over 30 years' experience. We offer a comprehensive range of integrated design and manufacturing services adapted to meet our customer's our customer's varied requirements.

Focusing on low to medium volume, high mix product profiles for a range of industries, Jaltek uses advanced systems to support products throughout their lifecycle, offering a single service or complete solution.

We have a diverse customer base, from global PLCs to start-up ventures, many have worked with us for over 15 years - testament to our customer focus and support in an ever changing marketplace.

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# Run of new manufacturers seek to buy British

*As Brexit and Covid reset the reshoring benchmark, 32 trade associations and research organisations have pooled their experience to ease the decision*

Manufacturers that source often low-priced components from abroad are finding UK-based alternative suppliers via Reshoring UK, a collaborative marketplace, initiated by the Gauge and Toolmakers Association (GTMA).

Beck & Pollitzer and Frog Bikes are among companies that have found or are seeking UK suppliers this year with the help of the reshoring platform. The Scottish Plastics and Rubber Association is the latest business group to join the growing 32 trade associations and research organisations on the Reshoring network which now has representation in each devolved nation.

Covid-19, Brexit and other external shocks are pushing more companies to look for

local suppliers for quality and shorter lead times. Lower costs are a primary driver for sourcing parts in Asia, but more companies are finding that technical capability, quality, environmental issues and proximity are more important than price alone, when such parts may suffer from global blockages, quality defects or delivery delays.

Reshoring UK is an interactive, match-making tool that allows companies to search for a UK-based company by manufacturing category or a key word search by region, industry sector or association. Companies can then post enquiries to the selected companies requesting further information. It is designed for OEMs, tier ones and SMEs to locate manufacturing

capacity which may be conveniently sited 'down the road'.

Assisted by Reshoring UK, specialist moulder and toolmaker BEC Group has helped several UK companies that have struggled with suppliers in Asia and Eastern Europe who cannot deliver to the criteria that these products demand: quality, delivery and responsiveness. Often a company needs quick and expert consultation with the supplier about a technical issue, where it helps if the supplier is local.

Critical components are particularly suitable for the switch from China or Eastern Europe back to the UK, said BEC Group's Marketing Manager, Clare Elvy: "Customers who enjoy stable supply chains have had



**Covid-19, Brexit and other external shocks are pushing more companies to look for local suppliers for quality and shorter lead times**

to reframe their priorities and are now looking for faster communication, faster problem solving, tighter control and increased agility. Risk management is moving up the priority list. Locally-sourced is rapidly rising in importance with a spotlight on environmental impacts. There is higher demand for better traceability of products, and shorter supply chains with less environmental impact.

It is not just critical components that can be reshored. Clare added that the flexibility and agility of supply of British companies mean they can often compete with lower cost countries on simple products too: “The UK can compete on cost when it comes to being able to flex-up supply, as companies face demand fluctuations, rarely having minimum order quantities, no big shipping costs, quick turnaround times etc.”

BEC Group helped UK company Guru Systems to produce moulded parts. Guru had experienced long lead times, communication and material selection issues with an offshore manufacturer for their first-generation smart meter, Hub 1.

Reshoring supply is gaining popularity among many manufacturers, such as machinery installation specialist Beck & Pollitzer as CEO, Andrew Hodgson, explained: “As a passionate UK businessman, I am keen to see my company play the fullest role possible. We have played a major part in offshoring for more than 20-years. We are ready to support moves to bring much of this back to UK.”

Frog Bikes, a manufacturer of children’s bicycles, has also benefited as strategy director, Shelley Lawson, detailed: “Reshoring UK has helped Frog Bikes connect with UK-based suppliers for some of our key componentry, as alternatives to Asian suppliers. We are keen to investigate these options both to build resilience in our supply chain, and to reduce the environmental footprint associated with bike production.”

In November the Scottish Plastics and Rubber Association joined Reshoring UK. Kevin Ross, president of SPRA and managing director of Impact Solutions, said: “We have seen a reversal of globalisation where manufacturing was focused

in lower cost countries over a number of years. This reshoring has been intensifying as a result of Brexit and Covid as the limitation of global supply chains have been exposed but also the capability, ingenuity, diversity and cost effectiveness of the UK supply chain has been proven.”

The Reshoring UK platform works by linking the members and customers of 32 trade associations using an intelligent search. It is not creating another network but leveraging the existing strengths of these well-established business groups.

The GTMA’s CEO, Julia Moore, added: “Matching the needs of businesses that are reshoring, or even to shine a light on the ‘lost skills’ the engineering marketplace can provide, demonstrates where the Reshoring website excels. It can make the compiling of an end-to-end supply chain much more efficient, minimising the effort required to find businesses that are capable and competent enough to provide the support required.”

BEC Group says that UK purchasing teams have become entrenched in a

culture of driving efficiencies and cost.

Clare said: “This is understandable considering the pressures they have been put under. There has been no reason for change. Brexit presented an opportunity to discover new UK suppliers but Covid has forced many purchasing teams into uncharted territory. The challenge is how to engage purchasing teams to locate suitable UK suppliers. Reshoring UK helps to bridge that gap.”

Reshoring UK also plans to provide practical, long term procurement solutions to large companies as Julia Moore explained: “Provided that OEMs and tier ones make a conscious decision to look at choosing a more UK-centric supply base, we can actually help them to source the best solutions, solve their manufacturing challenges and add value so they have a longer-term solution.”

[www.becgroup.com](http://www.becgroup.com)  
[www.reshoring.uk](http://www.reshoring.uk)  
[www.gtma.co.uk](http://www.gtma.co.uk)



## Welding proximity sensors in stock



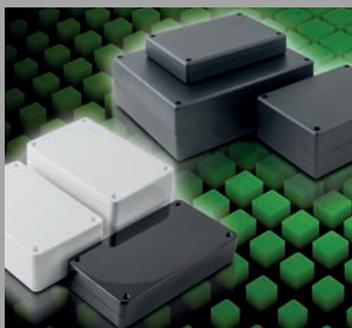
RS Components has added the Omron E2EW series welding proximity sensors to its portfolio. Featuring improved sensing technology and robust construction, E2EW series sensors are designed to reduce downtime and improve productivity in automotive welding applications by reducing the risk of sudden stoppages due to materials misidentification or sensor failure.

A key feature of the E2EW series is its ability to identify iron and aluminium accurately at the same distance. This is particularly useful in modern automotive applications, where the trend towards lighter vehicles for improved fuel consumption and the increase in demand for electric vehicles is prompting a change

in component materials specification from heavier iron to lighter aluminium. As a result, production lines are increasingly using a mix of the two.

The series is equipped with I/O Link, which means it can be connected into wider production line networks. This enables useful data regarding sensor performance to be shared and monitored, making it easier to predict and schedule essential maintenance.

[uk.rs-online.com](http://uk.rs-online.com)



## Simple, rugged and attractive

Two families of ABS enclosures from BCL Enclosures combine simplicity and ruggedness to provide an unobtrusive enclosure in situations where aesthetics are important, such as domestic, commercial and office spaces.

The AB series comprises two-part enclosures with a matt finish and lids which are retained with four self-tapping screws that can be inserted from either inside or outside then hidden with the supplied matching plastic covers.

There are integral stand offs in both halves of each box and three models (AB77, AB78 and AB88) also have PCB slots. Six models are available in total. The AB77, AB78 and AB88 measure 178mm (l) by 122mm (w) and are 36, 55 and 74mm high respectively. Wall thickness is 3mm. The slightly larger AB99, AB910 and AB1010 enclosures measure 240mm (l) by 190mm (w) and are 40mm, 65mm and 90mm high respectively, with a nominal wall thickness of 4mm.

The BM series offers similar features in a two-part ABS enclosure, but with a polished finish.

[bclenclosures.com](http://bclenclosures.com)



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# Strategies for EMS providers in current crisis

*Perzeptron's co-founder and CEO, Markus Renner, argues that process optimisation is the secret to higher liquidity, shorter lead times and better delivery in these troubled times*

Perzeptron's co-founder and CEO,  
Markus Renner



**Many EMS companies have opted to maintain high inventory levels to ensure availability of rare parts. However, high inventory levels do not guarantee delivery excellence**

Declines in sales of up to 25 per cent, empty order books and cancelled orders: the Covid-19 crisis is having a dire impact on many electronics companies. If you're not in the medical industry, you need to cut costs hard. However, there are also opportunities. Take the time to optimize your materials management and order processing. Build transparency and a consistent data pool. Leave Excel lists behind. If this crisis has taught us anything, it's to value our time.

How much time is wasted by purchasing teams looking for missing parts, bottlenecks in materials management or the status of a manufacturing order? How much energy does distribution pour into internal calls to provide customers a reliable delivery date? How much effort does production expend determining which orders need to be fulfilled this week? All this while short-time work and sick leave are eating organizations' manpower. Over 20-years consulting

experience in the electronics and EMS industries has taught us it takes courage and will power to achieve these goals, including absolute transparency in materials management and order processing.

Regarding courage and will power, it should be noted that EMS material costs account for 60 to 80 per cent of manufacturing costs, making them a crucial factor. Many EMS companies have opted to maintain high inventory levels to ensure availability of rare parts. However, high inventory levels do not guarantee delivery excellence. In fact, they curtail a company's flexibility. Even worse, if manufacturing orders are cancelled or fail to materialise, the effect increases exponentially. This ties up money needed for purchasing materials for new orders.

The picture might seem gloomy, but the potential for savings is enormous. Information management and material handling are

areas where companies can use simple tools to boost productivity and liquidity. Process efficiency is the quotient of an order's processing time and its total lead time, which in electronics manufacturing is often well below 10 per cent. The trick is aligning the scheduling frameworks with the appropriate bottlenecks.

Instead of starting manufacturing orders with ordering all materials, order start dates and purchasing orders should be aligned with the date on which eliminating bottlenecks for critical components becomes possible. The result: shorter lead times and decreased idle times for orders. This means reduced capital commitment and more productivity by focusing on those manufacturing orders which can realistically be fulfilled. This also leads to greater delivery date transparency and better on-time delivery.

Keeping an eye on orders, purchasing on time and detecting/eliminating

bottlenecks must be based on a transparent, common data pool which is available to purchasing, manufacturing, logistics, distribution and management.

To this end, Perzeptron has developed MiG Materials Management in Balance. MiG is an add-on for existing ERP systems designed to analyse and visualise data in those systems. Separate views, analysis and optimisation are offered for different departments. This is designed to improve coordination between departments and improves collaboration. As every user has access to the same data set, there is no room for ambiguity or doubt.

MiG is all about setting priorities, highlighting orders with missing parts in the manufacturing overview so production management and logistics can adjust the manufacturing processes. Simultaneously, purchasing can react to ensure all materials required by the order are available when needed. Employees continuously monitor material movement, making strategic decisions to optimise the procurement process. Spending hours searching for parts and information is eliminated, as is hurriedly ordering missing parts at inflated prices or rescheduling the manufacturing process at short notice. MiG's advanced edition includes integration with components distributors. At a glance, purchasing can see inventory levels and prices.

Introducing a few simple measures can have a noticeable effect on improving materials management and the manufacturing process at contract manufacturers, suppliers and OEMs. In times of economic turmoil, optimisations like these are often crucial to a company's survival. At the same time, they create a new way of collaborating within the organisation and interacting with the customer: helping employees shift from being mere operators to contributing constructive strategies to further the company's long-term development.

[www.mig-perzeptron.de](http://www.mig-perzeptron.de)

MiG offers greater transparency in order processing and materials management



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# Independent distributors: Expect tight supply especially earlier in 2021

*Electronics buyers will face longer lead times and some shortages in the first quarter, but it is unclear how long unfavorable buying conditions will last*

Non-franchised distributors say there will be limited supply for some passives and semiconductors in the first quarter of 2021 but tight supply for some parts could last through much of the year.

Demand has increased as several key customer segments, which had slowed manufacturing of their products during the pandemic, have now increased production of electronics systems and are ordering more components. In addition, distributors and some OEMs have increased inventories because of uncertainty and potential strong demand later in the year.

However, there is disagreement in the outlook for 2021 beyond the first

quarter. Some in the supply chain say that supply and demand will “normalise” after the first quarter with no severe shortages for most parts.

But others are forecasting tighter supply later in the year as people worldwide get vaccinated against Covid-19 and the impact of the virus wanes. The thinking is the overall economy will recover and displaced workers will return to their jobs and demand for electronics equipment by consumers and businesses will bounce back, resulting in greater component demand and tighter supply.

Some independent distributors said in December they were already seeing shortages of components due

to increased demand from the automotive industry and because of overall uncertainty in the supply chain, which is resulting in distributors and OEMs, increasing inventory levels.

Luke LeSaffre, director of sales - Americas for independent distributor Fusion Worldwide, based in Boston said: “Customers are coming to us with a long laundry list of parts” which are constrained. “Most shortages that we’ve seen have been from automotive customers. We expect that to broaden in the months ahead,” said LaSaffre.

## Component demand is rising

He said demand is increasing from automotive customers for MCUs and some



**COVID injected a great deal of uncertainty into forecasting demand. There’s been more of a push to place orders and lock in supply for components**

**Todd Snow**, vice president of purchasing for independent distributor **Smith**



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aluminum and electrolytic capacitors. Some automotive-grade MLCCs are also constrained, he said.

However, overall “right now we’re not seeing too much in terms of MLCC shortages but customers are calling that out as an area of concern,” said LaSaffre. MLCCs could be a problem for buyers later in 2021.

“We are hearing rumblings that we will start to see major shortages in the latter half of the Q1 and Q2 and have begun to look at lining up supply in anticipation of it,” he said.

LaSaffre said there has been some tightness with chip resistors. “Resistors and MLCCs often move in lockstep. We’ve actually seen more business on resistors than MLCCs. If one is tight than the other is likely to follow suit,” he said.

Some series of STMicroelectronics microcontrollers are highly constrained. “A lot of it is related to STMicro trying to allocate more capacity to some of their 5G oriented products,” said LaSaffre. “We’re expecting to see a pretty big uptick in demand related to 5G rollouts starting in middle of Q1.”

In addition, some NXP transceivers “have been tight in part due to resurgent automotive demand,” said LaSaffre. Some parts from Marvell and Texas Instruments also have long lead times.

#### Uncertainty in market

Matt Fonstein, vice president of trade at independent distributor NewPower Worldwide, based in Nashua, NH, said the majority of orders that NewPower has seen over the last six months are for parts that are in tight supply, including controllers, graphic RAM chips and MLCCs. Customers are buying the parts for buffer and hubbing programs that NewPower offers because

of uncertainty in the market, he said.

“They are not sure where the market is going to be in 2021 so they are putting products in hubs so they know they have continuity of supply,” said Fonstein. Supply will remain tight for a number of components in the first quarter and perhaps beyond. Some of the shortages are not Covid-19 related.

“There are some big headaches for buyers not related to the pandemic, he said. For instance, a “huge” fire destroyed the Kasei Microdevices (AKM) factory in Nobeoka City, Japan in October, said Fonstein. The factory makes audio digital-analog and analog to digital chips used in audio and consumer electronics equipment and appliances. With production shut down, there are shortages for many AKM parts. Shortages could continue well into 2021. The company said the factory will not be rebuilt for at least six months, but some industry analysts think it will be longer than that.

The destruction of the AKM plant is causing other supply issues because AKM supplies raw materials for crystal oscillators. There are now shortages of those parts. AKM customers are working to redesign boards, and are looking for alternative parts, he said.

There are also some shortages of low-end Intel and AMD processors because of strong demand for notebooks and Chromebooks. A shortage of substrates used in manufacturing of processors and other high-end integrated circuits could have an impact on processors made by AMD and Nvidia.

“There’s a handful of substrate manufacturers. We are heading into a situation where that material is going into a shortage,” said Fonstein. “Intel, AMD, Nvidia are fighting over supply. Intel consumes about 80 per cent

of substrates and are willing to pay premiums to get their hands on the substrates,” said Fonstein.

LeSaffre said one reason buyers can expect tight supply of some semiconductors in 2021 is a shortage of 200mm wafer capacity. While many chipmakers have shifted from 200mm wafers to 300mm, there are still a lot of chips produced on the smaller 8-inch wafers. However, as of December 2020, there were “major constraints on supply of 8-inch wafers,” he said. Strong demand for power management chips, display drivers, sensors and analog chips and some controllers built on 200mm wafers has resulted in tight 200mm foundry capacity.

#### Fewer wafer starts

Another cause for tight supply was there were fewer wafer starts in early 2020. “It was very much Covid-19 related,” said LeSaffre. “There were shutdowns and reductions in workforce and things like that,” he said. “So, there was a limit on output and that affected the current supply situation.”

There are also “geopolitical factors contributing to a run on fab capacity,” said LaSaffre. As part of the U.S. trade war with China, Huawei Technologies faces restrictions on use of U.S. technology. As of 15 September of last year, the semiconductor companies were not allowed to sell semiconductors to Huawei if the chips were developed or produced with U.S. software or technology. Before the deadline, Huawei placed large orders to lock in future supply.

In addition, there is a lot of uncertainty right now going on with SMIC, the Chinese foundry, said LeSaffre. They may also face restrictions on U.S. technology. “If that happens that’s going to remove overall capacity at the foundry level,” he said.



**Customers are coming to us with a long laundry list of parts which are constrained. Most shortages that we’ve seen have been from automotive customers**

**Luke LeSaffre**, director of sales - Americas for independent distributor **Fusion Worldwide**

Dave Valletta, executive vice president worldwide sales for components manufacturer Vishay Intertechnology, headquartered in Malvern, Penn., says buyers should expect tight supply conditions in the first quarter, but more normal buying conditions in the second quarter.

He said in the second half of 2020 component demand began to pick up in some segments such as automotive and industrial started to recover. Automotive in the fourth quarter was “scrambling” to replenish inventories which were depleted. “By inventories I mean finished goods. Cars on the lot. This is driving a sharp increase in component demand, which is putting some commodities into shortage situations,” he said. He said there are shortages right now on some optoelectronic devices and resistor chips.

“Some of the shortages will continue through the first quarter,” said Valletta. But demand will “smooth out” later in the year, he said. “Will the level of demand that we’re seeing from automotive be sustainable all year? I think it will probably smooth out a little after the first quarter,” he said.

One reason demand may lessen is that the number of car shipments will increase in 2021, but not excessively. Valletta noted that vehicle

production peaked in 2017, at about 94 million vehicles. In 2020, it was expected 70 to 75 million vehicles would ship and in 2021 about 80 to 85 million, said Valletta. Demand for components by the auto industry will rise, but not enough to cause severe shortages of many parts.

The same may be true with PC shipments. PC sales growth will be much less in 2021 compared to 2020. Last year PC sales increased sharply because more people worked and learned at home. Researcher IDC said PC sales would end 2020 growing 11.2 per cent to 291.3 billion units. However, in 2021 PC shipments will rise only 1.4 per cent although notebook shipments would rise 3.2 per cent, according to the researcher. While component demand from the computer industry may not decline in 2021, it won’t be overwhelming.

Valletta said another reason why component demand was high in the fourth quarter was “there was a lot of stocking going on. Our distributors were building stock,” because they were concerned there could be future shutdowns by component manufacturers because of new Covid restrictions imposed by governments.

The increases in component buying that occurred

in the fourth quarter by the automotive and industrial supply chains and distributors will likely ease in the first quarter and supply will catch up with demand. So tight supply of some components will ease as more parts are produced.

### Demand will remain strong

Todd Snow, vice president of purchasing for independent distributor Smith, Houston, Texas, agrees there will be strong demand in the first quarter of 2021 and it will be stronger than the fourth quarter of 2020. However, he expects demand will remain robust through the second quarter of 2021 as well. He said there are several reasons including the buildout of 5G networks and handsets, continued strong demand for notebooks, Chromebooks, and other computers from people working and learning at home and rising electronics content in vehicles, as well as higher vehicle sales.

“There’s a lot of optimism with 5G infrastructure,” he said. 5G networks are being built and sales of 5G handsets will increase sharply, which will help drive component demand.

Even with the beginning of the distribution of vaccines, the work-at-home and learn-at-home trends will not abruptly stop in the first quarter of 2021. “You have

a lot of home computing activity going on right now,” said Snow. “PC sales are up as companies buy additional equipment to support their employees working at home,” he said.

With so much uncertainty, some electronics companies are changing their supply chain, and inventory strategies in 2021.

“Before Covid, inventory was managed very much on a just in time basis,” said LeSaffre. Companies operated lean, and “minimising carrying costs was a common widespread strategy,” said LeSaffre.

But Covid has “injected a great deal of uncertainty into forecasting demand. There’s been more of a push to place orders and lock in supply for components,” he said. A lot of customers have changed their minds concerning inventory. “They no longer see it as a something that needs to be minimised but rather optimised and finding there’s more value in having inventory,” said LaSaffre.

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# Despite pandemic, executives say North American distribution is strong

*The state of North American distribution is healthy because distributors are essential links in the electronics supply chain*



James Carbone

Electronics distribution executives say the state of North American distribution is robust and will continue to grow because its role in the electronics supply chain is essential and growing in importance to both electronics component buyers and component manufacturers.

While the coronavirus pandemic resulted in double-digit declines in sales for some distributors in the second quarter of 2020, the pandemic will not have a long-term impact on sales growth. Distributors say they have weathered the downturn caused by the pandemic and North American business started to recover in the second half of the year.

Distributors say the recovery shows the resilience of the North American distribution industry and confirms how important the role of distribution is in the electronics supply chain. When the pandemic hit North America last March, "we did not miss a day," said Phil Gallagher, Avnet CEO. "Everybody thought the supply chain was going to be disrupted. The silver lining for us is we did not miss a day," he said. "I think it further explains the positive value that we bring to the technology supply chain. We're in the center of the technology supply chain. It reinforces the importance of what

we bring to the market for our suppliers and our customers," he said.

Some distributors reported sales increases for the year, while others say their businesses bounced back in the third and fourth quarters and they expect strong sales growth in 2021. Longer term, distributors expect continued healthy sales growth in North America because of stronger component demand from such segments as 5G, medical, artificial intelligence and alternative energy. At the same time more traditional customer segments such as industrial and automotive, will continue to grow in North America.

"American distribution is very strong," said Mark Burr-Lonnon, senior vice president EMEA, Asia and global service at Mouser Electronics. "Part of the reason it's been strong for us is we are more involved on the design side. The U.S. remains a powerhouse of design."

He said while Mouser is seeing strong growth in Asia and Europe because it is "fertile ground for us to grow, we see good growth in the Americas. This year (2020) were going to be up over six per cent in the Americas in terms of dollars and the number of buyers," he said.



**"American distribution is very strong. Part of the reason it's been strong for us is we are more involved on the design side"**

**Mark Burr-Lonnon**, senior vice president EMEA, Asia and global service at **Mouser Electronics**

## Distribution differences

Distribution in Asia is different than in North America in some ways. "The Americas distribution business is more similar to the European market than it is to Asia, specifically with our concentration of mid-sized industrial OEMs that work to provide solutions across a broad range of applications," said Rick Marano, president of Arrow Electronics' Americas components business.

Consumer does not play as significant a role in the Americas

as it does in Asia," he said. Other customer segments such as Internet of Things, industrial and medical are strong segments with distributors worldwide. Burr-Lonnon added the military-aerospace market is a "strong market for distribution in North America and Europe," but not in Asia.

Don Akery, president, TTI Americas, said emphasis on total cost of ownership (TCO) is another way North American distribution is different than distribution in Asia. He said Asian





customers focus more on piece price and immediate stock than on cost of ownership.

North American and European customers "require competitive pricing, but it is not the only data point in their procurement decisions," said Akery. They seem to value distributors' support of their design efforts as TCO.

He added North American customers are buying more components through distribution than they were 10 years ago. "The component shortages from 2017 and 2018 helped drive the distribution value proposition of assurance of supply, especially on the low average selling price components," said Akery.

Many buyers analyzed the "cost of missing components to the cost of having a distributor inventory and pipeline inventory and determined that it is much less expensive to work with a distributor," he said. Buyers moved from using only purchasing price variance (PPV) as the sourcing reason to total cost of acquisition/ownership.

#### Smoothing demand cycles

Distribution's role in the supply chain will continue to grow in importance. "Distribution will continue to be a key provider in the electronic supply chain in the

future," said Akery. As electronic content continues to increase, distribution will be needed to help smooth the demand cycles, he said.

Distribution will play a key role in managing the supply chain for the largest customers but will also continue to support the long tail of smaller customers, Akery added. TI has seen its customer base in the Americas and globally increase for years as more "electronic capabilities are being added to many products," he said.

The role of distribution will evolve especially with how distributors interface with customers. "We are seeing a large increase in customers connecting directly with our systems via APIs (Application Program Interface) to receive real-time information required to support their business," said Akery. "This digital interface is an opportunity and a risk for distributors," he said.

The use of APIs is an example of how the distribution business is changing. However, change is a constant in electronics distribution and has had an impact on the role of distributors. One big change in distribution and the electronics industry has been consolidation.

"The distribution world has

Avnet CEO Phil Gallagher

**"Relationships and trust matter. Our customers and suppliers have choices and they will choose to do business with people they trust"**



consolidated in terms of suppliers and distributors over the last 10 years, and over that time, expectations from our customers and suppliers have increased," said Marano.

Customers expect that distributors "supplement their efforts across a broad range of new and existing technologies" such as embedded, security and cloud," he said.

Suppliers, meanwhile, want to broaden their customer bases into the "mass market of OEMs and we've had to adapt our approach to ensure that we provide them the scale they expect from us," he said. As a result, Arrow has invested in engineering and technical resources and tools, ERP systems, and a broadened sales team and digital platform.

#### More design activity

Marano said there has been a significant increase in customer design activity as "our customers have continued to innovate even during the pandemic period." "Specific market areas where we have seen activity is aerospace and defense, communications, consumer and industrial," he said. Arrow is seeing "broad adoption and interest in new technologies such as silicon carbide, security and cloud deployments," said Marano.

Gallagher noted that distribution design support is growing in North American and other regions of the world. "For years all the designs were done in the West and all the production was done in Asia-Pac. That's not the case anymore," he said. While there is still a lot of design in North America, more design work is also being done in Asia, he said.

"We're still doing a lot of design work and our customers expect us to do design here and service the supply chain wherever they manufacture," he said.

Buyers can expect distributors to invest in services such as design, value added and cloud capabilities. Digital platforms will continue to proliferate to provide customers with a full on-line product development experience.

While change is inevitable in the electronics industry, there are aspects of distribution that will never change. One example is relationships between distributors and their customers and suppliers.

In distribution, "relationships and trust matter, said Gallagher. "People do business with people they like and trust. Our customers and suppliers have choices and they will choose to do business with people they trust, he said. "That will never change."



# Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
<b>CABLE ASSEMBLY &amp; HARNESSING</b>											
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
<b>CIRCUIT PROTECTION</b>											
Bourns	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
<b>ENCLOSURES</b>											
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
<b>FREQUENCY MANAGEMENT</b>											
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.digikey.co.uk	Y	500	£250,000	0	100%	15	130	Y
<b>HEATSINKS</b>											
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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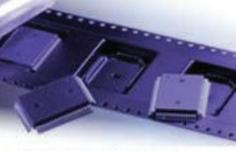
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Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
<b>ICs &amp; SEMICONDUCTORS</b>											
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
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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
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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
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
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 Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
<b>OBSOLESCENCE / HARD TO FIND</b>											
	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
<b>OPTO ELECTRONICS</b>											
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
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
<b>PASSIVES</b>											
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
<b>POWER &amp; BATTERIES</b>											
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	☒M	£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
<b>SENSORS</b>											
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
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

# Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
<b>SWITCHES &amp; KEYBOARDS</b>											
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
<b>TERMINAL BLOCKS</b>											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
<b>THERMAL MANAGEMENT</b>											
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
<b>TRANSFORMERS &amp; INDUCTORS</b>											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	24	Y
<b>WIRELESS SOLUTIONS</b>											
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
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£10m	Essex/SE	100	7	AS9100 Rev D, ISO9001:2015, ISO 140001:2015, UL, CCC, IPC-610-G Class 3	Y	Y	Y	Y	Y	Y
CML Innovative Technologies (uk) Ltd	01284 714700	www.cml-it.com	£12M	UK/EU/China	65		ISO9001, TS16949, UL ISO9001 2015, IATF 16949 2016	N	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£12.5m	UK & Far East	72	10	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£18.6m	Andover (Hampshire)	130	6	AS9100 ISO13485 ISO9001 IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electrica.co.uk	£2.4m	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	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.7m	SE	50	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£11m	Hampshire	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.6m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC-J-STD-001, IPC 7711/7721	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Incap Electronics UK Limited	01782 753200	www.incapcorp.com	£13m+	UK, Slovakia, Estonia & India	1,300	20	ISO9100, ISO14001, ISO13485, AS9100D, ISO45001 & IATF16949	Y	Y	Y	Y	Y	Y
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iwec.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£10m	UK	90	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
KEY-TECH ELECTRONIC SYSTEMS	01592 597711	www.key-tech.co.uk	£5 Million	UK	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711, BS EN ISO13485:2016	Y	Y	Y	N	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£15.9m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
Speedboard part of NOTE	01753 746700	www.speedboard.co.uk	£115m	UK/EU/China	1,050	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001, ISO14001, IPC-A-610 Class 3, IPC-7711/7721, WHMA-3620, Certified IPC Trainer	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, IPC-A610 Class 3	Y	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	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£8.2m	SE	77	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£16m	Derby	130	6	ISO 9001, ISO 13485, ISO14001, IPC 610, 620, 7711/7721	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	5	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

## C-CLASS COMPONENTS

Essentra Components	0845 758 5070	www.essentracomponents.co.uk	£283.3m	UK	2500		UL / CE / IATF	N	Y	Y	Y	N	Y
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# PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie Printer 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 Ltd	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 9001:2015, EN 9100:2018, EN 9104:2013, UL796, ISO 14001:2015	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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