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Covid-19 eight-page Special Report
Page 27

Ventilator specification



+ we list CEMs offering box build with ISO13485 (medical accreditation)

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On the cover – April 2020

The NHS needs our help!

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Editor's Word



Hammer the curve

I've never spiked three leaders in a month but this month is different. Just as I finish my research and get the words onto paper, the global impact of the pandemic evolves, and my words are rendered meaningless. We go to print now so this is all I have to say.

Respect to all healthcare workers who are fronting-up the fight against an invisible enemy that kills at will. Respect to all the companies who are re-tooling to manufacture medical supplies so desperately needed. Respect to all the groups of designers and engineers who are rapidly prototyping ventilators for immediate mass production. Respect to all the people, who leave their homes every day to keep the fabric of society running. Finally, respect to everyone who just stays at home as requested.

Am I being over dramatic? As an engineer I have a rough understanding of the term 'exponential'. Trust me, being on the downside of any exponential event is not a good place to be. National health systems are not designed for exponential events. You can't 'ride' an exponential curve, you have to hammer it flat, and fast.

The articles in this issue were written across several weeks. Given the pace of change, which is almost hourly, some of the information is likely to have been superseded by the time you read it. Please take this into consideration as you work your way through the pages.

I hope to be back next month with news that the curve is being hammered hard and emergency ventilators are flowing off thousands of production lines the world over. Hope it is then.

Jon Barrett

N ES News

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LaunchPad SensorTag in stock



Mouser Electronics has introduced TI's SimpleLink LaunchPad SensorTag kit. The enclosed and battery-operated kit is designed to enable rapid prototyping, helping Internet of Things developers evaluate new product ideas without having to develop hardware or software from scratch.

The kit offers integrated environmental and motion sensors, multi-band wireless connectivity, sub 1GHz swivel antenna and software. The kit incorporates the CC1352R SimpleLink multiband and multiprotocol wireless microcontroller, which supports concurrent sub 1GHz and 2.4GHz operation in a single-chip device. Enabling a variety of networking options, the microcontroller's FCC, CE and IC-certified radio is compatible with Bluetooth Low Energy, Thread, Zigbee and 802.15.4 PHY and MAC.

Developers can use this kit with other kits in the LaunchPad ecosystem to create custom topologies, using the microcontroller's broad offering of connectivity stacks. The SensorTag kit also includes ambient light, temperature and humidity, Hall effect, and accelerometer sensors, with the flexibility to add many more through TI BoosterPac ecosystem and other components.

www.mouser.com

Buying into RF expertise

Cambridge-based Plextek Group has sold microwave chip design business, Plextek RFI, to CML Microsystems.

Plextek RFI specialises in RF, microwave and millimetre-wave ICs and modules. The team has completed in excess of 100 IC designs, operating at radio frequencies up to 100GHz and is a third-party approved design house for a number of semiconductor companies. Experience includes: front end ICs for mm-wave 5G; broadband monolithic microwave ICs; receiver, transmitter and power amplifier ICs for microwave links; and GaN PAs for commercial and defence applications.

CML's group managing director, Chris Gurry, said: "PRFI's dedicated and experienced team enhances our strategy for expansion within communications markets. Their design expertise expands upon the Group's existing skills."

www.cmlmicroplc.com



Prep your BoM for AI

Farnell research confirms strong adoption of AI within IoT devices. AIoT is the major emerging trend from the survey, demonstrating the beginning of the process to build a true IoT ecosystem. Research showed that almost half of respondents already use AI in their IoT applications, with machine learning the most used technology, followed by cloud-based AI.

Security continues to be the biggest concern. Businesses treat IoT security as a top priority by implementing hardware and software security to protect against potential threats. Ownership of collected data is another important aspect of security, with respondents preferring to own the data collected by an edge device as opposed to the IoT solution provider.

Farnell's global head of technical marketing, Cliff Ortmeyer, said: "Opportunities within the Internet of Things and AI continue to grow, fuelled by access to an increasing number of hardware and software solutions which enable developers to bring products to market more quickly than ever before, and without the need for specialised expertise. This is opening up IoT to new entrants, giving more developers the opportunity to innovate to improve lives."

www.farnell.com



Data acquisition platforms ready to ship

Analog Devices and Arrow Electronics have worked with Trenz Electronic to produce three ready-to-use data-acquisition platforms that relieve design and manufacturing challenges for developers of professional measurement instruments.

The AnalogMAX-DAQ1, Q2 and Q3 combine an Analog Devices' data acquisition signal chain and power solution; an Intel MAX 10 FPGA and a memory subsystem comprising up to 64Mb 166MHz SDRAM, 64Mb Quad SPI Flash; and 4Kb EEPROM in a 86.5 by 25mm form factor. With a Micro USB receptacle, 23 GPIOs and two SMA connectors, these platforms can be deployed in portable instrumentation and desktop equipment such as medical devices, as well as process-controllers and automated test equipment.

www.arrow.com

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ES News

In Brief

A green future?
EU Automation believes manufacturers could do more to boost energy efficiency, reducing demand for energy and raw materials to cut carbon emissions. Solutions include designing waste out of the production process and choosing to repair equipment when it breaks down. Industrial automation parts suppliers can often source new, reconditioned or obsolete parts so the facility can quickly return to production.
www.euautomation.com

Strong connections
The Interconnect Technology Suppliers Association has released figures showing that the UK connector industry is faring well despite various challenges in 2019. Against the backdrop of Brexit uncertainty, which stabilised in the second half of the year, ITSA members saw a revenue growth of five per cent over 2018. Key market areas include mil/aerospace, mass transportation and communications.
itsa.org.uk

Accelerating European innovation
Maxim is to open a new design centre in Dublin, Ireland, which will focus on product development and research in analogue semiconductor design. The company will recruit a strong team of mixed-signal and analogue design engineers to staff the new facility. The $25M investment will be geared towards recruiting talent, equipment and building costs, with the new centre becoming Maxim's seventh design centre in Europe.
www.maximintegrated.com

Enhanced high voltage access
SIGA Electronics has announced that it is enhancing its high-voltage and high-power transformer capability through the acquisition of Stabilised Transformers, a transformer manufacturer based in Wolverhampton. Customers will continue to enjoy access to Stabilised Transformers products, now delivered by a larger organisation with additional capabilities.
www.sigatransformers.co.uk



Exclusive availability for DT connectors with Snap-Cap

TE Connectivity's Deutsch DT two and three-position Snap-Cap connectors are now available in Europe from TTI. Snap-Cap connectors are recent additions to the DT connector line, often used for applications in harsh environments such as truck, bus, construction and agricultural vehicles.

DT connectors are used to make wire-to-wire connections; to connect wires to integrated header modules on printed circuit boards; and to provide low power and signal-level communications for sensors and actuators.

The Snap-Cap variant adds cap plugs that have enhanced front-seal retention and a secondary wedge-lock design. The front seal can be replaced in-field, an advantage over moulded-in designs.

Other enhancements include improved wire alignment to maximise seal performance when wires experience a side load; the ability to configure the connector's rear snap-in seal cover caps in standard or extended shrink-tube cap variants; and a choice of normal or thin wire-seal options to accommodate a wide range of wire insulation thicknesses. Housings can be specified in standard black and grey colours.

www.ttieurope.com

Performance connector backshells are UK-made

Weald Electronics has announced a new family of backshells for MIL-DTL-26482 Series 1 and MIL-DTL-38999 Series III and IV connector systems.

The LMA19 series of sealing and strain relief backshells are manufactured with a variety of RoHS compliant finishes. Weald's sole distributor, Lane Electronics, has stock of standard backshells, in a variety of sizes and finishes, for next day delivery. There is no minimum order quantity or value on standard products.

Designed to protect the integrity of cables and connections, the backshells provide cable support to prevent bending and over flexing, plus protection against water and dirt ingress when used with a heat shrink boot. These are two-part components allowing uncoupling for inspection and repairs without damaging the boot.

LMA series backshells feature full 360deg screening against EMI/RFI interference and come with a tool-free constant force spring or band strap.

For those requiring a non-standard backshell, Weald's design and prototyping team works with customers to develop bespoke solutions.

www.wealdelectronics.com

E-commerce accelerates

After an upgrade, Anglia claims its Anglia Live website is one of the fastest, most flexible e-commerce sites in the electronics industry. The site's new and enhanced features include a completely configurable parametric search, allowing customers to compare devices, guiding them towards the best solution.

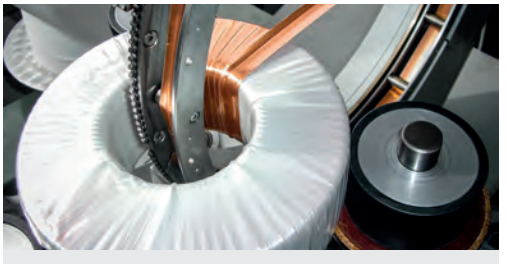
The search facility is geared towards engineers and buyers. Users can apply multiple filters to a single search and the parameters automatically turn grey when narrowed down to only one option. An innovative undo feature allows users to undo changes rather than resetting the whole search.

Users can compare specifications without opening each individual page, saving valuable time. Likewise, the search is fast, generating thousands of results in less than a second based on keyword, part number or industry standard number.

Email notifications alert users when a component is coming into stock or when inventory becomes low. Anglia's free Ezysample service is integrated into the site, as is Anglia Sigma which details a customer's delivery performance, breakdown of enquiries and billing data.

Customers can save regularly purchased products as custom Order Pads to save time.

www.anglia-live.com



Refined product line improves support

Demystifying component choice is the primary motivation behind REO's decision to streamline its products. Instead of offering a 'buffet' of options and leaving buyers to fend for themselves, REO is now offering fewer choices, supported by more comprehensive advice. The aim is to help buyers make the correct decision, first-time.

Another aspect relates to the electrical component supply chain. Demands, such as the rise of electric vehicles, have accelerated quickly. While supply has increased, international tariffs and trade disputes over raw metals have exacerbated shortages.

This has increased lead times for devices including these components. For example, some capacitors' lead times have extended from 15 to over 30 weeks in less than three years. By reducing the number and variety of devices on offer, earmarked component stockpiles can be reassigned to where they're required.

www.reo.co.uk

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Brexit clarity brings confidence boost

The breaking of the Brexit impasse has led to a surge in confidence among the UK's SME manufacturing businesses, according to the latest national *Manufacturing Barometer* report.

The previous quarterly study revealed a sector experiencing its toughest quarter in a decade, with more SME manufacturers reporting a reduction in sales, profits and staff numbers than in any period across the last ten years. However, the latest *Manufacturing Barometer*, published by SWMAS and partner Economic Growth Solutions, highlights a marked uplift in confidence among manufacturing businesses following the UK's exit from the EU at the end of January.

Almost half say they are more confident about their prospects than this time last year, with 22 per cent feeling broadly the same and 32 per cent feeling less confident.

SWMAS' managing director, Simon Howes, said: "The foot is coming off the brake. The forecasts for the first six months of 2020 are starting to look much more positive. We are not yet at the end of the road regarding Brexit, but it seems that we have at least decided which road we are going to take, so our manufacturers can begin the journey.

"Political certainty appears to have improved clarity, resulting in a (partial) return to confidence in future sales and profits. This, in turn, should lead to more confidence in investing and recruiting."

Some 41 per cent of firms say sales have increased in the past six months, while 60 per cent of SME manufacturers expect sales to increase over the next half-year. The percentage of businesses expecting investment in plant and machinery to increase in the next six months is up 14 per cent from 37 to 51 per cent.

Howes concluded: "The general clamping down on investment and recruitment decisions is finally easing. Customers are now coming forward with plans which were previously on hold."

www.swmas.co.uk



Buying into cyber defence

Nexus Industrial Memory is now supplying the new CryptoAuthentication line of memory tokens. The line comprises four products (IAT4.5Kb, IAX4.5Kb, IAT10.5Kb and IAX10.5Kb), all suited to embedded systems that require cyber robust removable memory devices for applications that include the transfer of passwords or the physical transfer of security keys, certificates, sensitive data or system configuration files.

At the heart of all the devices is a Microchip CryptoAuthentication high-security hardware IC. Its features include a unique and non-changeable 72-bit serial number (set by Microchip), 512bit one-time programmable (OTP) zone, random number generator and SHA-256 hash algorithm for data encryption.

Nexus Industrial Memory's managing director, Michael Barrett, said: "Datakey CryptoAuthentication tokens combine the best of both worlds, namely silicon geared for high security applications and a rugged form factor that makes them ideal for use in harsh environments. Our specialists are on hand to help customers make their applications as reliable and as secure as possible."

All four tokens are compatible with the Datakey SlimLine, available in PCB-mount and panel-mount form factors. In addition, several panel-mount receptacles in the range have IP65 or IP67 ratings and are available with a locking connector for high-vibration applications.

www.nexusindustrialmemory.com

Flash PMI shows fast growth

The *UK Flash PMI* reveals manufacturing output has grown at the fastest rate in ten months, hitting 52.8 up from January's 50.1, despite emerging signs of supply chain disruption from the deadly coronavirus outbreak.

However, numerous car makers, including Jaguar Land Rover, face halted production lines in the coming weeks as Chinese factories remain shut, spelling trouble ahead. Stocks of inputs are falling at the quickest rate for over seven years and vendor lead times are lengthening to the greatest extent since March 2019.

This has highlighted the industry's reliance on key components from the Far East, and how unstable this can be for the economy.

CEO of electric vehicle battery manufacturer AGM Batteries, Kevin Brundish, warns that the UK must prioritise the creation of an on-shore, full cycle supply chain if the manufacturing sector is to grow and meet the growing demand for electric vehicles and energy storage.

Kevin said: "The electrification of vehicles is a crucial factor in achieving the UK's carbon neutral 2050 targets. In order to meet the unprecedented demand for electric vehicle battery production, the UK will need the equivalent of a staggering eight 15GWh factories by 2040.

"With battery demand for the automotive and energy storage market set to skyrocket, leading British manufacturers like ourselves are hoping for investment in the infrastructure needed to service the industry. The UK's economy can be boosted with manufacturers who are able to keep up with the huge expansion of this market and create jobs.

"Battery supply for the UK manufacturing industry is already struggling to meet demand, and in response, the UK Government should continue to prioritise the creation of on-shore, full cycle battery plants instead of relying on large scale manufacturers abroad. It is costly and increases carbon footprint to have these batteries imported, especially when the UK has the talent and capabilities at home."

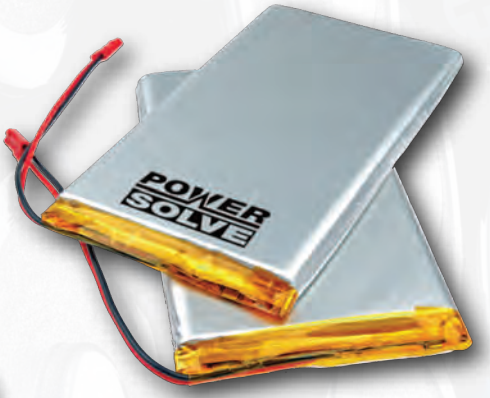
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POWER SOLVE

The Electronic Component Show

Electronic Component Show rescheduled

Jack Pollard explains that following the escalation of the COVID-19 outbreak the Electronic Component Show has been provisionally rescheduled to 20 May 2021*

Following press briefings by Boris Johnson, UK chief medical officer Professor Chris Witty and chief scientific advisor Sir Patrick Balance, the responsible and correct action to take is rescheduling the *Electronic Component Show* to 20 May 2021.

What factors have led to this decision?

First and foremost, we will not risk the health and safety of our exhibitors, visitors and staff. Given how quickly the spread of COVID-19 has been, we are not willing to put any member of this community at risk. The new date gives the industry time to deal with these unprecedented circumstances.

Why postpone until 2021, not later this year?

We are already seeing many shows postpone until late Q3 and Q4 this year. In what is already a busy time of year for shows, visitors and exhibitors can only attend so many events in short time. There is no evidence suggesting a date that the country will be back to normality. To save possibly re-scheduling again, we have decided to push back a full year.

I was planning to attend one of the seminars, what now?

In May, we will be producing a tabloid *ECS* edition containing written presentations of the seminars that were due to take place. If you are a registered reader of *Electronics Sourcing* UK or you were pre-registered for the event, you will receive a free copy.

What about my registration for the 2020 show?

Your pre-registration will be automatically transferred across to the 2021 event, so nothing to worry about.

Now, on a more positive note.

Where will the 2021 event be?

We are delighted to announce a new venue for the *Electronic Component Show 2021* will be the Imperial War Museum Duxford*.

When will the 2021 event take place?

Thursday 20 May 2021*

Why Duxford?

Britain's largest aviation museum, Duxford houses the museum's large exhibits, including nearly 200 aircraft, military vehicles, artillery and minor naval vessels in seven main exhibition buildings. For an industry that is so deeply involved in aerospace technology and so incredibly vital to aviation design and development, it's the perfect venue for design engineers and buyers to source the electronics they need. Some may even be working on the next big breakthrough in aviation. So, you can attend, source the electronics you need and kick back in the home of a MK7 Spitfire or prototype Concorde.

Anything else I need to know?

Fortuitously, we have been making plans for the next event for some time now. We are disappointed that we cannot bring you the show this year, however, we are truly excited about the plans we have for 2021. To all purchasers, design engineers and members of the electronics community: watch this space.

**Subject to official confirmation*

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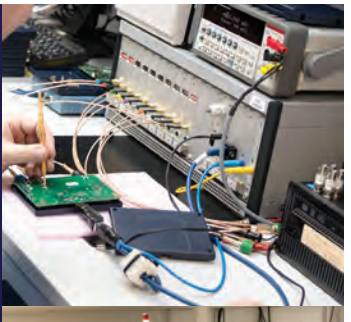
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Spotting counterfeit components

Cupio's MD Andy Bonner looks at the counterfeit types that can be encountered and then discusses how to combat their influx

As electronics manufacturers and distributors face an ongoing and significant threat from counterfeit components, they must protect themselves appropriately.

The Semiconductor Industry Association classifies counterfeit parts into the following types:

- Incorrect or false markings and/or documentation
- Unauthorised copy
- Not produced by the original component manufacturer (OCM) or produced by unauthorised contractors
- Off-specification, defective or used OCM product sold as new or working
- Does not conform to OCM design, model and/or performance standards

A comprehensive counterfeit-trapping strategy will include x-ray inspection, electrical testing and acoustic micro-imaging working together.

X-ray inspection

High-resolution x-ray inspection lets users see inside components without destroying them and compare them with known good parts. Components that appear externally identical often have internal differences. Anomalies in lead wires, die sizes/positions and truncated pins can all be identified.

Overall, x-ray inspection, using a high-resolution x-ray microscope like Nordson Dage's Explorer can facilitate rapid detection of counterfeit components. The machine is simple to use, and components can be inspected while still sealed in their shipping materials, making them logistically and commercially easier to return if necessary.

Electrical testing

Electrical testing is used to check a component's performance against its published specification. This is done by analysing the component's pins' electrical characteristics under dynamic stimulus. The pin response relates directly to the component's nature, internal structure and manufacturing processes. This strongly indicates whether the component's bond wire and die configuration conform to the expected specification.

Acoustic micro-imaging

Acoustic imaging complements x-ray techniques by providing information on different aspects of component integrity.

Nordson SONOSCAN acoustic imaging technology, for example, transmits high-frequency sound waves into the sample immersed in deionised water. Reflected sound waves help to accurately identify internal dimensions, cracks, voids, delamination and interface quality issues characteristic of re-used components. A layer-by-layer analysis of material properties as well as material consistency and thickness help separate the real components from the imposters.

Accessing counterfeit detection technology

An x-ray machine costing in the order of £100,000 represents a significant investment. This can be amortised by also fulfilling roles in production and quality control. Larger companies may justify the expenditure by considering component volumes versus potential cost of a counterfeit contamination.

Alternatively, companies like Cupio offer inspection and testing services. With no ties to any component manufacturer or distributor, it can provide impartial third-party advice and results. Costs, although dependent on the nature and amount of testing, would be a fraction of any capital machine expenditure.

www.cupio.co.uk



Cupio's Basingstoke non-destructive inspection facility

Reflected sound waves help to accurately identify internal dimensions, cracks, voids, delamination and interface quality issues characteristic of re-used components

Two-day QPL assembly

Hampshire-based NYK Component Solutions is offering a fully qualified QPL released two-day assembly service on MIL-DTL-38999 III circular connectors. Working with Conesys, NYKCS has increased the stock profiles and installed additional assembly equipment at the new facility in Southampton.

With three shell styles and 52 insert arrangements available, plus various keying and plating options, the assembly service lets NYKCS supply a huge range of approved components quickly and efficiently.

NYK Components' CEO, Kevin Wells, said: "We are focused on providing flexibility, quality, best price and delivery to our customers. By building MIL-DTL-38999 III in just two days we are strengthening this offer yet further. We would love to do this quicker, but we are limited by cure times on some of the materials used."

NYK Component Solutions is a franchised distributor of electrical connectors and accessories for aerospace and industrial applications. Qualified to AS9100 Rev D, AS9120 Rev B and QPL listed, the company works with manufacturers to provide customers with flexible access to an extensive and unbiased selection of approved interconnect products. This includes circular connectors, circuit board connectors and connector accessories.

From its Southampton HQ, NYKCS operates an integrated quality management and order workflow system. This provides customers with access to a flexible inventory of approved and certified components designed to meet the needs of the most demanding supply chain.

www.nykcs.com



Options include three shell styles and 52 insert arrangements

"The company works with manufacturers to provide customers with flexible access to an extensive and unbiased selection of approved interconnect products

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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

John Denslinger guides readers to trusted sources of data, information and advice in the face of Coronavirus concerns

COVID-19 • By John Denslinger

America catches a cold or more accurately, a virus. Never did I imagine a pathogen would threaten the health of the electronics industry. Just last month, I cited the enormous progress in trade negotiations with the signing of USMCA and the certainty it brought to our industry. Well, the certainty I spoke of was short lived. In less than three months, fear has spread faster than the virus itself. COVID-19 better known as Coronavirus has unnerved governments, financial markets and economies around the world.

I don't wish to understate the toll on humanity the coronavirus may cause. The potential global impact could be staggering. The origin is suspect. The contagion is uncertain. Screening is limited if not inadequate. There is no known inoculation or vaccine for prevention. Quarantine and containment appear to be the only defence at this stage.

Fortunately, companies responded quickly with caution and concern. Paramount was the health and safety of their employees. Accordingly, travel was halted to hot zones in China and elsewhere, manufacturing plants in the affected areas closed, and supply chains temporarily disbanded.

Much has been written already about COVID-19's impact on the supply chain. It's an assessment best communicated by experts. My interest is tackling that next question: where do I go for information and guidance that best protects my business and my employees going forward?

Governments are involved. China instituted massive quarantines and restrictive travel within its borders. Other overseas countries stepped up their own border controls, restricted citizen travel to/from China, and instituted scanning of international passengers. In the US, our Federal Government leads on several fronts: the CDC is providing timely updates and resources; the President formed a Coronavirus Task Force; the CDC and Customs & Border Protection implemented enhanced screenings on arriving travelers; DHS issued supplemental instructions for inbound flights and individuals who have been in China; and USCG issued guidance for marine vessels, people and materials entering US ports. The National Association of Manufacturers' website www.nam.org is an excellent resource for keeping up to date on these matters.

Specific to the electronics industry, I suggest ECIA's website www.ecianow.org for relevant information. An initial survey in early February revealed most companies struggled mightily with visibility. By the end of February nearly all could describe the coronavirus impact on: on-time delivery and the likely disruption recovery period. If you are looking for more detail, Dale Ford, chief analyst, compiled the data by semi, passives and electro-mechanical. Similarly, the February 2020 TPC Semi Industry survey confirmed the weak outlook for Q1 largely due to product availability but did note the positive bookings outlook for Q2 that somewhat supports a production recovery. Lastly, it's worth listening to a podcast hosted by ECIA featuring Chad Moutray, chief economist at NAM. Basically, he says it may be several more weeks before we clearly know if this was just a Q1 disruptor or a calendar year issue. This comment became more understandable in my recent conversation with Dave Doherty, president & CEO, Digi Key. Dave pointed out unforeseen delays for a number of companies wanting to resume full production. He cites up-stream raw material supply problems as the root cause. In general, it's far from clear when supply lines will actually normalise.

Bottom line, verify your suppliers' resumption plans with a critical eye, keep abreast of governmental actions, stay alert to CDC directives, and above all, know it will be certainty that restores the industry to good health.



Ready to interact with video wall technology?

Zytronic has debuted a new technology for interactive video wall applications featuring seamless touch transition between screen tiles.

To build an interactive video wall, designers typically fix protective glass panels to each display and then use a clip-on infra-red or camera-based touch detection system, which creates a protruding bezel. Unfortunately, infra-red and camera-based touch detection technologies tend to be susceptible to false and accidental touches and can be confused by strong sunlight or by dirt and debris accumulating on the surface.

The new Zytronic projected capacitive solution removes both these issues, enabling ultra-fast, accurate touchscreen responses and providing borders that match the latest near-borderless LCDs. Each zero-border ZyBrid screen is supported by its own ZYX500 multi-touch controller, which outputs to a single master controller. Zytronic's proprietary firmware combines the data from the individual controllers, presenting a set of x-y co-ordinates to the host computer as a HID plug and play touchscreen device. Instead of individual touchscreens, the computer 'sees' one giant touch sensor, no matter how many people are interacting on the video wall.

Individual screens can be tiled, and multiple touch controllers linked to create huge, near-borderless interactive walls, with each thermally toughened glass touch sensor providing durable, vandal-resistant protection for displays beneath.

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Simple sourcing for smart buildings

Bridgetek has introduced a collection of display units to accompany its PanL building automation platform. Providing optimal performance and features, the units cover a diverse array of prospective uses.

With dimensions of 192 by 125 by 26.4mm, the PanL70 is employed in the PanL Smart Living Solution. It boasts an 800 by 480 pixel resolution TFT display that delivers an output of up to 420cd/m² with a 65deg viewing angle. Up to five touchpoints are supported through the PanL70's capacitive touchscreen. Its audio attributes consist of either a 90dB buzzer or a 1W mono speaker. A MEMS microphone and an ambient light sensor have also been incorporated.

Other options in the range include the PanL70Plus, which is part of the PanL Room Manager solution. Featuring slightly bigger overall dimensions, this version can house a 13.56MHz RFID reader, as well as an LED matrix status indicator. Another option is the five-inch PanL50. This relies on an FT813Q EVE graphics controller but has the same 800 by 480 resolution as the larger form factor units. It likewise comes with buzzer or speaker options and has multi-touch capabilities. Where smaller scale hardware will prove preferable, the PanL35 is a 3.5-inch touch/audio-enabled display unit with 320 by 480 resolution.

All units have RJ45 serial ports, which means that they can get both power and data using the cabling already installed within the building, via Power-over-Ethernet (PoE).

www.brtchip.com



First choice for fibre optics

New from OMC, the FDE2850 series fibre optic transmitter diode is optimised for use with 200µm glass fibre optic systems. It is designed to deliver high power at fast speeds for demanding applications, such as those found in mass transport, petrochemical, industrial datacomms and high-voltage energy infrastructure.

The emitter is available as a housed fibre-optic transmitter module in a range of housing and connector styles. The device delivers a typical coupled power of 813µW at 100mA into 200µm glass optical fibre and can also be aligned to deliver power into fibre sizes as small as 50µm. Operating at the infrared 850nm wavelength, the device features a fast rise and fall time of 12ns.

Following investment in enhanced capacity, OMC has reduced manufacturing lead times on this part. OMC can turn around transmitter batches based on the FDE2850 in around six to eight weeks.

www.omc-uk.com



In touch with robust GUI demand

KOE has expanded its range of LCD display modules with projected capacitive and Pixel Eyes in-cell capacitive touchscreens.

Screen-sizes for the bonded projected capacitive touchscreen line-up range from 6.3 to 12.3in with resolutions from 800 by 280 pixels up to 1,920 by 1,200 pixels. Pixel Eyes in-cell capacitive touchscreen technology features on the new 8.8in TX22D200VM0BVA and 10.2in TX26D208VM0AVA modules. KOE's proprietary Pixel Eyes technology integrates projected capacitive touch panel functionality into the LCD cell.

Key features of both types of display are said to include accurate and flexible touch interactions; support for multiple touch points; consistent performance with up to 8mm protective cover glass; and compatibility with wet fingers or gloves.

Both the PCap and Pixel Eyes touchscreen display modules are suitable for graphical user-interface applications that require a robust, reliable touch interface offering precise and flexible gesture interaction.

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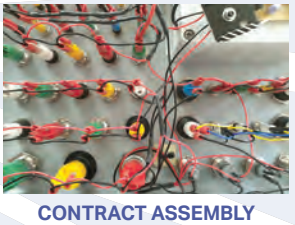
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Distributors grow inventory to win new business

Some distributors have increased inventory levels of new and old components as well as components that are in short supply

James Carbone

Some electronics distributors have been aggressive about increasing inventory levels over the last two years as a way of attracting new business and increasing business with existing OEM and electronics manufacturing services customers.

In some cases, distributors are increasing their breadth of inventory by adding products from new suppliers. In other cases, distributors are stocking new part numbers from existing suppliers as well as older components that they previously listed on their websites but did not stock. Distributors are also making a point to increase inventory levels of semiconductors and other components when lead times for parts stretch and are at a risk of going on allocation.

Frank Cantwell, vice president of product management and inventory at Allied Electronics, said the distributor has increased its breadth and depth of inventory over last 12 to 18 months in part because of supply tightness for certain components. "We try to maintain a buffer for customers so they don't have supply chain interruption," said Cantwell. "We have to maintain the appropriate fixed stock levels during those shortages or allocations. We work with our manufacturers as best we can to manage that so our customers don't see a disruption in the supply chain," he said.

But Allied has also added new products involving technology segments. For instance, it has added products to support IoT applications. Allied is also increasing its breadth of inventory to strengthen the position it has in the industrial market, said Cantwell.

Some distributors view inventory as the lifeblood of their operations. "Stocking a broad and deep inventory of components has always been a cornerstone of our business and it always will be," said Don Akery, president TTI Americas. "We have been strategically increasing the breadth of part numbers we carry throughout the last several years," he said.

Last year, TTI increased the part numbers it carried by 11 percent and "that is a trend we expect to continue as our suppliers introduce new products," Akery said.

TTI also increases its inventory when demand increases and "we begin to see extended lead times. Our algorithms drive an increased level of inventory," he said. The idea is to build its depth of inventory to make sure its customers can buy the parts it needs during shortages.

For instance, "our product team saw the signs of that the multilayer ceramic capacitor market (MLCCs) was tightening and started increasing our inventory in 2016. When the MLCC shortage came, we adjusted our stocking strategy to make sure we protected our customers," said Akery.



> "We are always looking to expand our breath of inventory. It's one of the things that is a tenet of our business"

Jeff Newell, vice president, products for **Mouser Electronics**

Increasing its breadth of inventory and increasing stock of parts in short supply helps TTI maximize customer service and to expand its customer base almost 40 per cent since 2015, said Akery.

Key to success

Expanding breadth of inventory is key to the business models of small volume distributors that supply parts for new product introduction. "We are always looking to expand our breadth of inventory. It's one of the things that is a tenet of our business," said Jeff Newell, vice president, products for Mouser Electronics. He said Mouser wants to provide its customers "the broadest offering of products to design into their next project. We constantly look to expand. We did that last year and we are continuing to look at that this year," said Newell.

He said Mouser will also add to its depth of inventory depending on the market environment. "In 2018, we were adding a lot of depth because business was very strong. In 2019, when business slackened, we reduced some of it," said Newell.

Mouser's "job one" is to add new products from the suppliers that it already carries, he said. "We put a pretty good percentage of all new products on the shelves and promote those products with customers," he said. But it also adds new suppliers to beef up its product offerings to customers. In recent years, Mouser added

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Micron, Xilinx and a number of sensor suppliers among others.

The biggest category of products that Mouser has targeted over the last several years has been memory, said Newell. "We never really had a big memory offering," said Newell. With memory, Mouser was concerned that its inventory would be overvalued because of "wild price fluctuations that occur with memory," he said. The company then decided that because memory was "a large percentage of the overall semiconductor market and a product that customers needed for design," it needed to add more memory products, said Newell. This distributor increased its memory offerings to include DRAM, SRAM, NOR and flash solid-state drives.

Because of the growth of IoT applications, Mouser has also increased its inventory of sensors. "Sensors have become a really hot product group. There are not really any big sensor companies left. Sensor companies seem to be the shiny new object because everyone wants to buy them," said Newell.

Building stockpiles

Another distributor that has boosted its inventory levels in recent years is Digi-Key. "We have approximately 3X the stock keeping unit (SKU) count that we had in 2011," said Dave Doherty, president and chief operating officer. "We have more than two times the amount of inventory that we had since 2011 and our sales have grown a little less than 2x."

Many of the components that Digi-Key has added are new products that its current suppliers have introduced. "Our primary mission is new product introduction and supporting engineering customers and the innovation that is occurring," said Doherty. Often that means stocking the latest and greatest products from component manufacturers. However, Digi-Key also adds older parts to its inventory that had been listed on its website, but it did not stock.

In some cases, Digi-Key will talk to its component manufacturers and tell them "we've listed this part as a non-stock product for five years and it hasn't gotten any traction. Why don't we actually stock some of them" so a customer can see the attributes of the part compared to other similar parts, he said. It gives users more choice.

When parts are in stock "our statistics show there are very few parts that have zero movement. They are finding a home somewhere," said Doherty.

Digi-Key and other distributors have increased their breadth of inventory because of Internet of Things. IoT has resulted in greater demand for certain components such as sensors, microcontrollers, power management ICs among others.

"There are clearly more sensor applications," said Doherty. Such applications also need other components for computational power and connectivity, he said.

Digi-Key also adds inventory when lead times stretch. "When we see signs that lead times are going to stretch, we buy up parts and we make sure we have enough to satisfy our customer base," said Doherty. "We did that in the second half of 2016 in advance of the two-year up cycle" During that time there were shortages of MLCCs, chip resistors and discretes.

With the outbreak of coronavirus, Digi-Key has added inventory in anticipation of tight supply as some component manufacturers have had to cut back production.

While Digi-Key adds inventory when supply is tight, it does not allow "a single customer to come in" and buy all of inventory of a scarce part, said Doherty. " We will inject additional inventory to hedge and protect our customers," said Doherty.

He said Digi-Key has also added inventory of less common parts. In some cases, a component manufacturer will develop a part for a specific customer application, but there may be more applications for the part.

Building inventory has been key to WPG Americas' growth over the last five years, said Ian Basey, vice president, supplier marketing and asset for the distributor.

WPGA is not a broad line distributor, but focuses on storage, memory, solid-state lighting and power, said Basey. "We have a small line card of about 75 suppliers," he said. The distributor has focused its inventory efforts with those suppliers.

He said that the distributor has been increasing its inventory for LEDs and memory. With memory, WPGA added inventory "across the board for flash, DRAM and solid-state drives."

With solid-state lighting, WPGA has increased inventory in part because horticulture is a big market for the distributor. Vegetable and other plant growers need lighting systems to grow plants indoors.

Much of the WPGA inventory building for LEDs has been with suppliers that it has used for years. "We have added some suppliers, but we've really stayed with the suppliers that we have on that side of the business," said Basey. "Cree is a longtime partner of ours and on the power side we have a company called ERP Power. They are a very big power company in the lighting space. Those are two big lines when it comes the horticulture market. We are buying more from the suppliers we have."



"Stocking a broad and deep inventory of components has always been a cornerstone of our business and it always will be"

Don Akery, president **TTI Americas**

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Anti-counterfeiting: what buyers need to know

RINA senior regulatory consultant Dr Alex Martin guides readers through the ramifications of counterfeit components, plus some remedies

Last year's report by the OECD and EU's Intellectual Property Office found trade in counterfeit goods was valued at USD $509 billion, an increase of nearly $50 billion from 2013. So, while global trade in legitimate goods may have stalled, trade in counterfeits is up. Unfortunately, electronics is the fourth most affected industry.

Counterfeiting is problematic on several fronts. Economic costs include lost revenue and unpaid tax. Also: counterfeiting spans components and finished products; many longstanding authorised distribution channels have been upended by ecommerce platforms; buying means sourcing from complex, multi-tiered international supply chains that are difficult to trace; and the impacts of counterfeits can be severe, even fatal.

Fake electrical goods present safety risks. Regarding chargers, attention escalated following the death of a 23-year-old Chinese flight attendant who suffered an electric shock when using a fake charger in 2013. Investigations followed, including one by the Electrical Safety First charity which purchased 50 chargers and found that 98 per cent failed one or more safety tests.

Counterfeit components pose potential safety, reliability and quality costs. With the rise of IoT and wireless technology, hacking risks also arise. Take the case of Marc Heera, imprisoned for trafficking counterfeit goods in 2015: specifically the Hondata S300. A plug-in module for Honda cars, the S300 adjusts air-fuel mixture, idle speed and other variables. Heera's branded counterfeits looked genuine but used reverse engineered PCBs. Honda warned that cars fitted with the counterfeit modules could experience various problems including RPM limits, failures to start and even hijacking of the brakes and steering.

What steps should buyers take to prevent purchasing counterfeits? To start, attempt to verify the legitimacy of the purchase. With components, this traditionally involved checking part numbers recorded in industry databases. However, counterfeiters can obtain and reference genuine part numbers on their components. So, the battle moves. Countermeasures now include tagging higher value components with fluorescent signatures that can be scanned for authenticity by their recipients and the exploitation of physical unclonable functions: phenomena embodied in physical structures that are easy to evaluate but hard to predict. Hence, buyers should be aware of anti-counterfeiting technologies and whether suppliers are employing them.

Consider approaching a test house or consultancy to perform analysis such as using a scanning electron microscope to show whether re-bonding has occurred. Individual materials can be subjected to accelerated stress testing to see if they perform as expected. Speak with several providers to see what methods they suggest and ask how the methods will provide verification.

As a strategic issue, vendor management should be decided at purchasing manager or director level. Preventing inadvertently purchasing counterfeits should always be part of a corporate strategy, meaning that if anything questionable arises it should be recorded and acted on which, in the worst case, might include withdrawing business.

With counterfeiting, prevention is better than cure. Guarding against purchasing counterfeits means being vigilant and following processes. Think through the checks and if they instil confidence. If not, consider what more could be done, like going to a third party for analysis.

www.rina.org



RINA senior regulatory consultant
Dr Alex Martin

> **Counterfeiters can obtain and reference genuine part numbers on their components**

Rising to the challenge

With the advent of Industry 4.0 and growing digitalisation, Rittal has enhanced its offer to enclosure purchasers with smaller models, which are both easier to specify and simpler to install

Rittal's AX and KX compact enclosures are designed to deliver simpler, faster assembly and component installation, greater flexibility and enhanced safety.

Rittal MD, Uwe Scharf, explained: "In conjunction with the introduction of our Blue e+ range and the VX25 large enclosure system, this means all our core products have been entirely redesigned, and are fit for Industry 4.0."

The digital age is increasingly making its presence felt in switchgear workshops with a growing need for automation, greater flexibility and product availability. Rittal provides effective support for the entire value chain surrounding the production of panels and switchgear, from engineering to ordering to automation.

The two latest additions to the Rittal enclosure portfolio contain improved features, along with new opportunities for value creation.

The time-savings start at the point of delivery: panels can be removed individually; doors and cam locks are easier to install; while the wall mounting bracket can be screwed into place from outside the enclosure without impacting the protection rating. This substantially reduces the risk of damage during transit as the brackets, which protrude beyond the sides of the enclosure, can be attached on-site.

The rising number of sensors and actuators deployed in the switchgear industry is raising the quantity of cables to be housed. The new enclosure's modular design, along with improved cut-outs and larger gland plates, creates, on average, a third more space for cables. In addition, integrated locators in the side panels enable the simple, precise and time-saving incorporation of interior installation rails.



As the rails have a 25mm spacing, the AX and KX can use accessories from the VX25 portfolio, such as lights or terminal blocks. This keeps the inventory of smaller parts to a minimum, with no need for machining and drilling.

Safety is a high priority for all Rittal enclosures. Fortunately, installing components into the AX and KX leaves their protection category unaltered and the same is also true of their UL certification. Overall, Rittal claims the new features make these compact enclosures more robust, and despite the greater number of potential use cases, the total number of components and accessories has been markedly reduced.

www.rittal.co.uk



Smoothing a bumpy ride

President of Digi-Key Electronics, Dave Doherty, explains how the company's core model helps purchasers ride the relentless cycle of expansion and contraction



President of **Digi-Key Electronics**, **Dave Doherty**

I'd say we're at a dynamic time in our industry, but I'm an optimistic guy and always see the glass as half full. As a company, we're definitely at an exciting point—our new 2.2 million square foot expansion is about 95 per cent complete, and advanced automation systems will be installed and tested ahead of our planned June 2021 completion date.

Aside from the construction, we've added more than 200 suppliers and over 300,000 new products over the last two years. We introduced our DK IoT Studio tool and continue to make website enhancements, so customers have the information they need as quickly as possible.

Weathering industry cycles

But it hasn't been all sunshine for the industry, which went through one of its greatest expansions and contractions over the last 24 months. Digi-Key remained remarkably consistent in its new customer growth and line items shipped desite some minor pullback in 2019 due to product lead-time expansion and contraction.

The period of 2017 to 2019 was as volatile as any three-year period since I joined this industry 35 years ago. Lead times for passive products indicate the volatility that has been experienced, depicting the disruption that occurred in 2017 and 2018 with a much steeper correction slope in 2019. This was a bit of a perfect storm, in particular with MLCC capacitors where the price point had been driven down to the point that suppliers were pulling out of that segment. This, combined with increased usage in areas such as automotive, caused disruption to the demand/supply balance.

An evolving industry

Our industry is characterised by newly developing markets that are engaged in innovative product introductions; this makes it difficult to predict customer acceptance and thus, actual demand. This reality will continue to make it challenging for suppliers to accurately predict and plan capacity requirements. Additionally, suppliers and traditional distributors are once again being pushed to reduce the amount of inventory they carry, placing even more burden on purchasing professionals.

A positive consequence of Digi-Key's core model, however, is that it has helped address this predicament. We continue to offer the broadest selection of product to support prototyping and NPI requirements. Because of increasing supplier minimum order requirements and our conservative philosophy, which places high value on holding inventory for immediate shipment, Digi-Key's growth has accelerated with customer segments characterised by a 'low to mid volume/high mix' model with very high service level requirements. We see this segment as the fastest growing portion of the domestic electronics market, where speed and service are essential.

We also see a growing trend with customers seeking machine to machine connectivity to automate repetitive functions like order placement, stock check and quotes. Digi-Key's robust, real-time application programming interface solutions thereby save customers time and money.

In closing, Digi-Key offers more than 10 million products globally, with more than 2.2 million in stock and available for immediate shipment. We have a great group of people dedicated to providing the best service, and tools designed specifically to support electronics purchasing professionals. Now that's something to get excited about!

www.digikey.co.uk





Hand-held enclosures deliver on comfort

Hammond Manufacturing has launched its new 1552 family of hand-held enclosures. Initially available in six sizes, the IP54 rated UL94-V0 flame-retardant ABS enclosure features an ergonomic design that fits comfortably into the hand, enabling it to be used for long periods in applications such as a machine controller or an electric hoist control.

Removable end panels support easy modification, and for use with flying cables, an alternative end panel with an integral cord protector and a strain relief bracket is available. An optional wall mounted holder allows the unit to be stored in a convenient location when not in use. Alternatively, the 1552 can be used as a desktop enclosure.

www.hammondmfg.com



Get a handle on enclosure sourcing

FDB Panel Fittings has introduced a new enclosure handle in traditional L format from DIRAK incorporating various features for increased versatility.

Managing director at FDB Panel Fittings, Gary Miles, explained: "In order to increase both the flexibility as well as the operating comfort, DIRAK has expanded the previous properties with a specific benefit. We now offer a new L-handle for padlock with a square threaded rod. This enables a precise adaptation of the height adjustment of cams with variably adjustable catches for standard cams."

Benefits are said to include easy and precise height adjustment of the latching cam, which enables correct fitment with square threaded rod to engage single or three-point cams. Stainless steel construction with a mirror finish provides corrosion resistance while IP65 sealing allows for use in indoor or outdoor environments. A concealed padlock feature enables secure closure in all situations.

www.fdb.co.uk



More choice on display

Rolec now offers a wider range of industrial electronic enclosures with windows for standard display modules and panels. These diecast aluminium, GRP and plastic enclosures are ideal for command electronics, IoT/IIoT, Industry 4.0, smart factory technology, process automation and machine control.

Options include the profiPANEL IP65-rated HMI enclosures, which can be mounted on a suspension arm or wall pivot. They can be supplied with the front plate fully machined to suit standard display panels from manufacturers such as Siemens and Beckhoff.

Other enclosures that can be supplied with a machined lid include the round aluDISC diecast aluminium enclosure, and the multi-purpose starCASE IP66 sealed enclosure. Both options can be mounted 'lid closed' to protect electronics.

Rolec's polyDOOR IP66-rated GRP enclosures are available with clear display windows in all eight sizes.

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Enclosure specification: get the inside info

Selecting an appropriate enclosure for industrial applications can be tricky, particularly given the changes in manufacturing. OKW examines the key factors to consider when weighing up enclosure choices

Plastic versus metal enclosures is a familiar dilemma—one that shows just how much choice purchasers now have in the age of industrial internet of things and Industry 4.0.

Plastic is at home in today's smart factories because they are spotlessly clean and less challenging and conversely, chic brushed aluminium looks fabulous in modern home automation systems. To help identify the right material for the application in hand, OKW has put together some key questions you may want to consider.

How tough should my enclosure be?

Plastic is surprisingly robust and quality levels have risen significantly in recent years. OKW is increasingly choosing ASA or ASA+PC-FR over ABS because ASA's UV stability makes it better able to resist the weakening effect of the sun's rays. High-gloss ASA is also easy to wipe clean, making it perfect for medical electronics and other hygiene-critical applications.

Should you need something stronger, consider folded sheet aluminium. This is best for desktop and 19in rack cases because it is strong, light and easy to work. OKW's metal enclosures division, Metcase, can manufacture customised enclosures in smaller batches because the tooling costs are low with no need to alter moulds or dies.

Stronger still and highly waterproof are Rolec's diecast aluminium enclosures for challenging industrial environments. Stainless steel is even tougher, although more work is required to make it waterproof.

But don't write off plastic for industrial applications. Rolec's glass-reinforced polyester enclosures offer excellent chemical resistance. OKW also manufactured various ASA+PC industrial enclosures, many providing versions of its diecast aluminium cases.

How waterproof should my enclosure be?

First, ascertain the precise nature of the water ingress threat. Will your enclosure be splashed, fully immersed, or must it withstand high pressure water jets or steam cleaning?

Diecast aluminium and moulded plastic enclosures will always have higher ingress protection or NEMA

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OKW's Easytec enclosures in tough UV-stable ASA plastic are suitable for industrial sensor and IoT applications

ratings than their folded aluminium counterparts because they comprise fewer case sections so there is less chance of leakage. Another critical factor is how well the sections clamp together. Don't assume that extruded enclosures are waterproof simply because they have a one-piece main body; it all depends on how the ends are capped.

How much customisation will I need?

Customising a standard enclosure is always more cost-effective than specifying a fully bespoke housing. Now, new technology is making it more cost-effective to customise cases in smaller volumes.

Any standard plastic or metal enclosure can be machined, finished, printed or laser marked but it pays to do your homework.

Folded sheet metal enclosures are easier to customise than moulded or diecast cases. Extruded aluminium cases can be cut to length easily, but you can't change their width or height without incurring re-tooling costs.

Profile-based aluminium enclosures also offer a wealth of opportunities. Rolec's multiPANEL and profiPANEL HMI/panel enclosures, for example, can be specified in any chosen size up to 800 by 800mm as standard.

Can I combine plastic and aluminium?

Combining aluminium and plastic can provide the best of both worlds, as in OKW's Synergy and Smart-Terminal enclosures. Applications include IoT/IIoT, gateways, data systems engineering, network technology, medical electronics, measurement and control.

OKW's vice president of marketing, Robert Cox, said: "Materials have been at the heart of so many of our innovations but even so, combining aluminium with plastics in the way we did has enabled us to offer so many more benefits."

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> **"New technology is making it more cost-effective to customise cases in smaller volumes**

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Break out of proof-of-concept purgatory



LOU LUTOSTANSKI, VICE PRESIDENT, INTERNET OF THINGS

Avnet's vice president, Internet of Things, Lou Lutostanski, offers a five-point guide to successful IoT implementation

Businesses spent $745 billion worldwide on IoT hardware and software in 2019 alone. Yet three out of four IoT implementations are failing. Why? One big reason: leaders are failing to go all in.

To make IoT successful companies need to transform not just hardware and software but the way their business works. These dynamic deployments require an entirely new approach, far beyond the traditional push to get new business applications off the page and into production.

If the right steps aren't taken in the beginning, you end up in limbo: caught between the dream of what IoT could do and the reality of today's ROI. That spot is called proof-of-concept (PoC) purgatory. Here are five signs you might be in PoC purgatory—and tips on how to escape.

1) Lots of data, and not much else

There's no surer sign of PoC purgatory than an IoT solution that produces only dashboards. Making data visible is futile unless AI makes it smart enough to drive organisational insights. This requires a clear, well-communicated business objective.

Objectives such as operational efficiency, customer service or revenue generation let users leverage the right technology to develop actionable insights. That's when cloud, customer, employee, public and real-time data meet the analytics that point to actions.

2) Pushback from unexpected places

It's surprising how many stakeholders come out of the woodwork including project managers, system integrators, operations specialists, installers, HR, marketing, sales and customer service: all have questions, comments and critiques.

Looping in all areas of business is crucial to get a proof-of-concept going. To maintain that momentum and avoid PoC purgatory you need solid change management plans. Customising communications to each stakeholder group will ensure they understand exactly what's in it for them.

3) Teams aren't speaking the same language

Make sure everyone is working off the same playbook. For example, informational technology and operational technology teams have long had their separate realms to play in. IoT requires the skills of both teams to succeed. They also need to trust each other. IT professionals need to trust OT devices to connect to their carefully constructed networks, while OT leaders need to feel comfortable with a new security stack interacting with their hardware.

It can take up to 10 partners to get an IoT solution to market, not including internal stakeholders. It's crucial everyone's moving in lockstep.

4) Can't get the CEO on board

Big initiatives take big support. Businesses get stuck when business managers love the idea, but the C-suite won't sign on. Pilots drag on and leaders become disillusioned. To avoid spinning your wheels, it's crucial to ensure all C-suite stakeholders, including the CEO, understand what your IoT deployment will give to the business.

Construct a simple roadmap from robotic arms and sensors, to factory insights, to dollars-and-cents impact on the bottom line.

5) Want to be in IoT, but you don't know why

Lack of an apparent use case is the most common reason people are in PoC purgatory. Considering IoT implementations can take a year or more, it is mission critical to have clarity on what the solution is trying to achieve.

Align around your use case first. Align your in-house capabilities and external collaboration around the technologies best suited for your objective. Align your data intelligence to ensure it's delivering insights that transform the business. Align employees around the business transformation—and retrain and reskill them continuously as the solution evolves.

When you align internal stakeholders to the business objective and ensure external partners are functioning as extensions of your team, a business goes from stuck in purgatory to full production and tangible payoff.

www.avnet.com

Ploughshares to ventilators

NOTE: Situations are changing by the hour. By the time you read this the NHS may already have the first batch of the 20,000 ventilators it has asked for. If not, read on

I don't quote from the Bible that often but over the years I've used the phrase 'swords to ploughshares' to describe the process of moving a state's productive capacity away from machines of war to more peaceful activities.

So, it came as a shock that I've coined a new phrase 'ploughshares to ventilators' in response to the government's request for JCB and other manufacturing OEMs to retool for the manufacture of 20,000 ventilators asap.

Don't ask but I know a little about ventilators. In normal operation human lungs draw air in via a vacuum created by the diaphragm muscle. Iron lung aside, when human respiration starts to fail (for a multitude of reasons) the solution is the reverse, to force air into the lungs. Enter the ventilator.

Basic mechanical ventilators do exist, I own one, but from my understanding they are typically used for patient transport and situations where the patient can be constantly monitored. At the other end of the scale are fully automated ventilators used in operating theatres and intensive care units. I assume these are what the NHS is asking for.

Multiple modes

Ventilators operate in multiple modes by adjusting multiple variables such as volume, pressure, frequency and O2 concentration. This demands a fail-safe, software controlled, electromechanical solution.

I've read some quotes stating the concept of retooling manufacturing sites to rapidly respond is beyond this country's capabilities. Rubbish.

For the past 30-years UK manufacturing has retooled to do just that. Design processes are digital, manufacturing processes are digital, test processes are digital. UK OEMs and CEMs have specifically invested in fully automated, lights-out production hardware that in many instances can operate on lot-size-one.

International standards

All this is underpinned by an industry which is ruled by international standards to medical, defence, automotive and aerospace levels.

If there was one machine this country could make, fast and right, it's a ventilator.

Everything can be prototyped via 3D print in one day once the STL files are available. CNC machining centres can handle the metal parts; spark erosion machines will have the injection mould tooling ready in hours; laser and water jet cutters can handle the sheet work; PCBs would be etched in hours and the design files used to program the pick and place machines, reflow machines and test facilities.

What about components? It just happens that the UK is home to some of the world's greatest component distribution organisations, specifically geared to hold plenty of stock and deliver next day. It's just what they do, and they do it well. Likewise, these companies are part of a global network of distribution hubs. If we don't have a part here, it can arrive, for example, from the US in 48-hours max.

Likewise, distributors don't just distribute. They also design, manufacture and test, typically in niche operations such as interconnect and wiring. This helps distribute production capacity and lets each business concentrate on doing what it does best. Manufacturing is only one solution. What about rework and repair? How many faulty ventilators, regardless of age, are sitting in NHS warehouses? Maybe none, maybe thousands. This is where the UK's repair and rework sector kicks in. With world leading IPC training facilities and vast teams of rework operators the capacity is there.

But what if a repair requires an obsolete part. No problem. The UK leads the world in obsolescence management from global distributors who specialise in sourcing and supplying obsolete components to specialist engineering companies who can manufacture alternatives. How do I know this: because my last visit before isolating was to Pacer's clean room watching just such production.

3D Printers

And it doesn't stop there. I own an industrial grade 3D printer. Across the UK, schools, universities, businesses and domestic properties are home to thousands, maybe tens of thousands of 3D printers. All I need is the STL file uploaded to Thingiverse, the material spec and the machine mode and I'm off and running. News reports suggest this is already happening in Italy where a 3D printer started outputting valves which need to be replaced every eight hours. Looking at the design, I imagine my machine would produce one valve every two to four hours depending on layer height. That's a minimum of six per day. Call in a network of 1,000 machines and you have an emergency output of six thousand parts per day.

All printed parts could be delivered to a central location for laser scanning for dimensional checks etc. Once the injection tooling comes online this capacity could be stood down.

All that I can imagine getting in the way is red tape. There is good reason for this. A faulty respirator is as likely to kill a patient as keep them alive. So I guess someone at the top has to decide: do the best we can within the existing red tape; throw every regulatory resource at the problem to make it go away fast; lower the standards; or abandon the standards and trust the manufacturers. I'm glad I'm not making that decision.

How confident am I that the UK can invoke a sovereign ventilator manufacturing capacity in weeks: 100 per cent. For the last 30-years I visited OEMs, CEMs, distributors and a plethora of other companies in the supply chain who have been showing exactly how they can do this if asked and sufficiently funded.

In many respects I hope this article is pointless. I hope that by the time you read this the pandemic is under control and the NHS is being held at or below capacity. I hope that everything I have described above has been triggered, and new or repaired ventilators are already arriving in hospitals.

Hope

I hope, because if a patient is intubated, on an automated ventilator, in an intensive care unit, every card has been played.

Engineering unites



In the time it has taken to publish this magazine something has happened which I have never witnessed before. An entire world of engineers, distributors and manufacturers have mobilised to design, prototype, test and eventually manufacture an army of ventilators in the face of a virus which has chosen to target human lungs.

I've seen, individuals, small companies, hospital departments, universities and colleges, open source gatherings, blue-chips, and national consortia all at work, all at the same time, all with the same, single goal.

Some are using readily available products in a DIY form like the individual who is repurposing a wetsuit into a form of iron lung. Some are resurrecting obsolete designs which worked well in the past and can work just as well now. Some are supporting existing ventilator manufacturers in their efforts to increase output. Some are creating new, low-cost, easy to assemble designs. Some are focussing on getting new 'industrial grade' machines into the market using the latest rapid prototyping process to shrink the time-to-market to weeks, max.

Somewhere in this mix, workable solutions will emerge.

I've signed up to a Slack channel for one of the open source projects and amongst the thousands of offers of support are many requests for help. Some are from dense cities in developed countries but there are also requests from remote parts of developing countries where medical resources are already limited.

The designs which rise from this mammoth effort clearly need to be applicable across a range of environments from established hospital IC units, to remote field hospitals.

In an ideal world none of these designs will ever be needed. The worldwide clampdown will slow the pandemic to a point where health systems can cope. If this is the case, none of this work will have been wasted. Taking a look at all the recent Corona-19-like outbreaks they seem to like human lungs for a reason. Thus, we must assume this is not the end of this type of virus' attempts to exploit humans as its preferred host.

In anticipation, I imagine the world would benefit from two things. A stock of ventilators to cope with immediate demand and a freely available library of tested designs which manufacturers can use to scale production at a moment's notice.

To provide an indication of the work under way, we have used the following pages to reproduce the UK Government ventilator specification, plus we have listed CEMs with box build capability who are ready to help.

To indicate how fast this event is moving, as I close the article off, I've just read that the UK Government has placed an order with Dyson for 10,000 ventilator units. Onwards and upwards.

Rapidly manufactured ventilator system specification

Department of Health & Social Care

On 20 March 2020 the Government published a specification of the minimally clinically acceptable ventilator to be used in UK hospitals during the current SARS-CoV2 outbreak. To provide readers with an indication of the task-at-hand we have reproduced the specification document below.

It sets out the clinical requirements based on the consensus of what is 'minimally acceptable' performance in the opinion of the anaesthesia and intensive care medicine professionals and medical device regulators.

Ventilation



At least 1, optionally 2 modes of ventilation:

- must have mandatory ventilation (for the deeply sedated and paralysed). The user can set a tidal volume and the output is a pressure regulated flow to achieve this volume, for example, pressure regulated volume control (PRVC), SIMV-PC
- optional pressure support mode for those patients breathing to some extent themselves, for example, BIPAP. The user sets an inspiratory pressure and an expiratory pressure. The ventilator can sense when a patient starts to breathe in and apply the inspiratory pressure, then sense when the patient starts to breathe out and apply the expiratory pressure (this pressure is still positive but lower than the inspiratory pressure)

If the patient stops breathing in pressure support mode, it must failsafe automatically onto mandatory ventilation.

Inspiratory airway pressure, the higher pressure setting that is applied to make the patient breathe in:

- plateau pressure should adapt to achieve volume and be limited to 35 cmH2O
- peak pressure should be no more than 2 cmH2O greater than plateau pressure
- ideally there should be a mechanical failsafe valve that opens at 40 cmH2O

Positive End Expiratory Pressure PEEP (usually called EPAP during pressure support mode). The lower pressure applied to the patients airway to allow them to breathe out, but not too much:

- range 5 to 25 cm H2O adjustable in 5 cmH2O increment
- patient breathing system must remain pressurised to at least the PEEP level setting at all times

Inspiratory:Expiratory ratio (I:E) (note, confusingly, it is actually E/I time). The proportion of each breathing cycle that is spent breathing in compared to breathing out:

- 2.0 (i.e. expiration lasts twice as long as inspiration)
- optionally adjustable in the range 1.0 to 3.0

Respiratory Rate. The number of breathing cycles every minute:

- range 10 to 30 breaths per minute in increments of 2 (only in mandatory mode) can be set by the user

Tidal Volume (Vt). The volume of gas flowing into the lungs during one inspiratory cycle:

- must have at least one setting of 400ml +/- 10 ml
- ideally 350ml and 450 ml options
- optionally Range 250 to 600 ml in steps of 50ml
- even more optionally up to 800 ml
- optionally the ability to input body weight and have volume calculated as, for example, 6ml/kg of ideal body weight

Gas and electricity



Incoming gas supply:

- all gas connectors and hoses must use standard non-interchangeable connectors and be colour coded according to current standards
- must connect to wall pipeline oxygen supply via Schrader valve connector (BS 5682, not the bicycle wheel version). If hose not permanently fixed to machine, then must connect with NIST (Non-Interchangeable Screw Thread – ISO 10802). Oxygen pipeline pressure is 4 to 5 Bar
- optionally can incorporate a backup oxygen cylinder connected via either Schrader valve or Pin Index System
- must be able to be operated on any attached cylinders. Oxygen cylinder pressure is either 1 to 137 bar if no regulator is fitted, or 4 bar if the cylinder incorporates a pressure regulator. The ventilator must be able to work with either. The ventilator must include a pressure regulator to decrease 137 bar cylinder pressure to 4 bar working pressure. Working pressure inside the ventilator may be up to 4 bar, but it must be impossible to expose the patient to any pressure above 40 cmH2O
- optionally can connect to wall pipeline medical air via Schrader valve (NB 'medical air' is 4 bar. Must not connect to 'surgical air 7 bar' supply)
- optionally can connect to Anaesthetic Gas Scavenging System
- optionally can operate using an oxygen concentrator device for input oxygen

Electricity supply:

- should connect to 240V mains
- battery backup – see below. Must have 20 minutes backup battery in case of mains electricity failure
- optionally hot swappable batteries so that it can be run on battery supply for an extended period, for example, 2 hours for within hospital transfer
- must avoid harmful RF or EM emissions that could interfere with other critical machinery

Gas supply to patient:

- user must be able to control inspired oxygen proportion (FiO2). The percentage of oxygen in the gas being breathed in by the patient. Room air is 21% oxygen
- at least 50% and 100% options
- very preferably ideally variable between 30 and 100% in 10% steps
- patient breathing system connections: the ventilator must present 22mm outside diameter (OD) 'male' standard connectors for connection to user supplied 22mm 'female' connectors on the breathing system

All elements in the gas pathway must meet biological safety and oxygen safety standards, especially to minimise risk of fire or contamination of the patient's airway.

Unknown issues



How plentiful is 4-bar oxygen supply?

- absolute minimum oxygen requirement is the human consumption of about 250 ml/min. However, achieving this is only possible if certain breathing system designs are used and 'driving' gas is done by air. Specifically, would have to use circle breathing system with active CO2 absorption
- if consumption in the range 1 to 2 l/min is acceptable, then a wider range of designs is possible, but some very basic designs are not
- if consumption in the range 10l/min is acceptable, then any possible design can be considered

What is the resistance of HMEF-bacterial-viral filters that are to be used with the ventilator? Is it clinically relevant?

Is there any need to consider running from only low pressure oxygen, for example, from a concentrator? This makes design more complex.

How plentiful is the supply of syringe drivers and drugs for sedation?

- if limited, then a vaporiser could be used to vaporise Isoflurane for sedation
- this would need certain breathing system designs, mandatory AGSS and a supply of vaporisers

If monitoring can be done by another machine, it could be left out of the ventilator, but essential parameters must be available to the clinician.

Battery backup

Every current ventilator used inside hospitals has a battery backup, so users will expect it to be there and will behave as if it is, for example, unplug it from the wall in order to rearrange cables or while manoeuvring the patient. However, this needs very careful thought to balance the risks. Including this in the spec means instantly trying to source 30,000 large, heavy batteries. Specifying a DC voltage (ie 12VDC) may well be the most sensible for the machine working voltage. Need the advice of an electronic engineer with military/resource limited experience before specifying anything here. It needs to be got right first time.

Infection control



All parts coming into contact with the patient's breath must be either disposable or decontaminatable between patients.

All external surfaces must be cleanable in the likely event that they get respiratory secretions or blood splatter on them. Cleaning would be by healthcare workers manually wiping using an approved surface wipe with disinfectant or cloths and approved surface cleaning liquid.

There will be a separately sourced HMEF-bacterial-viral filter between the machine and patient which may impact on resistance within the system, which may need to be accounted for with some designs. The pressure being delivered to the patient is the specified pressure. If the filter has a resistance of, say 2 cmH2O, the ventilator needs to output 37 cmH2O to achieve a set 35 cmH2O at the patient. This will need further detailed consideration. Usually HMEF filters have negligible resistance, but the viral filtering filters may have much higher resistance that may be clinically relevant.

Optionally include facility for ultrasonic humidifier-warmer to be included.

Miscellaneous



Must be reliable. It must have 100% duty cycle for up to 14 days.

Optionally it can be used beyond 14 days, the expected durability must be specified.

Can be floor standing.

Ideally small and light enough to mount on patient bed and orientation-independent functioning.

Should be as robust as possible. For example, it may be dropped from bed height to floor.

It must be intuitive to use for qualified medical personnel, but these may not be specialists in ventilator use:

- must not require more than 30 minutes training for a doctor with some experience of ventilator use
- must include instructions for use
- ideally instructions for use should be built into the labelling of the ventilator, for example, with 'connect this to wall' etc
- must include clear labelling of all critical functions and controls using standard terms, pictograms and colours that will be readily recognised by UK healthcare staff
- Must have transparent design, supply chain, manufacture and testing processes that are of sufficient quality to enable MHRA officials to deem appropriate for usage in exceptional circumstances.

Must not be excessively cumbersome so that it would impede hospital operations or prevent easy movement within hospital premises.

Must be made from materials and parts readily available in the UK supply chain (anticipating increasing global restrictions on freight movement).

Standards

There are many standards that exist in this area. Below is a list of the most relevant ones. They are not formal regulatory requirements but many are harmonised against regulatory requirements. Consider them as helpful advisory standards for now. MHRA will lead an exercise to define which can be 'safely' relaxed for this emergency situation:

- BS EN 794-3:1998 +A2:2009: Particular requirements for emergency and transport ventilators
- ISO 10651-3:1997: Lung ventilators for medical use – emergency and transport
- BS ISO 80601-2-84:2018: Medical electrical equipment. Part 2 to 84. Particular requirements for basic safety and essential performance of emergency and transport ventilators – especially the parts on 'patient gas pathway' safety (very similar to IEC 60601)
- BS ISO 19223:2019: Lung ventilators and related equipment. Vocabulary and semantics

Monitoring and alarms



Must alarm at:

- gas or electricity supply failure
- machine switched off while in mandatory ventilation mode
- inspiratory airway pressure exceeded
- inspiratory and PEEP pressure not achieved (equivalent to disconnection alarm)
- tidal volume not achieved or exceeded

Monitoring

The following should be continuously displayed so the user can verify:

- current settings of tidal volume, frequency, PEEP, FiO2, ventilation mode
- actual achieved rates of tidal volume, breathing rate, PEEP, plateau pressure, FiO2
- if it exists, in pressure support mode there must be real-time confirmation of each patient breath and an alarm if below acceptable range
- optionally CO2 monitoring included

Rapid UK manufacturing capacity

In a recent Government announcement regarding the immediate need for additional hospital ventilators, the spokesperson referenced the critical role that the UK's contract manufacturing industry could play. In response, Electronics Sourcing has garnered statements from 16 CEMs who have the skills, experience, equipment, standards and training to immediately help.

If you are an existing ventilator manufacturer which needs additional manufacturing or test capacity, or you are coordinator involved in managing the design and production of new systems please use the array of companies below as your go-to solution for getting systems designed, built, tested and delivered: fast.



Circuit Solutions (Cambridge) offers conventional assembly, fine pitch SM, box build and test. Approvals include ISO9001-2015 and IPC610. Production staff are trained to IPC-J-STD-001 and IPC7711/7721 rework/modification. We welcome the opportunity to quote for manufacturing ventilators per the Government's request.

Dick Greenwood, *owner, Circuit Solutions*



With four factories employing 300 people, Alpha 3 Manufacturing is one of the UK's largest sub-contract companies. Specialising in box and panel builds for medical, military, space and industrial, the company holds ISO, UL and AS9100 Rev D accreditations with capacity to turn on ventilator production.

Emma Hoggins, *marketing co-ordinator, Alpha 3*

Fermionx provides product with a reliable, high-quality service in electronic contract manufacturing. Our 40-years' experience in contract manufacturing enables us to deliver practical solutions across a range of industries from medical and laboratory devices to detection and monitoring products.

Sarah Kneath, *marketing manager, Fermionx*



EC Electronics is ready, willing and able to help in this current crisis situation with coronavirus. ISO14001:2015 and ISO9001:2015 accreditations, plus IPC 610/620 workmanship standards, means the company can produce the electronics used in the production of ventilator equipment in the UK.

Phil Simmonds, *group managing director, EC Electronics*



Corintech is increasing production of critical healthcare components, including PCB assembly and electro-mechanical sub-assembly, for many of its customers. The company holds ISO 9001 and AS9100 (aerospace) quality accreditations and is ready to help if its services are needed.

Andy Price, *senior design engineer & marketer, Corintech*



AWS InCap is ready to support the urgent requirement for PCBA and box build ventilators for the UK government. The company's three European factories are ISO13485 accredited and feature SMT, PTH, box build and test capabilities. The highly skilled workforce is working hard in challenging times and appreciates the need.

Tracy Court, *group business development director, AWS Electronics Group*

Given the current Coronavirus situation, Assembly Contracts has manufacturing capacity available now and can help with the manufacture of any equipment. The company has experience in medical, aerospace, oil and gas, and instrumentation, with all relevant approvals.

Arthur Woode, *commercial director, ACL Assembly Contracts*



With extensive sector experience including medical, aerospace, defence and commercial, Teddington offers services from initial design to a turn-key box build. With a full mechanical capability, Teddington offers a one-stop-shop.

Kenny Maxwell, *sales engineering manager, Teddington Group*



Using its global supply chain, SeSemi Electronics (Kitting Division) offers support with component supply during the current demand peak for ventilators. The company can provide quick turnaround quotations and production ready kits delivered directly to any manufacturing facility.

Aimee Cadle, *managing director, SeSemi Electronics*



Custom Interconnect is qualified to ISO9001:2015, ISO13485:2016 (medical) and AS9100D (aerospace). Capability ranges from bare die to box build, including complex medical systems. Stats include: 10 production engineers, eight buyers, 1,000 suppliers, 35,000 component line items, six SMT lines, four AOI, three flying probe, one x-ray and cleanrooms.

John Boston *managing director, Custom Interconnect*

Dy-tech is an ISO-9001-2015 accredited CEM, specialising in procurement, assembly, test and box-build. The company offers rapid response, is an existing PCB supplier to the medical industry, can handle medium/high volume and is ready to provide PCB assembly needs.

Andrew Dymond, *owner and managing director, Dy-tech*



Speedboard is ready to take on additional work required by the NHS with the build of ventilators. The company is ISO 9001:2015 and ISO 14001:2015 certified. Speedboard currently manufactures electronics in heart monitoring systems for operating theatres.

Neil Owen, *managing director, Speedboard*



Derby-based CEM, Tioga, works in the industrial, aerospace, military and medical sectors. It manufactures complex, technically advanced products involving surface mount, through hole, systems build, test, configuration, box build, packaging, warehousing and shipping. Tioga is ready to help.

Warwick Adams, *managing director, Tioga Electronic Assembly*



In medical electronics manufacture, ETL blends innovation and a flexible approach within its AS9100 management system. Medical experience includes fast-track prototyping and project management. Production capabilities cover cable harnessing, mixed technology PCB assembly to turnkey builds.

James Arnold, *sales director, ETL*



Wilson Process Systems is approved to ISO 9001-2015, while its staff are trained to work to the IPC-A-610 Class 3 manufacturing standard. The company operates a comprehensive selection of automated surface mount and conventional technology assembly equipment, supported by services including light hand assembly. The company has capacity to support ventilator production.

Nick Wilson, *MD, Wilson Process Systems*

Simtek EMS specialises in manufacturing life affirming, life enhancing, life protecting and life saving products. The company is certified to ISO9001:2015 and ISO13485 for medical, while its employees are trained to IPC J-STD, IPC A-610 and IPC 7711 standards.
Simtek states it is poised to step up for whatever is required.

Richard Samuel, *technical director, Simtek EMS*

Nemco Ltd is an ISO 9001:2015, ISO 14001:2015 and AS9100 Rev D accredited CEM. Already providing assemblies into the medical sector we are fully operational to take on additional NHS requirements. We can provide a full suite of services from PCBA's to full box build. Manufacturing to the IPC610/620 standards you know you will be in safe hands. We also operate in the defence, aerospace and military sectors.

David Duric, Sales Director, Nemco Ltd

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CEMS WITH BOX BUILD CAPABILITIES

Manufacturer	Address	Telephone	Website	Email Address
4e Technology Ltd	Unit 6 Oakridge Office Park, Whaddon, Salisbury, Wiltshire SP5 3HT	01794 874227	4e-technology.co.uk	enquiries@4e-technology.com
Alpha 3 Manufacturing Ltd	Deltron Emcon House, Hargreaves Way, Sawcliffe Industrial Park, Scunthorpe, North Lincolnshire, DN15 8RF	01724 273200	www.alpha3manufacturing.com	darren.fuller@alpha3manufacturing.com
Assembly Contracts Limited	Ledson Road, Roundthorn Industrial Estate, Manchester, M23 9GP	0161 947 8000	acl.co.uk	arthur@acl.co.uk
AWS Incap UK	Croft Road, Newcastle-Under-Lyne, Stafford, ST5 0TW	01782 753200	awselectronicsgroup.com	sales@awselectronicsgroup.com
Challenger Solutions Ltd	Unit 85 Haltwhistle Road, South Woodham Ferrers Essex CM3 5ZA	01245 325252	challengersolutions.com	richardh@challengersolutions.com
Circuit Solutions (Cambridge) Ltd	Cambridge House, Cambridge Road, Hemingford Abbots, Cambridge PE28 9HQ	01480 460860	circuitsolutions.co.uk	dick.greenwood@circuitsolutions.co.uk
Corintech Ltd	Ashford Mill, Station Road, Fordingbridge, Hampshire, SP6 1DZ	01425 655655	corintech.com	info@corintech.com
CT Production Ltd.	39-40 Harwell Road, Nuffield Industrial Estate, Poole, BH17 0GE	01202 687633	www.ctproduction.co.uk	sales@ctproduction.co.uk
Custom Interconnect Ltd	CIL House, Charlton Road, Andover, Hampshire, SP10 3JL	01264 321321	cil-uk.co.uk	sales@cil-uk.co.uk
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Industrial Electronic Wiring Ltd	Unit 10 Birch, Kembrey Park, Swindon, Wiltshire, SN2 8UU	01793 694033	iew.co.uk	info@iew.co.uk
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Kaizen Technology Ltd	Unit 8-9 Saxon Way, Melbourn, South Cambs, SG8 6DN	01763 249666	kaizentechnology.co.uk	david.cousins@kaizentechnology.co.uk
Key-Tech Electronic Systems	Midfield Road, Mitchelston Industrial Estate, Kirkcaldy, KY1 3NL	01592 597711	key-tech.co.uk	dgrieve@key-tech.co.uk
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Pektron	Alfreton Road, Derby DE21 4AP	01332 832424	www.pektron.com	info@pektron.co.uk
Prism Electronics Ltd	30 Burrel Road, St Ives Cambridgeshire PE27 3NF	01480 462225	prism-electronics.com	sales@prism-electronics.com
Quality Precision Electronics Ltd	15 Faraday Road, Glenrothes, Fife, KY62RU	01592 771455	qpe.co.uk	sales@qpe.co.uk
Season Electronics Limited	Unit 600 Nest Business Park, Martin Road, Havant, PO9 5TL	02392 452222	seasongroup.co.uk	info@seasongroup.co.uk
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Speedboard Assembly Services	1A Alma Road Windsor Berkshire SL4 3HU	01753 746700	speedboard.co.uk	athwaites@speedboard.co.uk
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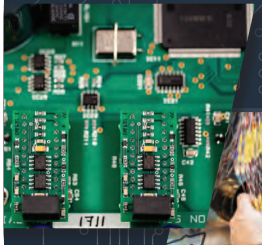
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Embedded MPUs will drive overall microprocessor market

Demand for microprocessors used in embedded applications will grow but chip buyers can expect small price declines over the next several years

James Carbone

The worldwide global embedded microprocessor market will post 8.3 per cent annual growth over the next four years as revenue rises from $15.9 billion in 2019 to $23.7 billion in 2024 as demand for embedded MPUs increases from communications, industrial equipment and automotive OEMs.

Despite rising demand, semiconductor buyers can expect steady lead times and modest price declines over the next several years, according to industry analysts. The average price of an embedded MPU is forecast to fall from about $43.31 in 2020 to $41.20 in 2024, said researcher IC insights.

Strong demand for embedded processors is driving sales growth in the overall microprocessor market, which also includes processors used in computers and cell phones. Revenue of embedded processors will increase 10 per cent in 2020 to a record high of $17.5 billion after rising 9 per cent in 2019 and 18 per cent in 2018, the researcher said. Worldwide unit volume of embedded processors is expected to grow 11 per cent to 406 million MPUs in 2020 after rising 7 per cent in 2019 and 14 per cent in 2018.

A number of trends in embedded systems is driving MPU growth, including increased automation in vehicles, industrial equipment and homes, according to Rob Lineback, senior market analyst for IC Insights. In addition, Internet connections are becoming pervasive in a wide range of end use equipment which is driving higher embedded MPU demand.

"Automation and big data analytics to the Internet of Things is increasing the need for embedded computing and processing," said Lineback. "In a growing number of systems, embedded processing is handling artificial intelligence and machine learning capabilities for autonomous operations without control by humans," he said. In the future, artificial intelligence is going to drive a whole new wave of innovation in certain areas and will impact system design and result in greater use of embedded processors, said Mike Palma, research manager at IDC Corp.

As a result, sales of embedded processors are expected to grow by a compound annual growth rate (CAGR) of 8.3 per cent as revenue increases from $15.9 billion in 2019 to $23.7 billion in 2024, while unit shipments are projected to increase to 575 million in 2024. In fact, sales of embedded processors have been increasing since 2014. Embedded MPU sales revenue increased 83 per cent from 2014 to 2019, while sales of computer processors grew 11 per cent during the same time. Cell phone application processors sales dropped 5 per cent between 2014 and 2019, according to IC Insights.

Embedded MPU share rises

Robust demand from multiple customer segments will mean embedded processing revenue will continue to grow as a percentage of overall microprocessor sales. In 2014, embedded microprocessors accounted for 11 per cent of global microprocessor revenue, while the computer market represented 58 per cent of the processor market and cell phone processors were 31 per cent of MPU sales, IC insights said. By 2024 embedded processors will account for 24 per cent of processor revenue; computers, 50 per cent and cell phones, 25 per cent.

One reason that embedded MPU demand and revenue will rise is the automotive market. "Automotive embedded processors are expected to see the strongest growth over the next five years with sales rising 14.1 per cent per year, according to Lineback. The industrial segment will post a CAGR of 9.4 per cent and embedded processor revenue from the communications industry, the largest market for embedded MPUs, will rise 8.8 per cent from 2019 to 2024, he said.

By the Numbers

10%
The growth rate of the embedded microprocessor market in 2020

$43.31
The average selling price of an embedded microprocessor this year

$17.5 billion
The expected size of the global embedded microprocessor market this year

8.3%
The forecasted compound annual growth rate for embedded microprocessors from 2018 through 2024

$23.7 billion
The expected size of the global embedded microprocessor market in 2024

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Alan Priestly, vice president analyst for Gartner Inc., said the embedded market is fragmented. He noted that in years past embedded processors were used mainly in the industrial market. While embedded processors are still used in industrial equipment, the market for them is expanding, he said. They are now used in everything from industrial controls, cars, transportation systems, mil aerospace market, switches, routers and high-performance devices and consumer electronics equipment, he said.

For instance, microprocessors are being designed into more vehicles, as cars and off-road vehicles are equipped with sophisticated systems such as advanced driver assistance systems (ADAS). In some cases, MPUs are replacing microcontrollers in vehicles as control of automotive electronics systems becomes centralised.

Priestly said there are about 50 MCUs used in the average vehicle for brakes, air-conditioning, instrument panels, security, door locks and other systems. However, the automotive industry is moving toward "centralising its processing resources and that is driving more demand for high-performances embedded processors in the car" which will mean fewer MCUs will be needed, he said. There will be several processors because the need for redundancy in a vehicle. With central processing there needs to be backup systems in the event of a system failure. Backup systems require microprocessors.

Long life cycles

Of course, embedded processors are being used in many more non-automotive systems as well because they have the same computing power as processors used in computers. "Embedded processors are essentially the same as a standard processor used in computer system, but they typically have longer product lives and extended environmental specifications," said Priestly.

For instance, an embedded microprocessor may be used in a piece of industrial equipment in an environment where the temperature may rise or fall sharply and the processor needs to function in very hot or cold conditions. As a result, embedded processors have to be "optimised" to handle different environmental conditions, said Priestly. That means embedded processors often have higher price tags than a similar functioning MPU used in computers.

Embedded processors are also used in equipment that tend to have much longer lifecycles than a personal computer, said Priestly. For instance, an industrial control or mobile base station may be in use for 10 to 15 years. Automotive, industrial, medical devices medical imaging devices can have product life cycle of up to two decades.

If there is a field failure, the microprocessor in the equipment may need to be replaced so manufacturers will build embedded processors for longer period of time than processors used in computers. In the embedded market you have to support a longer lifecycle. "Your average PC has about three- or four year-lifecycle," said Priestly. "The vendors that make PC processors refresh them very rapidly, and after 18 months or two years, you can't buy the old generation processors anymore," said Priestly.

Embedded processor manufacturers "charge more, but they guarantee the extended availability of the product," he said. Prices are also higher because volumes are much lower than for processors used in computers and cell phones. Billions of MPUs are shipped for computers and cell phones while thousands of embedded processors ship each year. "So, there are premiums on embedded products," said Priestly.

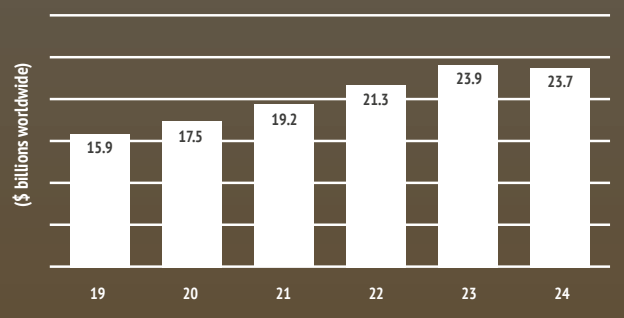
While prices for embedded microprocessors may be higher than other processors, there are a number of suppliers that compete for business. Intel, which is the largest microprocessor manufacturer, has about 50 per cent of the embedded MPU market, according to Gartner. As with its processors used in computers, Intel's embedded processors are based on x86 technology as are AMD embedded processors.

"A lot of x86 PC class processors wind up in a whole range of embedded systems from POS systems, digital signage, kiosks, industrial equipment, medical equipment, and lower performance ranges of servers, said Palma.

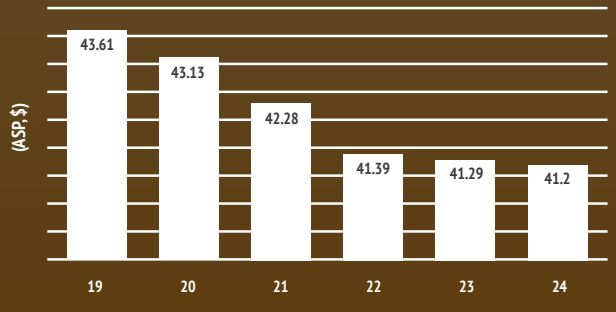
There are a number of processor companies that use ARM technology including, QUALCOMM, Nvidia, HiSilicon, Samsung and NXP among others.

Embedded MPUs will grow at an annual rate of 8.3per cent through 2024 when revenue reaches $23.7 billion
Source: IC Insights

Embedded MPU market grows staidly



Embedded MPU prices to dip



The average price of embedded microprocessor will decline slowly over the next four years.
Source: IC Insights

DISCOVER | SOURCE | COMPARE | BUY



Distributors add value and improve efficiencies in procurement

Farnell's regional sales director of UK, Ireland and Benelux, Mathew Thorpe, explains how buyers can streamline their purchasing process and control expenses

Buyers of electronic components want more than just products from distributors. They are facing increasing pressure from board-level stakeholders to show how they are reducing costs when purchasing new products. This means purchasing professionals are challenged with finding and sourcing electronic components in the fastest and most efficient way, as well as consistently identifying new ways of maximising savings.

A good distributor—certainly one that has longevity and customer satisfaction at its core—can help buyers identify cost-saving techniques through a comprehensive product portfolio and transparent value-added service, supported by innovative online tools and resources, on-time delivery and a strong global distribution network. In addition, distributors can also provide alternative design-in options that can speed a product's time-to-market.

Navigating a changing market

Since mid-2018, the European electronics market has encountered some major challenges—uncertainty has crept in and buying habits have changed. Yet, the expectations of purchasing professionals remain. Buyers must have the confidence to reduce costs and maximise production efficiencies.

For many, establishing a partnership with the right distributor is an effective way to fast-track results.

Indeed, a distributor's role in helping buyers streamline the purchase process and control expenses is crucial, especially as the cost of procuring a product can be much higher than the order's actual value. This figure can be even higher for some companies whose buyers devote hours to finding products for the best price and in-stock availability. Beyond the product itself, purchasing professionals need a distribution partner that operates e-procurement and e-invoicing systems capable of cutting costs associated with acquisition, administration and order processing.

For the distributor, it's important to consider how its products and services can play a part in saving a customer money and, in particular, how costs can be cut for small to medium enterprises, through to blue-chip organisations, whose needs are often not fully met by the 'average' distributor.

Farnell has chosen to tackle these issues through the creation and personalisation of its services and an extensive distribution network. Farnell's acquisition by Avnet in 2016 created a new breed of distributor designed to offer better support at all stages of the product development process—from design through to volume manufacturing and product lifecycle management. Also,



Farnell's regional sales director of UK, Ireland and Benelux, **Mathew Thorpe**



Multicomp Pro non-branded product are available on same-day despatch

Farnell's regional account managers take an integrated, multi-channel approach to helping buyers.

Farnell operates as a trusted advisor and strategic partner to purchasing professionals, providing access to a suite of integrated online tools to help simplify product searches, save time and give buyers greater control over spend. In some cases, Farnell has been able to reduce customers' purchasing costs by as much as 50 per cent.

A strong investment in the future

This has involved investing

Since mid-2018, the European electronics market has encountered some major challenges

$60 million in its Leeds-based warehouse which supports logistics operations across mainland Europe. More than a quarter of a million new products have been added as well as $150 million of stock. In the past 12-months, the company has increased its inventory by 25 per cent and added 40 new supplier lines, stocking more than 950,000 products via its global online catalogue with more than half a million in-stock products available to customers in mainland Europe.

Another differentiating service is the option for buyers to purchase from Multicomp Pro, a non-branded substitute product that offers the same quality and reliability as its branded alternative but at a more competitive price. All of this is complemented by a same-day despatch option and 24/5 technical support.

Access to innovative software and online tools

The iBuy online purchasing tool is a scalable add-on to a buyer's account on the Farnell website. This free tool is customised for each customer, helping to minimise administration times and speed up the procurement process. Buyers can cut the time they spend sourcing low-value products, while warehouse staff can slash processing times since goods arrive in one package with every order matching the invoice. Whether an engineer is buying a product direct, a buyer is sourcing the product, or an invoice clerk is paying the bill, iBuy offers visibility across the whole purchasing process.

Another online system, called ePass API, is an application programming interface that reduces the time and cost of searching for products by allowing customers to access condensed data for every product that Farnell supplies. Some customers have built their own software around the ePass API link to source products more effectively. This provides customers with a clear understanding of what's available in the marketplace, the price of an item and when it can be delivered.

Reducing burden of invoice processing

The Farnell integrated e-procurement options include a Purchase to Pay system that facilitates catalogue, purchase order and invoice integration with a customer's Enterprise Resource Planning (ERP) system. Time and cost savings are ensured by customers not having to input an order onto the Farnell website then re-enter it into their own ERP system and manually reconcile invoices. By example, the new addition of 2D barcoding offered by Farnell ensures products can be scanned straight into a customer's ERP system, improving accuracy and speeding up the process of receipting goods.

The e-Invoicing secure online portal provides rapid access to invoices and related documents in a customer's preferred browser. This is a benefit to end-users since the processing of supplier invoices has been identified as a headache for many finance departments. According to the Chartered Institute of Procurement and Supply, more than 80 per cent of UK managers claim that processing supplier invoicing has a detrimental effect on departmental productivity.

It's clear buyers expect and demand more from their distributors than good products at a good price. The only way for distributors to stay ahead in the competitive electronics market is to offer innovative services and support tools that are not available elsewhere. Buyers looking to streamline their purchasing processes and control their spend should work closely with their selected distributor to ensure they have access to the best possible procurement package.

uk.farnell.com

"The iBuy online purchasing tool is a scalable add-on to a buyer's account on the Farnell website



Over $60 million has been invested in Farnell's Leeds-based warehouse

Ready-for-rail purchasing

Charcroft director, Debbie Rowland, explains purchasing components for rail is simplified when the distributor adds knowledge of approvals and specifications

For rail applications, components need to ensure reliable operation and are typically sourced in relatively low volume. The need for reliability means that rail components must achieve operation despite difficult environmental conditions: preventing the ingress of moisture and contaminants; wide temperature variations; high vibration and shock; together with high transient voltages.

This reliability is essential to deliver the extended in-service periods which are expected of rail applications. The long lifecycle of rail equipment also means that parts are frequently required to support maintenance and refurbishment projects to re-purpose existing rolling stock. Whether components are for new systems, or replacement parts, they must meet the tight approvals required for rail electronics.

The critical approvals for power supplies used in rolling stock are EN 50155 and EN 5012. Other components, such as magnetics, transformers and high-power resistors can be covered by the EN 6100 standard for Electromagnetic Compatibility (EMC) and by the EN 60695 and BS 6853 standards, which protect against fire hazards.

Several products have features which are designed to ensure reliability. A power supply's resistance to shock, vibration, dust and moisture can be ensured by the rugged thermo-selective vacuum encapsulation process, patented by MTM Power. The 100 per cent burn-in and test of all units before shipping further ensures reliability. To minimise use of space, the units can operate without the need for external EMC filtering and use baseplate cooling so that they can be used without a fan.

For circuit protection, the IEC spacing on Airpax circuit-breakers comply with IEC 601 and IEC 950, in addition to the UL STD 1077 standard for supplementary protection. The operation of the breakers provides temperature-compensation, meaning that performance is not affected by changes in ambient temperatures.

Sometimes, a creative solution is necessary to meet the requirements for form, fit and function. In order to replace a legacy circuit breaker which had non-standard fixings, a third-party fixings company was used to manufacture adaptor plates for the replacement breakers. This allowed direct fitting of a new breaker into the legacy footprint and eliminated the need to re-configure the existing metalwork.

In another case, an additional barrier was added to the breaker assembly, to electrically isolate the connections of the AC breaker from the DC breaker fitted next to it in the system.

As a sector which needs equipment to operate reliably in harsh conditions, buyers can simplify procurement by expecting the distribution partner to fully understand rail approvals and component specifications. By adding in-depth experience and knowledge, working with third-party suppliers and providing in-house assembly, the distributor can simplify the procurement process and supply components and assemblies which are ready-for-rail.

www.charcroft.com

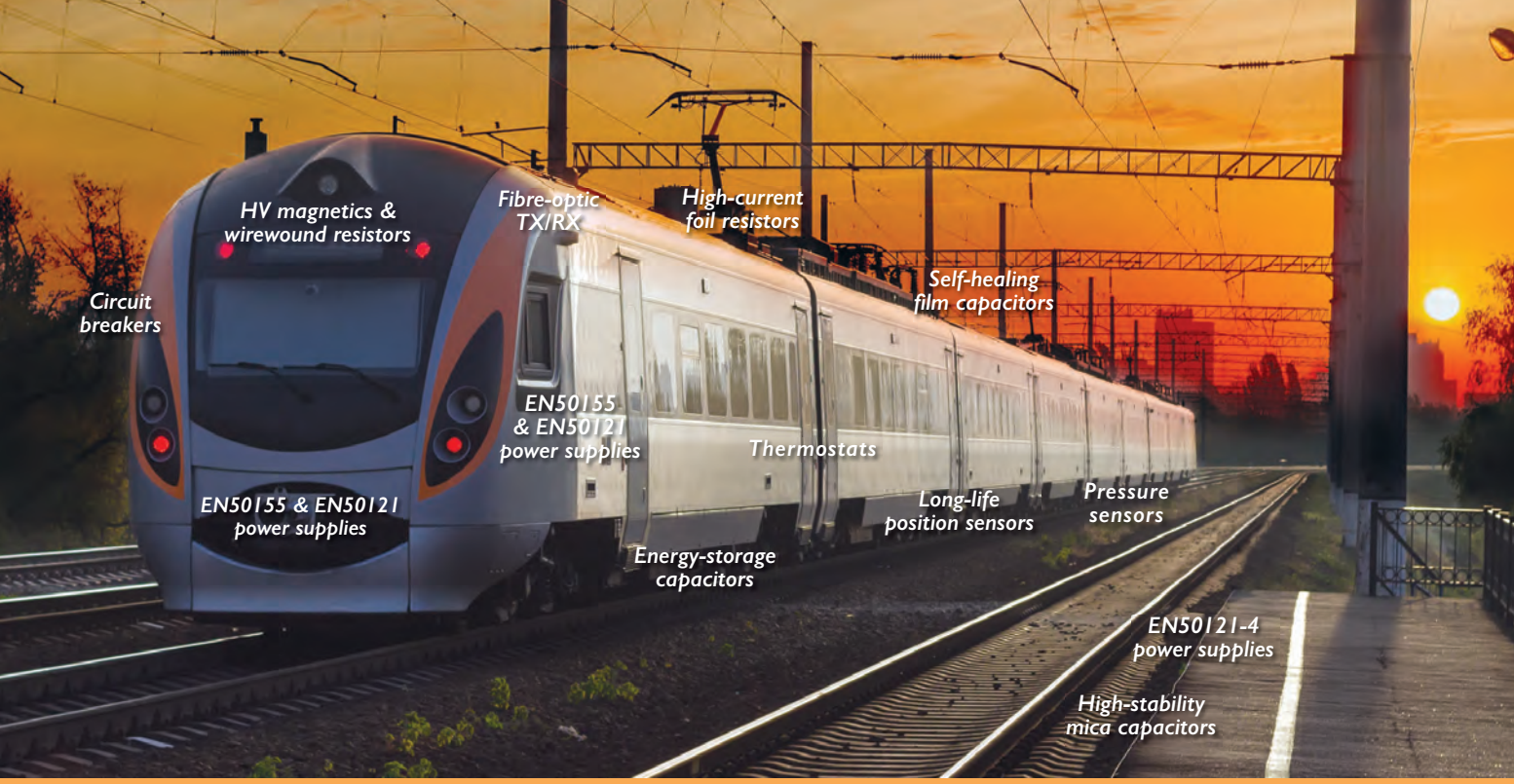


Director. **Debbie Rowland**



Cross-section of a power-supply with thermoselective vacuum encapsulation

Sometimes, a creative solution is necessary to meet the requirements for form, fit and function



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Great service is made to measure

ES asked PEI Genesis' managing director Europe, Jonathan Parry, how the company has tailored its offering to cater for diverse purchaser needs—from quick quotes to complex projects

***Electronics Sourcing* last visited PEI Genesis back in 2016. What developments and innovations have taken place since then?**

A great deal has changed since 2016. We have restructured our sales teams to be more aligned to how different types of customers want to engage with PEI. There are five customer segments: global strategic accounts, core branch accounts, account development group, redistribution and web. This allows us to serve our valued customers more effectively and in the exact way they wish to interact with PEI.

We have also added more manufacturers' product portfolios to expand our offer including Souriau, Conesys, Positronic and we've significantly added to our TE inventory.

What trends have emerged during this time?

Product trends have been rapidly moving towards smart connectors and designs which require connectors to be smaller, lighter, more robust and faster at transferring data. We are also seeing more customers transacting on our e-commerce platform so we are investing in a new website with greater usability and more functionality, which will launch later in 2020.

With the rollout of our customer segmentation strategy we are ready to meet all our customers' needs, from those who want to get a quick quotation and receive goods in 48 hours through to complex projects that require two to three years of design meetings and expert advice before the first order is placed. Either way, PEI is well placed to meet customers' expectations and deliver exceptional service.

How is PEI looking to reduce its impact on the environment, specifically reducing packaging?

Here at PEI we are looking at all options to reduce our impact, from financing colleagues to cycle to work to installing electric vehicle charging stations in our carparks. With regards to packaging, we reuse good quality packaging that we receive from our suppliers and utilise this in our shipments to customers. We also recycle all other materials including cardboard, plastic and metals.

Has PEI's stock holding changed in recent years?

Our inventory ensures a fast response to customers' needs. Our inventory is almost all held in component form which gives us flexibility to adapt our solution to best fit the customer's application. We also identify critical product families to meet the needs of each segment. For example, we recently added several million dollars of TE inventory, supporting our continued push into the industrial market including transportation, electric vehicles and factory automation.

What is the average order volume and is this based on R&D projects, maintenance or manufacturing projects?

PEI grew out of a business model primarily serving the smaller MRO and spares market where the average order size was less than ten pieces. With an MOQ of just one piece, our customers can get the exact quantity they need regardless of whether they are prototyping or ramping up for full scale production. As we have grown, we have maintained this core strength whilst adding larger customers with complex needs. For example, we are working on various projects in the aviation industry where demand for our connectors stretches over 30 years.

Have there been any bumps in the road in the connector sector over the last few years?

Over the past three years, some customers in Europe have been wary of proceeding with long term projects whilst there was uncertainty about the impact of Brexit. However, since the UK General Election which provided more certainty about the Brexit timescale, we are seeing more confidence return to the marketplace and RFQs are increasing again.

In the next five years we are forecasting significant growth in demand for our market focused expertise and we also expect to see dramatic growth in our web sales as more customers who already know what they need, choose to access our $90 million global inventory.

www.peigenesis.com



Managing director Europe, **PEI Genesis**, **Jonathan Parry**

Our inventory is almost all held in component form which gives us flexibility to adapt our solution to best fit the customer's application

Coronavirus causes sourcing headaches for buyers

The coronavirus pandemic has led to tighter supply and higher prices for some components including multilayer ceramic capacitors

Shutdowns and slowdowns in production of electronic components and other manufacturing materials in China caused by the outbreak of coronavirus has resulted in longer lead times, shortages and price increases for some electronic components.

Industry analysts, distributors and buyers say they expect coronavirus will likely continue to disrupt the electronics supply chain through the first half of the year and perhaps longer, resulting in slower component and end equipment shipments and lower sales revenue for semiconductor and other component companies in 2020.

Coronavirus began in Wuhan, Hubei province in China and its impact started to be felt in January when many companies had shut down production for two weeks because of Chinese New Year. Many factories remained shut down for two or more weeks after the lunar new year because of the spread of the virus. When factories reopened in February many operated at 30 to 60 per cent capacity.

As a result, buyers at OEMs and EMS providers expect shipment delays of components and other materials needed for production. A survey conducted by trade association IPC said electronics manufacturers are expecting at least a five-week delay in components and other production materials. IPC surveyed OEMs, electronics manufacturing services providers and printed circuit board manufacturers.

About 65 per cent of manufacturers surveyed said they were told by their suppliers to expect a three-week delay in deliveries of components and materials. However, executives at electronics manufacturers surveyed said they expect delays to be longer than what their suppliers were saying. On average, manufacturers were expecting shipment delays of at least five weeks and some said delays could be nine weeks or longer.

"The delays will likely have ripple effects for the rest of the year," said John Mitchell, IPC's president and CEO. "The longer China is affected by the epidemic, and the more it spreads to other parts of the world, the supply chain will experience more and varied strains and disruptions."

The survey found that 84 per cent of electronics manufacturers and suppliers are worried about the coronavirus' impact on their business operations including factory downtime, higher costs, transportation bottlenecks, pressure for alternative sourcing, delayed sales, and delayed prototyping that slows the introduction of new products.

Some companies said that they were considering alternate sources for parts materials produced in China. However, in most cases "it's not easy for manufacturers to switch suppliers," said Mitchell. "Securing alternate sources requires an investment of significant time and money that must be weighed against the value gained."

MLCC shortages again?

One company that has already seen delays in shipments of components is EMS provider Vexos. Lead times of "raw boards and mechanicals are extended at least four weeks and some longer," said Stephanie Martin, senior vice president global supply for Vexos, which has manufacturing facilities in the US, Canada, Denmark, China and Vietnam.

There are also delivery delays, shortages and price increases for electronic components. "Hardest hit seems to be the passive products particularly MLCCs. Some suppliers are not even acknowledging new orders. So, we have shortages, price increases and extended lead-times all happening," she said in early March.

Vexos is telling its buyers if there is available inventory of components, but the parts are not needed until May or June, buyers should "pull in the delivery date of the order and take the stock in house," said Martin. "Right now (in early March) there is availability of stock in the channel in many cases. The delay caused by the coronavirus and subsequent freight issues will create a hole in the available inventory down the road," she said. Vexos wants to make sure it has parts in inventory that it may need in the future so production is not impacted, said Martin.

Besides passive components and printed circuit boards, buyers may also find it's harder to buy light emitting diodes (LEDs) and liquid crystal displays (LCDs) because of production slowdowns by suppliers in China. China's display utilization rate fell about 20 to 25 per cent in February and the country's overall production output would drop 40 to 50 per cent due to component shortages, according to research firm Omdia.

There are about 20 LED and LCDs buyers in the coronavirus affected areas of China. Many suppliers have resumed operations, but many employees did not return to work when factories reopened in February, so unit production of LEDs and LCDs in the first quarter declined. Compared to the first quarter of 2019, the researcher said. LCD panel makers also face challenges sourcing components needed for production, including LCD polarizers, LCD modules printed circuit boards and other ICs because of a slowdown in customs clearance, according to Omdia.

Delays and shortages seen

While coronavirus has slowed down production of many components and materials, industry analysts said in early March that it was too early to say how severe the impact will be on the electronics supply chain, but said it will have a negative impact on sales for 2020.

"The biggest impact initially has been some delays in shipping products," said Paul Romano, chief operating officer of independent distributor Fusion Worldwide, based in Boston. He noted that some suppliers in China had been "shuttered for the last 30 to 45 days and that is going to create some impact with our market."

"We're seeing shortages across a number of different products," but the coronavirus is not the only reason for tighter availability of some parts, according to Romano. "Certainly, there is still some hangover from what we saw in 2018 and 2019," when there were severe shortages of MLCCs, chip resistors and some discretes. At the same time there has been a push in usage and demand is outstripping supply," said Romano.

"Many of those parts are produced in China and Japan. Remember China also produces many of the raw materials" needed for production of components which is contributing to the slowdown in manufacturing of parts, he said.

Because component manufacturing in China shut down for a while some component manufacturers "are trying to moderate demand and shortages by not accepting new orders. We expect that practice will continue to grow," said Romano.

Little impact on chips

The good news for semiconductor buyers is that coronavirus has had little impact on semiconductor production in China. "Global chip supply through the first two months of 2020 appears to be largely unaffected by the coronavirus outbreak," said Len Jelinek, research vice president, components & devices, for researcher Omdia.

"There's plenty of chip inventory in the channel, compensating for any coronavirus-related production shortfalls at semiconductor fabs located in the Wuhan area and elsewhere in China are a few semiconductor suppliers located in areas affected by the virus," said Jelinek.

The bad news is semiconductor packaging and testing operations were being adversely impacted by coronavirus because employees could not make it back to work following Chinese new year because of travel restrictions caused by the virus. As a result, many chip packaging and testing plants in China reduced or stopped operations, which created a bottleneck for chip companies that rely on back-end packaging and testing capacity, according to Omdia.

Perhaps the biggest problem for chipmakers is that coronavirus is disrupting production at electronics manufacturing services (EMS) providers and original design manufacturers (ODM). Those companies are the world's largest semiconductor buyers accounting for about 29 per cent of global chip purchases, said Jelinek. EMS providers and original design manufacturing (ODM) companies also face worker challenges as many electronics manufacturing employees were not able to return to work because of coronavirus.

Major EMS/ODM operations in China include Foxconn's iPhone production operations located about 300 miles from Wuhan in Zhengzhou. This plant was open and running, but only at about 10 to 20 percent of capacity due to workforce issues in February, according to Omdia. Jabil Circuit said the outbreak has slowed its electronics factories in the affected part of China to 65 to 70 percent of normal output.

EMS provider Plexus has facilities in China and its business has slowed because of the effect coronavirus has had on its supply base according to Omdia. It expects a $40 million drop in its fiscal second quarter revenues.

The capacity utilization rate for all electronics manufacturers in China was lower than normal in late February, the researcher said. Reduction in the production of equipment means fewer semiconductors and other components need to be purchased.

Semiconductor suppliers in China are also dealing with the logistics issues because of restrictions on air travel to and from China. The restrictions prevented many government staff numbers from returning to work after the lunar new year holiday break. As a result, the import/export process in China now is taking much longer than before, slowing the pace of commerce, said Omdia.

Electronics production resuming

Kevin Anderson, senior analyst, power semiconductors for Omdia, said there had been improvement in China in early March in terms of production resuming for components and other materials used in electronics. "But we are not out of the woods

"Because component manufacturing in China shut down for a while some component manufacturers are trying to moderate demand and shortages by not accepting new orders. We expect that practice will continue to grow



yet," he said. Coronavirus will have a big impact in first-quarter sales for many semiconductor companies. In addition the slowdown in production materials needed by electronics OEMs will continue beyond the first quarter.

"We think there will be some impact on Q2 as well. It depends on how quickly all the factories can get workers back in place," said Anderson. He said that coronavirus will result in semiconductor sales revenue planning by about 3 per cent this year.

However, Anderson said a silver lining in terms of disruption of production caused by coronavirus is that the outbreak occurred during the Chinese New Year. "A lot of the companies had built ahead in anticipation of the lunar new year so there was inventory. If the outbreak had happened in Q3 we would have a lot different situation because there would have been a lot more demand and less inventory in the supply chain, he said.

Short-term gain

Electronics distributors are not sure how much the outbreak will impact their businesses for the year, but in the short term it may boost sales as buyers at OEMs and EMS providers build their own inventories because of fear of shortages and price increases later in the year.

"Right now things are a little bit cloudy. There is some thought that with the coronavirus situation anyone who has inventory is likely going to be in a good position," said Jeff Newell, senior vice president of products for Mouser Electronics. "That's generally true, but then again once you sell through it, replenishing inventory might be a bit difficult."

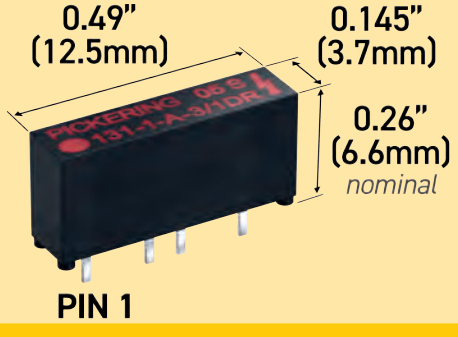
Don Akery, president, TTI Americas, said TTI was starting to see increased booking activity driven by fear of supply chain disruptions, including "customers placing orders further out. We are moving to ensure that our customers have assurance of supply and peace of mind," he said.

"We are seeing some uptick in sales. When people fear a disruption of their supply chain, the scarcity mentality comes in and people want to secure some products to be safe," said Dave Doherty, president and chief operating officer for Digi-Key " We're seeing some of that," he said in March.

He said the full extent of the disruption of production component factors was not known as of early March. "We don't have a handle on how big the disruption of the supply chain is going to be."

Distributors are trying to get as much information as possible from their component manufacturers that they carry. "We are in constant conversations with our suppliers about deliveries and expectations of when products will be available when they will be delivered," said Frank Cantwell, vice president of product and supplier management Allied Electronics.

What's new



Smallest HV reed relay

Pickering Electronics has launched what is claimed to be industry's smallest high voltage relay. Housed in the miniture SIL/SIP package, new Series 131 reed relays have a footprint of just 12.5 by 3.7mm and a height of 6.6mm, while delivering a minimum stand-off of 1,500V.

Featuring a choice of three, five or 12V coils, with optional internal diode, the relays are available in the 1 Form A (energize to make) SPST NO configuration. They can switch up to 0.7A, 10W. Devices are ideal for cable testers, mixed signal/semiconductor testers, backplane testers, high voltage instrumentation, in-circuit test equipment or other HV applications.

Pickering's CEO, Keith Moore, said: "Pickering Series 131 miniature SIL reed relays utilise vacuumed, sputtered ruthenium reed switches which have a superb low level performance, making them an excellent choice where a wide range of signals are involved. The range is based on our long-established Series 113 style of plastic package that incorporates an internal mu-metal magnetic screen to enable high packing density and Pickering's SoftCenter construction which protects the reed switch."

www.pickeringrelay.com



Exciting displays roll out

Display Technology has added to its line-up from Litemax with the new SCD2365-Y, a circle display with a mean time between failures of 100,000 hours and a brightness of 1,000cd/m².

The 23.6in Circle PC display offers sunlight readable viewing with a power efficient LED backlight. Digital signage, retail and vending applications would all benefit from this display.

Features of the new display include an aspect ratio of 1:1, contrast ratio of 600:1 and a wide resolution of 1,920 by 1,920, with a response time of 8ms and programmable pattern RGB circle lighting.

The SCD2365-Y has an operating temperature of zero to 50°C making it suitable for indoor environments and a storage temperature of -20 to 60°C. Measuring 890 by 890 by 75.7mm, the device offers a display area of 596.16 by 596.16mm with a viewing angle of 178deg both horizontally and vertically.

Input power interface options include DVI, HDMI, and DP.

www.displaytechnology.co.uk

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
CABLE ASSEMBLY & HARNESSING											
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	N/A	50	1,500+	Y
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	97%	50	1,500+	Y
CIRCUIT PROTECTION											
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
DISPLAYS & LEDs											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ENCLOSURES											
Bud	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	80%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Hammond	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	12,500	N/A	0 €	100%	50	1,500+	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ABRACON	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	91%	50	1,500+	Y
ECS	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	99%	50	1,500+	Y
Epson	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	59%	50	1,500+	Y
Geyer Quartz Technology	Geyer Electronic UK Ltd	01794 329341	www.geyer-electronic.com	N	N/A	N/A	£0	100%	6	50+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	100%	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	67%	50	1,500+	Y

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ICs & SEMICONDUCTORS											
Altera	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,600	N/A	0 €	60%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	9,500	N/A	0 €	83%	50	1,500+	Y
Atmel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,700	N/A	0 €	58%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	84%	50	1,500+	Y
Broadcom	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	80%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,400	N/A	0 €	63%	50	1,500+	Y
Diodes Incorporated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,600	N/A	0 €	98%	50	1,500+	Y
Exar	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	95%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	90%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,500	N/A	0 €	42%	50	1,500+	Y
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	97%	50	1,500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,100	N/A	0 €	97%	50	1,500+	Y
Infineon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	66%	50	1,500+	Y
Intel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	87%	50	1,500+	Y
Intersil	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,900	N/A	0 €	50%	50	1,500+	Y
ISSI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	98%	50	1,500+	Y
Lattice	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	69%	50	1,500+	Y
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Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	12,600	N/A	0 €	91%	50	1,500+	Y
Microsemi	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	40%	50	1,500+	Y
NXP	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,900	N/A	0 €	91%	50	1,500+	Y
ON Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,100	N/A	0 €	87%	50	1,500+	Y
Power Integrations	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	90%	50	1,500+	Y
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Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,500	N/A	0 €	96%	50	1,500+	Y
Skyworks	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	600	N/A	0 €	93%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	99%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	36,900	N/A	0 €	41%	50	1,500+	Y
Toshiba	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	100%	50	1,500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
ATP, Innodisk, APRO Kingston	Simms International Plc	01622 852 848	www.simms.co.uk	N	1000+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	16%	50	1,500+	Y
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Anderson Power Products	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,900	N/A	0 €	82%	50	1,500+	Y
Delphi Connection Systems	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,300	N/A	0 €	67%	50	1,500+	Y
FCI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,300	N/A	0 €	94%	50	1,500+	Y
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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
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Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	16,900	N/A	0 €	75%	50	1,500+	Y
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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 Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
OBSOLESCENCE / HARD TO FIND											
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y
Rochester Electronics	Rochester Electronics	+44.1480.408400	www.rocelec.com	Y	299	N/A	$250	N/A	10	400+	Y
	SeSemi Electronics LTD	01264 731009	www.sesemi.co.uk	Y	2800	N/A	£100	N/A	3	12	Y
OPTO ELECTRONICS											
Avago Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	8,200	N/A	0 €	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	22,500	N/A	0 €	74%	50	1,500+	Y
Dialight	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	9,800	N/A	0 €	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,800	N/A	0 €	99%	50	1,500+	Y
VCC	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,000	N/A	0 €	92%	50	1,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,100	N/A	0 €	99%	50	1,500+	Y
PASSIVES											
AVX	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	70,700	N/A	0 €	58%	50	1,500+	Y
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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
Wurth Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	63%	50	1,500+	Y
Yageo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	45,300	N/A	0 €	99%	50	1,500+	Y
POWER & BATTERIES											
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Jauch Quartz		01276 605900	www.jauch.com			£500,000	0	95	15	130	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Bel Power Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,400	N/A	0 €	94%	50	1,500+	Y
Cincon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,500	N/A	0 €	60%	50	1,500+	Y
Cosel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	11,800	N/A	0 €	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,900	N/A	0 €	100%	50	1,500+	Y
Mean Well	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,500	N/A	0 €	75%	50	1,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,200	N/A	0 €	93%	50	1,500+	Y
RECOM	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	23,300	N/A	0 €	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	98%	50	1,500+	Y
SL Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,100	N/A	0 €	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	4,600	N/A	0 €	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	3,400	N/A	0 €	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,300	N/A	0 €	70%	50	1,500+	Y
ams	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	78%	50	1,500+	Y
Bosch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	94%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,000	N/A	0 €	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	15,500	N/A	0 €	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	N/A	50	1,500+	Y
Omron	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	5,700	N/A	0 €	N/A	50	1,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Sensirion	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	N/A	50	1,500+	Y
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	70%	50	1,500+	Y
Apem	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,500	N/A	0 €	84%	50	1,500+	Y
Carling Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	300	N/A	0 €	87%	50	1,500+	Y
CHERRY	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	200	N/A	0 €	77%	50	1,500+	Y
E-Switch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	94%	50	1,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
Grayhill	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	84%	50	1,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	700	N/A	0 €	98%	50	1,500+	Y
NKK Switches	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	1,100	N/A	0 €	94%	50	1,500+	Y
Omron	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	900	N/A	0 €	68%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	400	N/A	0 €	98%	50	1,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
ADDA	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	800	N/A	0 €	59%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	500	N/A	0 €	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,200	N/A	0 €	99%	50	1,500+	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	4,300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	2,900	N/A	0 €		50	1,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	86%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	93%	50	1,500+	Y
Digi International	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	200	N/A	0 €	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	99%	50	1,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	85%	50	1,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	Y	100	N/A	0 €	36%	50	1,500+	Y



Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
AWS Electronics Group	01782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	430	11	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	Y	Y	Y	Y	Y	Y
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	£11m	UK & Far East	72	3	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
DJ Assembly	01904 436 456	www.djassembly.com	£1.25m	North Yorkshire	15	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610-F class 3, ISO14001, ISO 13485,UL	Y	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electricalimited.com	£1.75m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	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	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721, BS EN 61340-5-1 (ESD)	Y	Y	Y	Y	Y	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
Industrial Electonic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£10m	UK	90	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
Key-Tech Electronic Systems	01592 597711	www.key-tech.co.uk	£5m	Scotland	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711,	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	ISO9001-2008/IPC-A-610 Class 3/WHMA-620/ISO14001-2004/ IPC-7711/7721	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

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-20-30	Metal PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO9000: 2015	SML	Y	4-10	Y	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2015, UL, ISO 14001:2015	SML	Y	4-16	Y	Y	Y	Y	Y
DK-Daleba Printed Circuits	01992 510000	www.dk-daleba.co.uk	B/M/R	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	4-30	Y	Y	Y	Y	Y
Fineline VAR Ltd	+44 (0)1249 815 815	www.fineline-global.com	B	UK / Global	ISO9001:2015 / UL/ TS16949 / Nadcap/ AS9100/ISO14001	SML	Y	4-60	Y	Y	y	y	y
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	IS 9001:2015, IATF 16949:2016, EN (AS) 9100	SML	Y	4-34	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2015, IPC-A-610	SML	Y	4-30	Y	F/R	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2008, ISO 14001, EN9100:2009, UL, IOSCAR	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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