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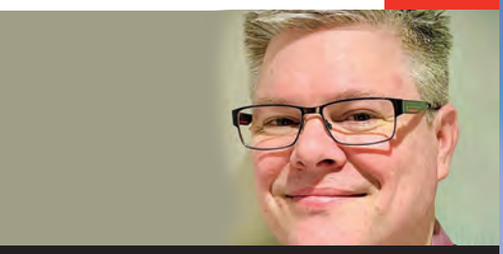

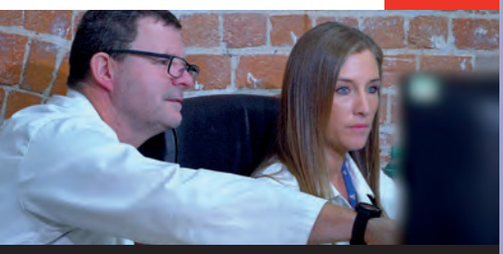

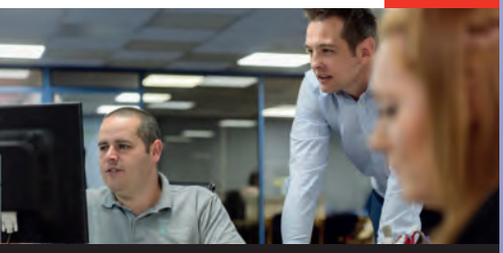

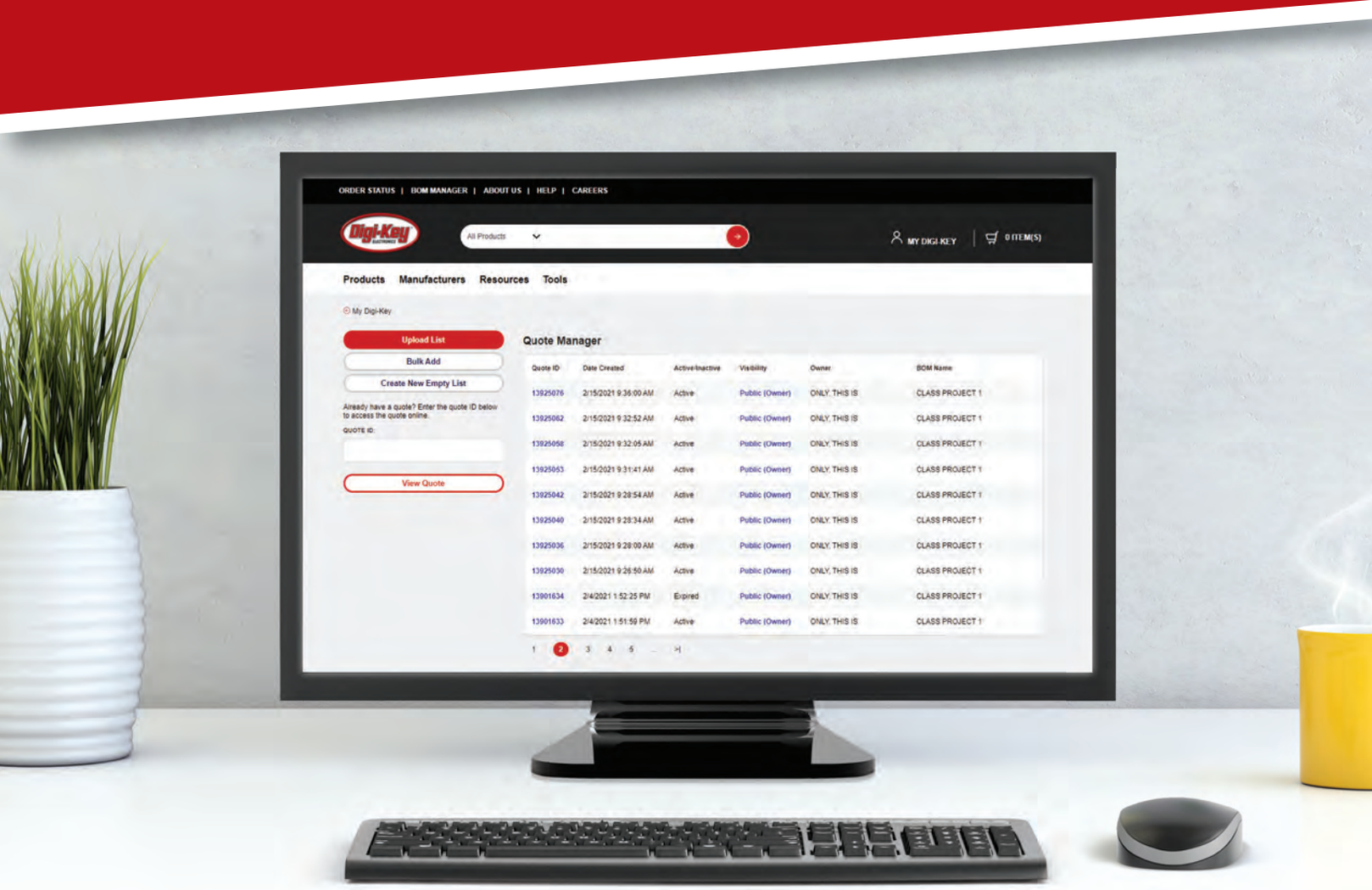

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On the cover – May 2021

Ask the Buyer
The latest market intel from purchasing professionals

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Contact

ELECTRONICS sourcing MMG PUBLISHING LIMITED

EDITORIAL
Managing Editor: Jon Barrett
jonb@electronics-sourcing.co.uk
Contributing Editor: Amy Barker
amyb@electronics-sourcing.co.uk
Editorial & Production: Thomas Smart
thomas.smart@electronics-sourcing.co.uk

ADVERTISING
Advertisement Manager: Emma Poole
emma.poole@electronics-sourcing.co.uk

DESIGN
Graphic Designer: Josh Hilton
josh.hilton@electronics-sourcing.co.uk

CIRCULATION
Circulation Manager: Vicky Leary
vicky.leary@electronics-sourcing.co.uk
Circulation Account Manager: Liz Poole
liz.poole@electronics-sourcing.co.uk

PUBLISHER
Mark Leary
mark.leary@electronics-sourcing.co.uk
Office Manager: Denise Pattenden
denise.pattenden@mmgpublishing.co.uk

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MMG PUBLISHING LTD
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Tel: +44 (0)1892 613400
Fax: +44 (0)1892 613402
@Electrosourcing

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Editor's Word

Cherished part numbers

Since becoming a city dweller, my car spends most of its life gathering dust. I tend to cycle, walk, use public transport, then take the car. When I do drive, it's typically single day, long-distance, motorway journeys.

Based on this usage and depending on which research one chooses, the best thing I can do for the planet is to keep my car. The logic is that the energy required to manufacture a comparable new electric vehicle would be disproportionately high compared with the energy consumed using my existing car.

Naturally, I need to ensure the vehicle remains safe, reliable and efficient. Given the car is approaching eight years old, this places me in obsolescence management mode.

The secret, hardly surprisingly, lies in part numbers. Often concealed under a film of oil or plastic cover and hidden amongst a plethora of other manufacturing data, the part number beats any other search method. A recent hunt for a battery nearly resulted in a Googlewhack: a search returning a single result. Likewise, my search for a replacement camera module located one in Korea.

At the time of writing the part would have been with me. However, I've had to accommodate a slight delay due to a rather large ship blocking a somewhat narrow canal.

So, cherish your part numbers. Record them accurately and safely. You never know when in the future they will become the lifesaver you need.

Jon Barrett

N ES News

View current editions online

www.electronics-sourcing.co.uk

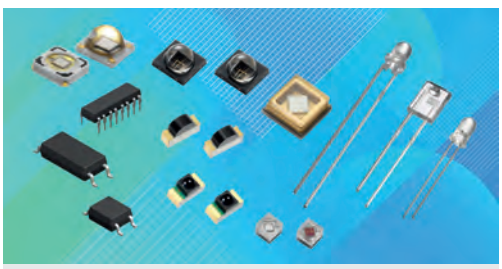
Deeper, wider passives agreement

Farnell has signed a new global franchise agreement with Yageo, extending its existing relationship to the full product range. Yageo specialises in passive components, including chip resistors and MLCCs.

Farnell's global head of IP&E, Simon Meadmore, said: "As one of the largest chip resistor and capacitor manufacturers in the world, Yageo products further enhance our extensive passive component portfolio, providing easier access to quality products for our customers. With warehouses in the United Kingdom, mainland Europe, North America and the Asia Pacific region, customers can rely on Farnell to deliver the components they need."

Yageo Europe's managing director, Arthur Wang, added: "We are delighted to have Farnell as a high service distributor supporting Yageo's comprehensive product range. Farnell already has a strong partnership with Kemet and Pulse. As a global passive component leader, Yageo Group will work closely with Farnell to provide customers with short time delivery and best service."

www.farnell.com



Bright future for LED purchasing

Anglia Components' new partnership with Liteon has expanded its range of opto products including discrete, ultraviolet and infrared LEDs and optocouplers.

Anglia's technical director, David Pearson, said, "Demand is growing for opto-electronics products, particularly in the applications of UV LEDs for sterilisation and IR LEDs for security and sensing solutions. For this reason, it is particularly timely to expand our range of these devices with Liteon."

Liteon's director of sales for Europe, Roland Prinzen, added: "We recognise the value of a strong distribution network for our components, and given their outstanding reputation in the UK and Ireland, we are delighted to partner with Anglia. Opto devices are key to many designs, increasingly so as we move to a new normal following Covid and we are confident that its FAE team will identify many new customers who can benefit from our innovative solutions."

Anglia is supporting the new line with inventory on the most popular parts available from Anglia Live.

www.anglia.com

Voice capture modules ready to purchase

Digi-Key Electronics has announced a global distribution partnership with ArkX Laboratories to offer its advanced far-field voice capture AFE module and development kit for voice-enabled IoT products.

The module is said to outperform other far-field solutions and deliver a superior voice experience by capturing voice commands from three times the standard distance, around corners, noisy and reflective environments, and without lowering playback volume.

Additionally, EveryWord technology is designed to provide the unique ability to identify and suppress speech from TV or other single-point noise sources.

The voice capture module can be used in IoT applications as a human-to-machine interface. EveryWord technology also offers superior performance for companies who want to bring their voice-enabled smart products and devices to market while mitigating risk, reducing development costs and accelerating their time-to-market.

Digi-Key's vice president of global supplier management, David Stein, said: "ArkX's advanced far-field products enable engineers and developers to bring a powerful voice experience to their products."

ArkX Laboratories' executive vice president, Michael Lang, added: "Digi-Key offers OEM engineers and developers a reliable resource to access our advanced voice capture solutions and first-class customer service."

www.digikey.com

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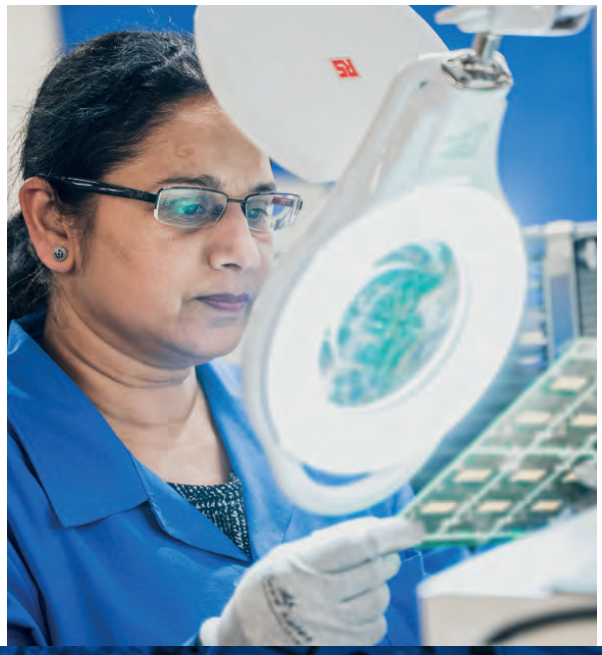

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ES News

In Brief

Two-year monitor warranty extension
ViewSonic has announced an extra two-year warranty in addition to the standard three-year protection on selected VG and VP monitors in the UK. The VG range is purpose-built for corporate environments, offices and home offices, while the VP range suits photographers, graphic designers, video editors, and more.
viewsoniceurope.com

Two become one
Franchised distributor, Solid State Supplies, and optoelectronic, display and laser solutions specialist, Pacer International, have merged. The merger is designed to create a scalable, more efficient organisation, benefitting customers of both companies by offering a broader portfolio and more complete value-added solution.
www.sssltd.com

Investing in UK component production
TT Electronics is expanding its Bedlington facility to support enhanced production of microelectronics, sensors and specialist components. A new 1,000m² ISO7 clean room represents a major milestone and is the latest phase of a £1.6m investment project to modernise, redevelop and increase capacity at the Northumberland location.
www.ttelectronics.com

Wearable enclosures for social distancing
OKW states growing demand for Covid-19 social distancing warning devices has created a burgeoning new market for its wearable enclosures. Body-Case and Minitec enclosures are ideal for proximity-warning electronics to help safeguard personnel in warehouses, distribution centres, factories and other roles where working from home is impossible.
www.okw.co.uk

New show date

MMG Publishing has announced that the ECS show, originally scheduled for May 2020 has been re-schedule to May 2022.

Publisher, Mark Leary explained: "Given lockdown deadlines, vaccine rollout and market feedback regarding staff travel it was decided to move the show dates to 2022. By holding this one day event in May 2022, it should provide a better opportunity for exhibitors to meet more visitors who will hopefully be more relaxed regarding attending trade shows.

"From the exhibitors' perspective, the new date provides over 12-months to prepare and plan for a successful show."

MMG is finalising details for the 2022 event and will update exhibitors over the next three to four weeks. Enhancements include better facilities and more space to ensure as much room for visitors and exhibitors regarding pandemic awareness.

Mark concluded: "I would like to thank exhibitors and visitors for their patience and understanding regarding the re-scheduling. The pandemic has clearly changed everyone's plans, working environments and life, hence we believe our decision to postpone to May 2022 is the sensible and safe choice for all."

www.electronic-component-show.co.uk

Integrated device cuts component count

Mouser Electronics is now stocking Analog Devices' ADAQ23875 µModule data acquisition solution. Featuring system-in-package technology, the product integrates multiple common signal-processing and conditioning blocks into a single device, reducing end system component count.

The device integrates a low-noise, fully differential analog-to-digital converter driver; a stable reference buffer; and high-speed 16-bit, 15 MSPS successive approximation register ADC. The device also incorporates Analog Devices' iPassives technology, designed to supply passive components with superior matching and drift characteristics, to minimize temperature dependent error sources through optimized performance.

The ADAQ23875 comes in a 9 by 9mm package, four times smaller than its discrete equivalent, enabling smaller-form-factor instruments without sacrificing performance. The DAQ features a serial low-voltage differential-signalling digital interface with one-lane or two-lane output modes, letting the user optimize the interface data rate for each application.

www.mouser.com

Buying into display integration

Rutronik states that ease of integration is a key benefit of new pixxiLCD graphic displays from 4D Systems. The configurable PIXXI-28 or PIXXI-44 GPUs offer functions including touch detection, microSD or serial flash memory, GPIO and ADC, with multiple millisecond timers, UART and I²C communication.

The displays are offered in different shapes and sizes, such as round or rectangular versions. There is also a choice between capacitive and non-touch displays.

The displays have a standard 15-pin ribbon cable connector in 0.5mm pitch with ZIF socket interface, through which UART, I/O, I²C and the power supply with reset signals are led from/to the display.

www.rutronik24.com

Helping meet buyers' and purchasers' needs

Mouser explains how investments in its line card, stock, facilities and support services are offering benefits to component purchasing professionals

The electronics industry has seen turmoil over the past 18-months as the global pandemic has re-shaped traditional ways of working. Alongside this shift in the workplace, the industry is also experiencing component shortages and supply chain difficulties. As a result, the role of the electronics distributor has become more critical than ever.

Engineers and buyers want timely access to the latest products, continuity of supply and new online technical resources and tools that support continued learning while working from home. These requirements have not gone unanswered at Mouser, a global authorized distributor that has invested heavily in its inventory, infrastructure, services and online resources. One key example is the continued expansion of the Global Distribution Centre in Texas, which has also gained significant advancements in state-of-the-art automation, enhancing efficiency and speed of dispatch.

1.1 million parts, ready to ship

Mouser's key focus has always been to stock a wide selection of inventory, particularly the newest products and technologies from its 1,100 manufacturer partners. The recent investment and expansion in facilities has allowed the company to accommodate even more stock. The distributor typically orders stock months in advance of anticipated demand, which helps enable its customers to access the world's most comprehensive selection of components. The team has done a good job trying to stay ahead of lead time extensions and product availability issues.

In spite of all the challenges faced in 2020, Mouser added over 70 semiconductor and electronic component manufacturers to its line card, and successfully introduced nearly 5,000 new products into the global marketplace. Some sources are very limited in their component offerings. With Mouser, customers can source their entire bill of materials in easy, one-stop buying.

With 31 manufacturers added so far in 2021, Mouser stocks the industry's widest selection, meaning customers can usually find the parts they need for their latest designs, or alternative products, if needed. These products are augmented by a range of associated resources, such as application notes, data sheets, technical documents and customer support.

Best-in-class customer service

Mouser continues to develop new online tools designed to provide valuable assistance in the day-to-day activities of buyers and purchasers. Recent examples include Price & Availability Assistant, Services & Tools, Technical Resource Centre, Conversion tools and Online Calculators.

Mouser has also constructed a new Customer Service Centre building at its Global Headquarters in Texas, in addition to expanding its 27 regional support teams across the world. The distributor has 10 Customer Service offices across Europe to provide customer and technical support in local time zone, language and currency.

Fully authorised distributor: 100 per cent

Customers expect Mouser, as an authorised distributor, to forge strong links with leading technology providers. The company has put professionals and procedures in place to ensure an effective and efficient supply chain, free of counterfeit or grey market products. Customers can expect to receive 100 per cent genuine products, fully traceable from each manufacturer. Technical teams can provide in-depth understanding of the latest solutions, providing customers with guidance and advice.

The strength of relationships fostered with manufacturer partners means Mouser constantly monitors the market to identify any issues such as lead times in advance, providing customers with a high level of service. As the industry's new product introduction leader, Mouser doesn't just ensure the right products from the right manufacturers, it also ensures quality and traceability.

www.mouser.co.uk

Automotive semiconductor shortage, an accident waiting to happen?

ECIA president and CEO, David Loftus, discusses how authorised distribution can help automotive manufacturers manage supply and demand challenges

ECIA president and CEO, **David Loftus**

Recently, news channels have been filled with articles about automotive manufacturers around the world shutting down production lines due to semiconductor shortages. Automotive executives and even government officials are scrambling to exert influence on the semiconductor supply chain to ramp production and reassign priorities to avoid production gaps and idling hundreds of thousands of automotive workers.

Of course, the pandemic has contributed to supply chain disruptions and shortages. There were certainly disruptions in the semiconductor supply chain in the first and second quarter of 2020, but most companies were back operating at or near their pre-pandemic levels within the third quarter. As the pandemic progressed and businesses and schools were forced to operate remotely, the industry experienced a surge in demand for PCs, smartphones and communications infrastructure. Cloud providers like AWS, Microsoft Azure and Google Cloud saw record growth in late 2020, further accelerating their investments in more server and communications hardware.

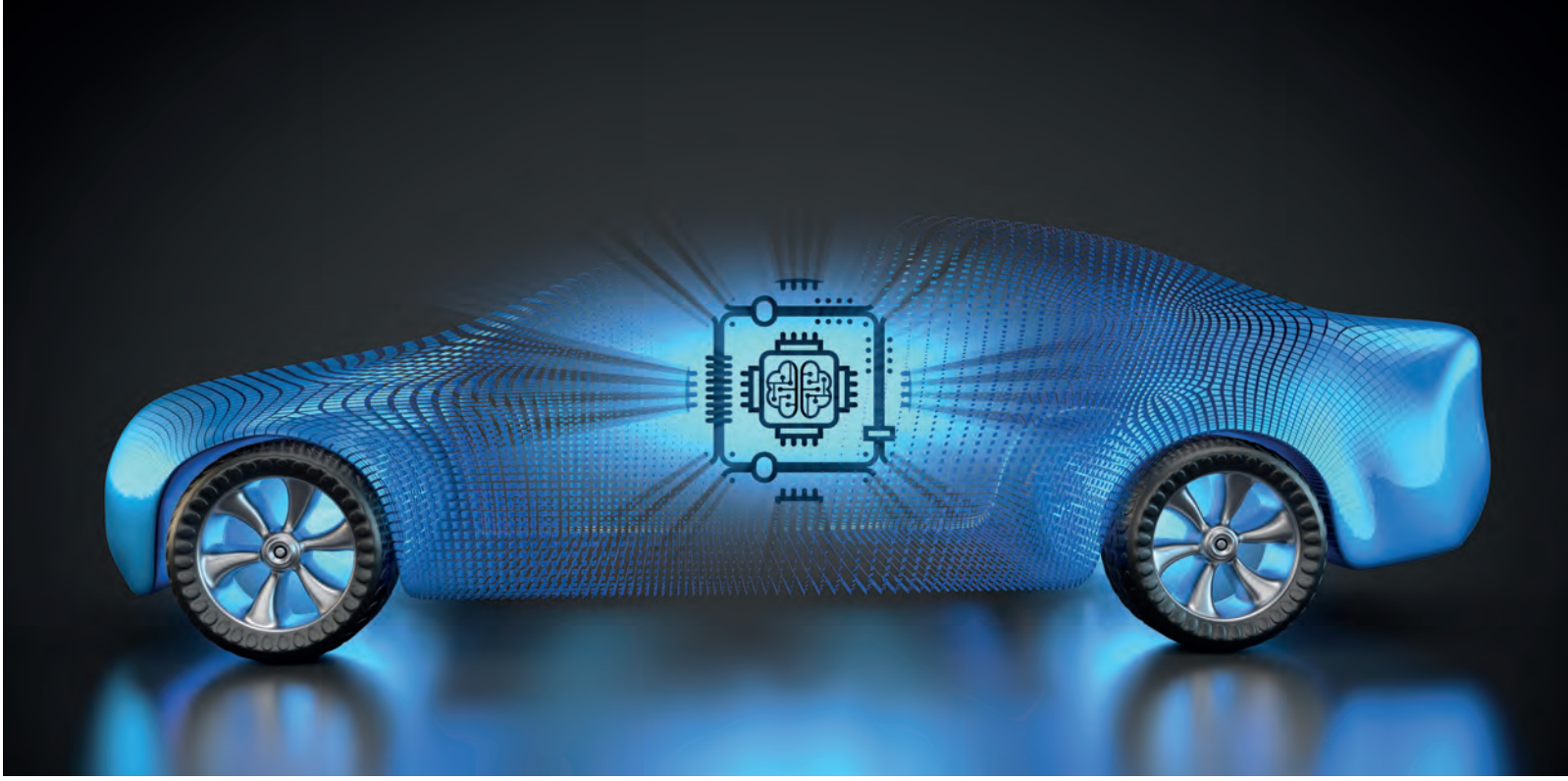
Automotive production line shutdowns also occurred. Auto factories around the world were temporarily shuttered until safety protocols and secure worksites were implemented to keep workers healthy. Shutdowns led to a supply gap to downstream dealer networks and consumers. Now, with factory volumes restored and economic recovery picking up, auto manufacturers, their Tier 1 suppliers and the entire supply chain began ramping orders for materials required to build automobiles. That's where the big supply chain problems bit them.

The current auto semiconductor shortage was an accident waiting to happen. For several decades, the automotive industry has driven one of the leanest and most demanding supply chains in the world. Just-in-time manufacturing works great in a steady state environment. Provided everyone's production lines are running smoothly, manufacturers can output products with minimal inventory and disruption. As procurement executives were driven to more aggressive cost-reduction goals, they pushed their teams to reduce middlemen and buffers perceived to add incremental cost. Unfortunately, with long lead-time items like semiconductors, the supply chain cannot react instantaneously. Especially when there is competition for fab, foundry, assembly and test resources.

The extreme focus on cost could and should have been balanced with a pragmatic view on the extreme cost of idled automotive production lines. To shut down production lines for $80,000 vehicles due to a missing $2 microprocessor was previously inconceivable but is happening all over the world today.

To minimise future shortages, automotive manufacturing companies can utilise the authorised channel to help them cushion supply fluctuations. There are methods of partnering with electronics distributors that can help avoid astronomically expensive shutdowns. Past decades have seen automotive customers eschewing the channel. Automotive procurement teams have increasingly been demanding semiconductor suppliers do business with them directly. In addition to perceived cost benefits, automotive procurement teams often assume they will get better priority working directly with electronic components suppliers. However, most semiconductor suppliers are not set up to efficiently supply automotive businesses

> **To minimise future shortages, automotive manufacturing companies can utilise the authorised channel to help them cushion supply fluctuations**



directly. With longer lead-times, higher minimum order quantities, limited finished goods inventory and shorter financial terms, most semiconductor manufacturers are geared for selling extremely high volumes of fewer part types to their highest volume customers. While over 100 million vehicles are normally sold annually, the mix of models and electronics across the automotive spectrum means most of their business is high-mix, low-volume to semiconductor suppliers.

Semiconductor operations teams are geared toward shipping directly to a narrow set of high-volume customers. For example, shipping 100s of millions of a narrow list of part numbers to someone like Apple for iPhones. Sometimes it can make sense for direct business from a semiconductor manufacturer when automotive companies standardise on a few components that are heavily utilised over the bulk of their product lines. But for most lower volume part numbers, distribution can be a better solution.

Products with longer lead-times and large production lot sizes, like semiconductors, need distribution for efficient buffering between the manufacturers and end customers. Semiconductors have long, complex production cycles, ranging from 10 to 26-weeks. With the advent of fabless semiconductor companies and asset-lite production strategies, a semiconductor company often relies on outside manufacturing partners and is often subject to their partners' production queues and utilisation constraints. Once production begins, large quantities of the same product flow through the manufacturing line. Again, distribution plays the role of matching a customer's demand for a steady flow of product to the long and burst-like production cycles of semiconductor manufacturing.

Supplier-authorised distributors are logistics experts that can aggregate volumes over many customers, efficiently holding and shipping inventory as needed to a broad customer base. Distribution also offers automotive manufacturers value-add services such as: special labeling, bar coding and packaging; corrective actions and failure analysis support; in-plant stores; vendor managed inventory; inventory consignment programs; part programming services; production part approval process and supplier quality programs. Collaboration between authorised distributors and automotive manufacturers presents a wealth of opportunity.

Not all automotive manufacturers demand direct business with semiconductor suppliers. Distribution was so important to the Japanese automotive industry that manufacturers like Toyota created their own distributors. Toyota Tsusho, now part of Nexty Electronics, is one example. These captive distributors helped ensure genuine products and avoid counterfeits. Today this authenticity is assured when buyers stick to the authorised channel and utilise free resources like www.TrustedParts.com.

While the pandemic and trade war actions have exacerbated the current shortages of semiconductors to the automotive industry, many of the current problems were avoidable. Future supply chain disruptions will undoubtedly occur. To minimise future supply chain disruptions, it is imperative that industries like automotive efficiently and effectively employ the resources and options available to them, and a huge, under-utilised resource available today is the authorised channel of electronics distribution.

www.ecianow.org

While the pandemic and trade war actions have exacerbated the current shortages of semiconductors to the automotive industry, many of the current problems were avoidable

PCB sourcing: a checklist

In this article we ask DK-Daleba's business development manager, Tony Hawkins, for a buyers' guide to PCB sourcing

What are the trends impacting PCB sourcing?

Two, four and six-layer FR4 boards represent the majority of PCBs and are likely to remain so. To handle thermal issues, aluminium clad IMS boards are an established product and designers are recognising the benefits of ceramic and heavy copper. Adapting designs for flex-rigids is also a recognised way of improving reliability and cost. The global PCB market is expected to grow at 4.3 per cent (CAGR) over the next five years with flex and flex-rigids growing 9.8 per cent.

How are material costs impacting pricing and lead times?

Recent material price increases have altered finished board costs. That is impossible to avoid regarding copper, CCL, prepregs, gold and other production materials. Percentage increases for some materials are reported in excess of 35 per cent. The actual board increase depends on the PCB type. A two-layer PCB will have proportionally more copper, solder mask and gold than a six or eight-layer, so increases have been typically around 15 per cent for two-layer and 8 to 10 per cent for others. Material prices can be attributed to commodity materials, such as copper and gold, being at exceptionally high levels but equally there has been a rapid increase in demand.

Asian manufacturing lead-times are also under pressure. As the world adjusts to the pandemic economies are recovering and demand is increasing. The Chinese economy has recovered strongly, with manufacturing increasing month-on-month. Chinese domestic PCB production

DK-Daleba's business development manager, **Tony Hawkins**

currently exceeds exports, making it difficult for suppliers to maintain lead-times. Sea freight times are also extended. Clearance into the UK or Europe is taking longer, necessitating longer shipping lead-times.

What questions should buyers be asking when engaging a new PCB supplier?

In the current disrupted market, explore the supplier's flexibility and whether it has the resources to offer value and a prompt, uninterrupted supply.

What accreditations does the company have? Most buyers will be familiar with ISO, IPC and UL but does the supplier have the accreditations required by the markets you serve?

How would the supplier accommodate a request for boards required within a few days? Does it have UK manufacturing for quick turn and offshore production for economy?

Is the supplier trading remotely with Asia or does it have a local office overseeing engineering, quality and supply? Local support adds value to the supply process with experts working with their manufacturing partners to ensure smooth production and supply.

Is consignment stock offered? What is the minimum batch size to secure the best price and over what period can that batch be consumed? Having price stable UK inventory which can be delivered next day is invaluable. Consignment stock sitting in your own warehouse is even more powerful.

What is the supply route to an EU manufacturing site? Is the supplier willing to import into the EU? If purchasing for EU factories, ask the supplier if they will arrange EU import for 'free circulation' to the factories.

Is the supplier a trading company or manufacturer developing new technologies? PCB producers are not designers but they should have engineers who can share the capabilities of new technologies. Ask about ceramics for thermal and low signal loss, heavy copper for power and flex-rigids.

Finally, flexibility is key. Value is important but ensure the supplier has the resources to offer different supply options and ensure you receive prompt uninterrupted delivery of PCBs.

www.dk-daleba.co.uk

> **In the current disrupted market, explore the supplier's flexibility and whether it has the resources to offer value and a prompt, uninterrupted supply**

Global copper demand drives up PCB prices

Fineline VAR's MD, Clive Wall, reveals the driving forces behind recent fluctuations in PCB pricing and supply

It is no secret the PCB market is turbulent with prices changing almost daily. Driven by a copper shortage it is impacting the PCB supply chain in new ways and there is no end in sight.

The markets draining copper reserves include electric vehicles, smartphones, green energy, telecoms and 5G. These consume huge quantities of copper adding pressure to an already stressed market. Additionally, copper PCB foil is prepared to exacting standards for fine tracks and complex features. Many copper producers prefer to sell to the less demanding energy and battery markets. Copper foil cost is currently increasing at a higher rate than copper as a commodity.

Foil capacity is increasing but not overnight. Two copper foil plants are expanding with deadlines of Q4 2021 and 2023. However, even this will not bridge the gap between supply and demand.

Past pricing wars and production efficiencies have lowered costs year-on-year to the point where 2020 PCB pricing was lower than 2000. Now we are seeing the opposite. Lead-times are extending and global PCB prices are rising rapidly. Costs may subside when the markets stabilise, but it is unlikely they will return to levels enjoyed in recent years.

Supply chain and logistics are another area causing market instability. Both sea and air freight are areas of concern. Whilst air freight demand has returned to pre-pandemic levels, capacity is significantly down due to the reduced number of passenger flights. This is also elevating prices and is expected to continue until passenger flights increase in the future.

Sea freight is in high demand, leading to container shortages. Also, Asia/USA routes are more profitable than Asia/Europe. Brexit added congestion and delays through UK ports.

Customers with strong, close partnerships with their PCB suppliers are best placed to navigate further upheaval.

fineline-global.com

Importance of a strong inventory

Mouser's senior vice president of products, Jeff Newell, explains how by ordering months in advance of expected demand, the company stays ahead of lead time extensions

In the face of semiconductor shortages and other supply chain disruptions in the automotive and manufacturing sectors, Mouser's longstanding strategy to invest in and maintain strong inventory is helping meet the component needs of buyers and manufacturers around the globe.

Mouser's senior vice president of products, Jeff Newell, said: "As an essential infrastructure business and part of the global supply chain, Mouser continues to ship hundreds of thousands of components every week. Because Mouser orders months in advance of expected demand, we have done a good job trying to stay ahead of lead time extensions and product availability issues in our industry."

With over 1.1 million unique part numbers in stock or available to order, Mouser's inventory position is designed to ensure customers get what they need fast. Additionally, the distributor specializes in the rapid introduction of new products and technologies, helping customers gain the edge they need to reduce their time-to-market. The company's assortment of products from over 1,100 manufacturer brands assists customers in finding alternate products should the need arise.

Despite 2020's challenges, Mouser added over 70 semiconductor and electronic component manufacturers to its line card and introduced nearly 5,000 new products.

Newell added: "There's never been a more important time to buy from an authorized distributor. Fully operational at all 27 of our global locations, Mouser has the professionals and procedures in place to ensure an effective and efficient supply chain, free of counterfeit or gray market products. Customers can always expect 100 per cent certified, genuine products that are fully traceable from each manufacturer."

Mouser ships everything from its distribution center in Texas, so all products are picked, packed and shipped from the same location, rather than from multiple warehouses in different countries.

mouser.co.uk

Mouser's senior vice president of products, **Jeff Newell**

Medical device trends impacting connector manufacturing

TTI supplier marketing manager, John Sandy, looks at the trends impacting connector design and selection in the medical device industry

Medical technology is evolving rapidly and connectors are evolving to meet changing needs and design standards. In the past, diagnostic and therapeutic devices were larger and generally stationary. Mini-circular connectors were common, with standard cordsets often connected to power and signal cabling in the walls. Primary requirements for those connectors were: easy cleaning/sanitising; easy mating; protection against mis-mating; and protection against movement or disconnection.

Today, medical connectors must meet more advanced needs. Signal and power requirements have grown as imaging and monitoring technology has advanced. Larger amounts of data are being read, analysed and transferred between hospitals, clinics and offices.

Future medical devices may include connector products originally developed for the data-communications industry, including mid to high-speed backplanes and connectors with higher pin counts. Established products offer more competitive pricing and future-proofing as data needs change during a machine's lifetime.

As more clinical devices make use of disposable or single-use probes, sensors, catheters and more, requirements for easy sterilisation and secure mating won't change. However, device-side connectors must support high mating cycles: 1,000 to 5,000 operations isn't unusual.

Whether the device works with a card-edge connector or pin-and-socket, the disposable connector used on the probe, catheter or sensor needs to be easy to mate, reliable and guaranteed to be sanitary.

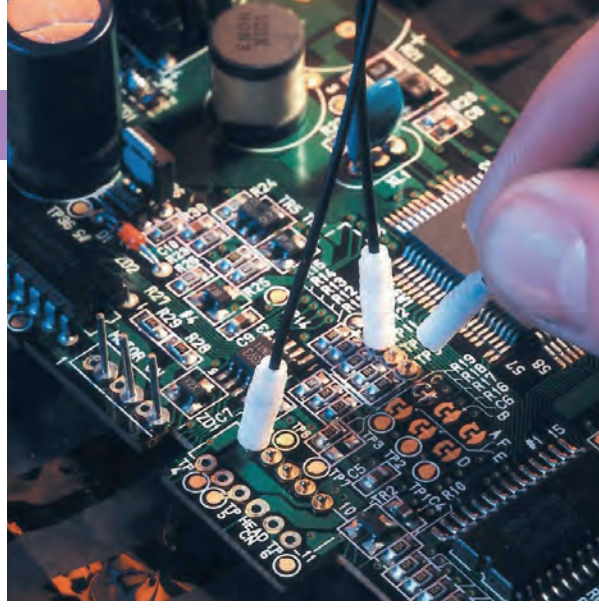
Manufacturers assemble and package single-use medical connectors in clean rooms where sanitation is guaranteed. This value-add makes connector suppliers a key part of the medical device supply chain.

Suppliers have also responded to specialised medical industry needs by creating new families of connectors. For example, magnetic resonance imaging (MRI) led to the creation of an entire family of non-ferrous or magnetism-resistant connectors safe to use near or in this equipment. Connected health care devices will move patient monitoring technology from doctors' offices and hospitals into people's homes. Inside such devices, reliable connectors that deliver greater signal, power and data in a smaller footprint will be the norm. As home health care continues to grow, nurses and caregivers will need devices with intuitive, secure connectors, plus smaller, cheaper probes and sensors.

Suppliers can provide a valuable service. Instead of simply supplying a connector, they can fabricate a sub-assembly in a clean-room environment to prevent contamination. Connector suppliers may increasingly be relied on to provide solutions in an evolving industry, plus value-added services.

tti.com

Identify faults fast



Oxley's SMOX, available for hand or automatic assembly with a compatible mating socket for quick test set up, can be used to quickly identify faulty components, cracked solder joints or short circuits.

Contact resistance is < 2mΩ through eight points of contact. On thick, multi-layered boards, where complex track designs can lead to expensive PCBs, the benefits of quickly and effectively identifying and repairing faults can be easily recognised.

To guarantee the best solder fillets the low profile SMOX features a chamfer design, ensuring a stronger connection to the board.

www.oxleygroup.com

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Restoring order post pandemic

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 explores some of the challenges facing the global electronics supply chain as it emerges unevenly from pandemic controls

Procurement's reboot • By John Denslinger

While medical teams, financial institutions and governments continue working tirelessly on Covid-19 issues, the forecast ahead for procurement is almost as daunting. Faced with the aftermath of shelter-in-place and similar decrees, the great American industrial reboot is about to begin.

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

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

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

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

All things considered, the great reboot is a welcomed challenge.

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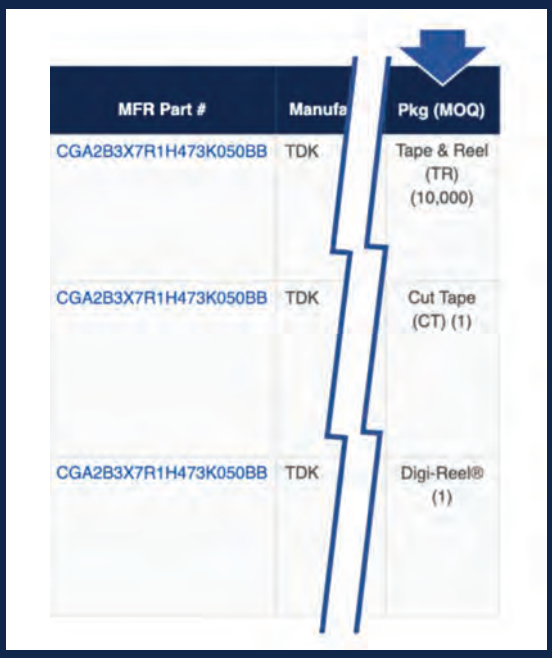

MFR Part #	Manufa	Pkg (MOQ)
CGA2B3X7R1H473K050BB	TDK	Tape & Reel (TR) (10,000)
CGA2B3X7R1H473K050BB	TDK	Cut Tape (CT) (1)
CGA2B3X7R1H473K050BB	TDK	Digi-Reel® (1)

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Adjusting to the new normal

Nemco's purchasing manager, Christine Stanley, explains how the company is dealing with material shortages, COVID precautions and post-Brexit supply chains

Nemco's purchasing team has faced plenty of material shortages including raw materials, component allocations, lengthening lead-times, factory closures and courier losses. However, rarely has it faced multiple problems simultaneously: until this year.

As a CEM, Nemco often purchases inside factory lead-times so buyers focus on materials available from current stock or in the pipeline. These are normal constraints, however we are now sourcing from a dwindling pool of materials globally. Furthermore, despite insisting on purchase order confirmations, materials don't arrive when scheduled. Alternatively, they are pushed out at the eleventh hour, not by a day or so, but months or more. This is increasingly common and causes havoc with planning and production because materials kits to service production lines are not clean on the expected dates.

Stockists and distributors are doing their best and frequently don't know themselves that shipments are delayed until it is too late. It would be helpful if suppliers could provide quicker updates on delayed deliveries and possibly offer alternatives where available. Some customers are open to using alternatives and our engineering team is working hard to find the best solutions.

Semiconductors appear worst hit by reduced factory capacity due to Covid-19, although raw materials for PCBs and passives can be problematic. Frustration caused by chasing stock updates is exacerbated by the number of suppliers working from home. We accept this and many of Nemco's staff are working from home with more than 60 per cent of the purchasing team doing so at any one time.

Since Brexit, carriage is slower, with some couriers not coping well. A high number of shipments have been delivered to the wrong region, eventually finding their way to us, while others have been lost without a trace. This is difficult under normal circumstances but when materials are in short supply, it's extremely frustrating.

Another issue is the added costs to cover Covid precautions at warehouses. All of our top suppliers introduced added delivery costs of between five and 15 Euros per drop last year. Standard delivery, which was previously one to two-days from Europe, is now four to five-days.

There is no quick fix and while the UK is exiting lockdown well, other countries are not. Materials will remain difficult to locate in the short term. Longer term is difficult to say but the likelihood of this scenario continuing beyond 12-months is high.

www.nemco.co.uk

Nemco's purchasing manager, **Christine Stanley**

Don't take supply chains for granted

Note Windsor's logistics manager, Brendon Jones, illustrates the value of nurturing long-term supplier partnerships in the face of market volatility

The electronic components supply market continues to face significant challenges, costs are trending upwards and lead times are lengthening, for all product technologies. In addition, several manufacturers have experienced raw material cost increases which are being passed on and we expect this trend to continue.

The pandemic and strong economic factors are driving demand to significantly exceed supply. Wafer fabs, including test and assembly, are now at or beyond full capacity. On average, demand versus supply is in the range of 120 per cent. For some materials, capacity is now critical, leading to unprecedented manufacturing lead time increases. We are expecting this situation to remain for some months, possibly well into 2022.

To compound these challenges, we have had storms, earthquakes, manufacturing factory fires and freight reductions to contend with.

A good CEM needs to navigate supply chain pressures while finding ways of adding value to the outsourcing relationship and simplifying customers' lives.

> **Wafer fabs, including test and assembly, are now at or beyond full capacity**

Brendon Jones said: "Through our key supplier relationships and Note's Central Sourcing division, we receive regular manufacturer updates from our strategic distribution partners and forecast the forward trends to allow us to work with our suppliers to minimise any disruptions."

All staff are now on site and the company has introduced Covid-19 processes and procedures. These include PPE and social distancing, plus reorganising the office space/ shop floor and staggering start/finish and break times.

High consumption rate, lower

value components such as generic resistors, capacitors and diodes are managed under consignment stock agreements with two preferred suppliers. Fast-moving consigned component reels are located on the shop floor in an area set aside for off-line set up to minimise set-up and changeover times.

Note Windsor also buffers component and final assembly goods at strategic suppliers or on-site for end customers. The final assembly goods arrangement tends to be for specialist parts needed for build-to-order projects. Windsor buys the components and materials on behalf of its customer; whereby it is underwritten by them and managed by Windsor on a min/max basis.

During early 2021 several component manufacturers requested firm orders for a 12-month horizon to manage allocation. Depending on component segment, forecasts needed to be converted to firm orders to get allocation. Order visibility is critical to ensure continuity of supply and Windsor's Kanban system aims to provide customers with peace of mind. The system self regulates by pulling higher level build when demand dictates and slows up when demand falls, allowing us to manage finished goods, work in progress, components in a kit form and even components that are on order or in buffer with suppliers.

Windsor nurtures long-term supplier partnerships, meeting regularly to review demand, forecasts and lead times to ensure continuity of supply. In any economic climate, an effective supply chain cannot be taken for granted. Like any other part of the business, it must be subject to continuous improvement. In this current market, long-term visibility is best to enable us to communicate through to our strategic supply base to manage these supply chains. The more visibility customers can give us, the more we can plan and forecast.

www.note-uk.co.uk

Note Windsor's logistics manager, **Brendon Jones**

MICRO HOT DIP SOLDERING

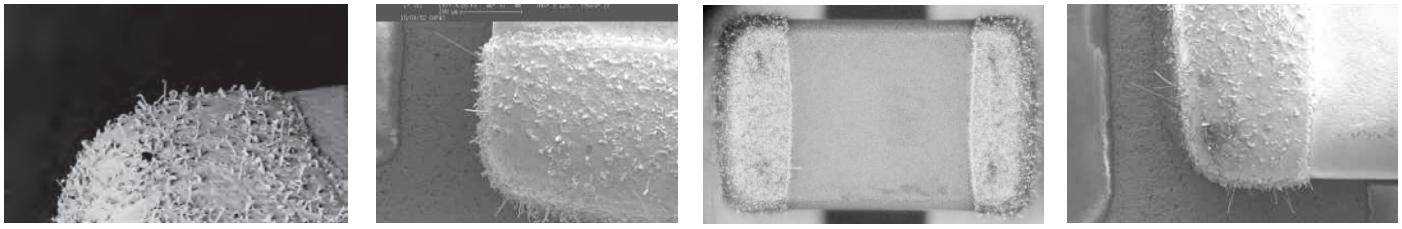
A RETRONIX PROCESS INNOVATION

It's a standard requirement that high-reliability electronic manufacturers must convert lead-free components to lead/tin for mitigating tin whiskers. Until now, hand-dipping or small batch processing has been the only micro component conversion method, which is costly, inconsistent & time-consuming. Therefore, manufacturers are rejecting the process, instead using lead paste to assemble PCBs with lead-free capacitors & resistors.

Tin whiskers are filaments of tin that grow out of lead free plating and can cause shorts.

The consequence of this cut corner solution is that the lead solder only covers the sides of the termination but does not reach the top surface. As widely reported by **NASA**, this process **DOES NOT** protect against the risk of Tin Whiskers. As components get smaller and PCBs more condensed this makes the problem worse, as tin whiskers have a shorter distance to travel to cause a short.

Tin Whiskers on top side of terminations:



Source - Experiment 5: Ceramic Chip Capacitor (nasa.gov)

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With the automated process designed exclusively by Retronix to tin micro devices such as 0402, 0603, SOT's to GEIA standards, the industry now has a comprehensive all-inclusive solution for tinning requirements.

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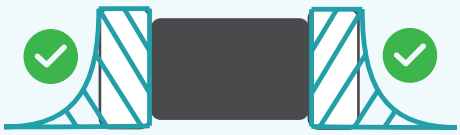
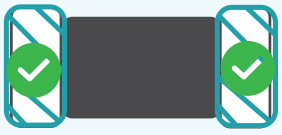
- The devices are moved to the fluxing station & then accurately over the solder wave. The pre-programmed automated system ensures the dip is precise & consistent.

SIDE VIEW



TOP VIEW



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Navigating an unsettled supply chain

Tioga's Karl Belmar and Gemma Smith explain how the company's project-based procurement system is helping navigate today's bumpy component supply chain

Over the last 12-months the viability of quoted information is at risk if the stock has moved

What was your biggest sourcing challenge over the last 12-months?

Brexit was a real tester regarding logistics delays, with unforeseen issues suffered by courier companies causing the biggest headaches. However, the biggest issue was the speed that stock was moving and changing. As a CEM, there can be a delay between quoting a customer and the order being placed. Over the last 12-months the viability of quoted information is at risk if the stock has moved and its replacement is on an extended lead time.

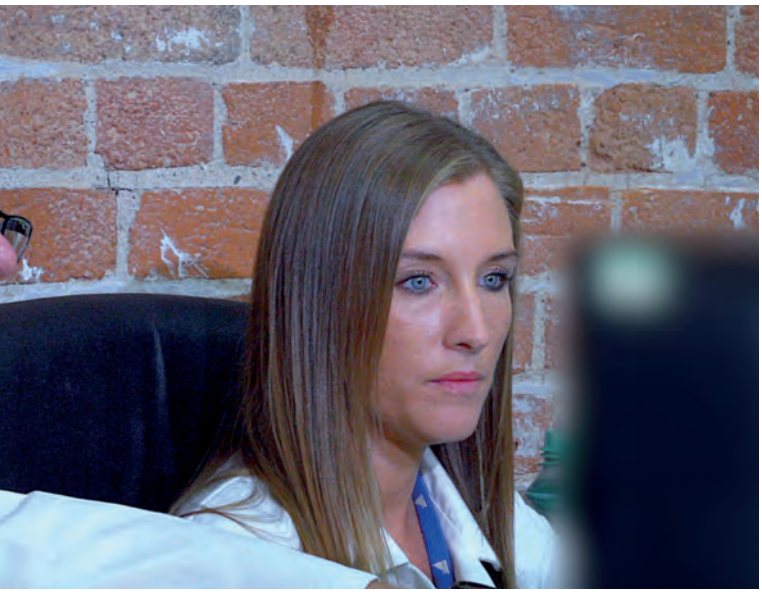
With over 20-years' experience, Tioga has a wide and varied vendor base which provides flexibility and reach regarding component procurement. The company has been utilising this capability to the full and sees it as a massive benefit for coming months.

Have logistics and haulage costs increased?

Yes, we have seen increases across our vendor base. For example, free shipping has now become a surcharge added to all orders. As a CEM building products seven days a week we typically place small orders every day, so this has had a significant cost impact. However, the biggest increase has been imports from direct and indirect offshore suppliers. Airfreight costs have increased fourfold and sea shipments have also seen significant rises. Delays and capacity are also major concerns.

Which components are experiencing extended lead times?

We are currently seeing issues across the entire parts spectrum including



microcontrollers, memory, crystals, LEDs and even connectors, with one particular RJ45 causing us to take some creative sourcing actions to meet build and supply deadlines.

Is Tioga's purchasing team working from the manufacturing facility?

At this point yes. There was a period of offsite working, followed by a period where limited numbers were allowed onsite. Tioga operates a project-based procurement system and buyers are integral to the production process. So, it was always key to return to safe, controlled operations as soon as possible. The HR and H&S teams have done a great job under difficult circumstances getting the team back to some normality.

What can suppliers do to make things easier?

Accurate and up to date information is key. Stock on hand, accurate stock due dates and data on pipeline stock would be a massive benefit. This would let us accurately assess how we are placed to action customers' builds at any point in time, while planning production with greater accuracy.

Have you sourced comparable components due to shortages and was this purchasing or engineering driven?

Yes, definitely. It's a team effort but depends on when the issue becomes apparent: either front end or at the purchasing stage. Tioga's project-based procurement approach keeps the buyers, engineers and production working closely at all times. The procurement team has over 50-years' experience in the electronic components supply industry. That really helps when solving supply issues by looking at alternatives or options.

Finally, what bumps in the road are you expecting over the next 12 to 18-months?

Talking to key suppliers and observing the market, I'd say lead times and subsequent serious component shortages will be the biggest bump of the foreseeable future. The likelihood is that the market and key suppliers will ultimately have less stock and even less flexibility when it comes to supporting contract manufacturers which differs vastly from OEM support.

www.tioga.co.uk

Dealing with uncertainty

FermionX' purchasing manager, Sheena Taylor, emphasises the importance of open communication between suppliers, CEMs and end customers when navigating periods of uncertainty

What have been the biggest sourcing challenges of the last 12-months?

Mostly it has been trying to work with so many unknowns. Securing certain stock and components hasn't been easy, during times of such uncertainty. There are so many factors all having an impact on the supply chain: soft allocation; knock on effects from OEM closures; customs delays; increased freight costs; the list goes on.

Have logistics and haulage costs increased?

Massively. We've seen increases everywhere and on top of this, the delays we've faced have also meant we've had to make changes to our production to maintain business continuity and continue to deliver products to customers on time.

What particular components are experiencing extended lead times?

It's forever changing, we've not really noticed a pattern in specific components. It has been quite random.

Are you and your colleagues working from your facility?

Yes, we are mostly working in the office now. We're lucky to have a lot of space in our headquarters and have been able to spread ourselves out and maintain social distancing at all times. Personally, I'm really enjoying the 'normality' of being back in the office and seeing my colleagues.

What could suppliers do to make your role easier?

Regular communication is vital. Whilst we understand this is a difficult time for everyone and there are so many unknowns, we appreciate the forewarning of potential future issues. This lets us relay information to our customers as soon as we hear. The earlier we know there is an issue the better so we can react and resolve it as soon as possible.

It's a frustrating time for all of us but we've just got to work together and do what we can to support one another.

Customers that have seen the least disruption are the ones that have been more robust in their forward ordering. This helps spread lead time risks through the supply chain. We appreciate this is not a luxury that every customer can afford but it certainly helps ensure business continuity for everyone.

Have you sourced comparable components due to shortages and was this driven by purchasing or engineering?

We do what we can to source suitable components, abiding by 'form, fit and function' where suitable. This is driven a number of ways: the supplier may offer an alternative; our engineering team advises on an alternative; and liaising with the end customer.

What 'bumps in the road' are you expecting over the next 12 to 18-months?

We're not out of the woods yet. It's going to be a tricky year with ongoing issues and further problems down the line. But we're all learning more as we go, securing stock when we can, forecasting further out.

www.fermionx.com/ecs

> **It's a frustrating time for all of us but we've just got to work together and do what we can to support one another**

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Taking the long view

Charcroft's Debbie Rowland claims distribution needs to take a longer-term approach to supporting the extended lifetimes of defence and aerospace equipment

Charcroft director, **Debbie Rowland**

A recent conversation with an engineer with 29-years' experience in the aerospace sector highlighted the fact that distribution needs to take the long view when managing component availability.

Some semiconductor manufacturers have started offering 10-year longevity guarantees on key components. While this helps some sectors, it does not come close to supporting the decades-long lifetimes of military and aerospace equipment.

A typical example is the Tornado family of multi-role and strike aircraft which were used by the RAF for forty years from 1979 until 2019. The Eurofighter Typhoon has been used since 2003 and next-generation Tempest is expected to come into service from 2035.

For defence buyers this meant sourcing components for the older Tornado and the current Eurofighter Typhoon, while also planning for Tempest.

To ensure aircraft can be supported over decades, distribution must develop special skills and features which support every aspect of supplying old and new components.

One special skill distribution needs to deliver is the ability to fill information gaps which have opened up over the years. If a buyer needs to source an obsolete capacitor originally manufactured by Arcotronics, how many distributors will remember that Arcotronics was acquired by Kemet, before being split and partially acquired by Vishay?

The need to retain legacy information is why Charcroft has kept and digitised every datasheet it received over the past 50-years. The datasheet PDFs also include hand-written notes which provide additional information such as when the component was made obsolete and a possible replacement.

When an engineer or buyer wants to compare the specification of an original capacitor with the recommended alternative, both PDF datasheets can be sent, searched and compared. The datasheets provide the customer with far more information than their drawing.

To keep the information up to date, every delivery note and certificate of conformity is also digitally archived and a library of internal part numbers used by some defence OEMs is also maintained. This streamlines procurement because a CEM may be asked to order a component using an internal part number, which can easily be linked back to the original part number used by the component manufacturer.

Sometimes, the alternative to a legacy or obsolete passive is only available in a different package, such as when a legacy paper foil capacitor is replaced by a smaller metallised film alternative. The solution can be that the replacement component is adapted in Charcroft's UK-based manufacturing facility to fit the circuit.

The need to maintain legacy information and skills is as important as supporting new and emerging technologies. It is this combination which enables component availability to be supported over decades rather than years.

www.charcroft.com

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In times of uncertainty, a contract manufacturer's supply chain management and design expertise can help customers react quickly and professionally

Events of the last twelve months have wreaked a significant economic impact across many sectors. The aerospace industry's multi-tier supply chain, from OEMs to suppliers of components and raw materials, has not escaped unscathed. However, with vaccine programmes underway and signs of air travel opening up soon, there is light at the end of the tunnel. Stalled or cancelled orders are being re-instated and new development projects are pressing ahead.

As order flow ramps back towards normal levels, any risk to the progression of recovery and growth must be carefully considered and mitigated. Aerospace procurement traditionally follows long-term multi-year programmes, along with long-term order contracts that mitigate risks such as component availability and pricing volatility. Recent events have called for shorter-term purchasing windows and restrictions to purchasing based on necessity. Extremely careful procurement planning will be required in 2021 and beyond to ensure supplies of components and assemblies can be reliably delivered on-time and in-full.

The electronic component supply chain is experiencing significant disruption which is driving price increases. Low semiconductor demand from many sectors (significantly automotive in 2020) pushed semiconductor manufacturers towards capacity reduction. With many sectors, including automotive, switching back on, cancelled orders are being replaced and existing orders pulled forwards. This demand fluctuation, along with the worldwide rollout of new technologies such as 5G, is outpacing semiconductor manufacturing capacity.

Some manufacturers are reporting component lead-times exceeding fifty-two weeks. Component lines considered commodities in past years are being placed on allocation. Distributors are regulating supply and discouraging stockpiling to avoid future dips in demand. It is a seller's market and price increases in some cases are exceeding 50 per cent.

If your procurement requirements include electronic assemblies, it is important to work and plan closely with your contract electronics manufacturer, making full use of their expertise. Ensure they have a careful eye on the component market and have allocated human resource specifically for this purpose. With a clear understanding of their customers' requirements and the current component marketplace, they will be best placed to advise on order scheduling, while providing timely warning of impending supply and pricing issues.

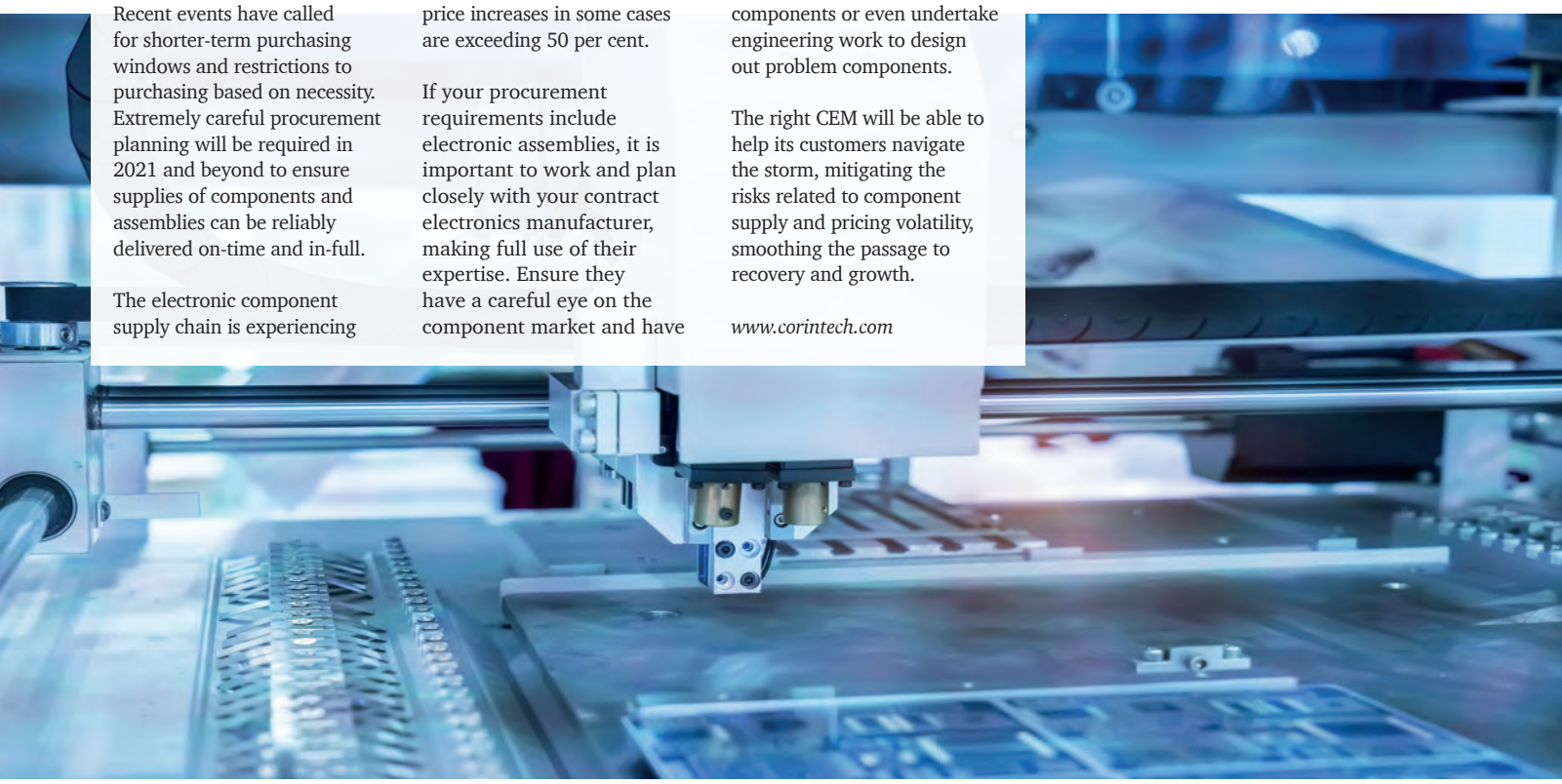
When component availability becomes an issue, it is critical that strict measures are in place to avoid counterfeit components entering the supply chain. A CEM, particularly if it is AS9100 accredited, should be able to demonstrate its controls.

If a CEM has strong engineering expertise, with adequate warning of supply issues, it will be able to provide recommendations for suitable alternative components or even undertake engineering work to design out problem components.

The right CEM will be able to help its customers navigate the storm, mitigating the risks related to component supply and pricing volatility, smoothing the passage to recovery and growth.

www.corintech.com

The electronic component supply chain is experiencing significant disruption which is driving price increases



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Staying in flight

Rochester explains how aerospace and defence buyers can be confident that critical components will remain available for long-life products and systems

Aerospace and defence systems have lives that far exceed those of the components which go to make them. Long-term product availability is vital in these sectors and companies need to ensure a reliable long-term source of components is available.

Companies need to establish a sourcing partner that can offer long-term availability guarantees and also demonstrate a controlled transition process through end-of-life and into long-term fully authorised supply or even long-term production.

As an AS6496-compliant distributor and licensed manufacturer, Rochester Electronics continues to offer military grade semiconductors and packages long after the original component manufacturers discontinue them. In addition to the millions of components available in-stock, Rochester's in-house hermetic assembly line offers a full complement of package styles including ceramic DIP, side brazed DIP, flat pack, CQFP, PGA, ceramic leadless chip carrier and metal can.

The company also offers a range of commercial and industrial components and can supply a custom flow built to meet the needs of source-controlled drawings.

Rochester's in-house qualification and test facilities are designed to ensure risk-free sourcing of components in compliance with industry standards. The company is a QML manufacturer certified by DLA Land and Maritime to MIL-PRF-38535 offering Class Q and Class V microcircuits for military and aerospace applications.

Certifications include:

- QML per MIL-PRF-38535
- DLA-certified hermetic assembly, electrical test, burn-in and reliability lab to Mil-STD-883
- Class Q (Class B) and Class V (Space) products
- ISO9001: 2015
- AS9120B:2016
- QSLD DLA Certified, verifying Rochester as a critical supplier to DLA and meets the DLA standards for distribution processes
- TAPA FSR-A: 2017

Rochester offers a range of manufactured products for military applications.

Intel: authorized source for all military grade CPUs and supporting memory products including 186/188/196/286/486 microprocessors.

Analog Devices: TigerSharc, BlackFin, and other Sharc DSPs.

Texas Instruments/ National Semiconductor: TMS320C30/40/50 and F206/240 DSPs, op amps, regulators and logic devices in historic packages such as DIP, ceramic, metal can.

NXP Semiconductors: extended temperature MC68000 microprocessors, PowerPC processors.

IBM: PowerPC Processors including PPC750 series.

Cypress: FIFO and Dual Port SRAMs.

Ampleon: LDMOS, VDMOS, GaN1 PowerFETs for RF applications.

Intersil/Harris: historic military-grade voltage regulators, drivers, timers and controllers.

Rochester built products are manufactured using known-good-die stored in one of its two nitrogen wafer storage facilities and are tested to AS6496 standards using the original test processes employed by the original component manufacturer. Products retain their original part number because they are guaranteed to meet the original datasheet specification. As a 100 per cent authorised source, anti-counterfeiting standards that apply to independent suppliers such as AS6171 and AS6081 are not required.

For ongoing critical obsolete component needs, where Rochester does not hold available inventory or wafer to build, the company can leverage its test and design engineering experience to keep customers' systems going.

Rochester can help with suitable alternatives (grades, speeds, finishes, packages) and the creation of additional testing parameters to provide the customer evidence needed to qualify the alternative.

Rochester can also support fundamental design changes such as the replacement of obsolete key components with ASIC solutions. The possibility exists in these cases to transition to an ASIC which has identical fit-form-function and is free of software changes and errata. This means that aerospace DO-254 re-qualifications, even for safety-critical (DAL-A) applications, can be greatly simplified as a minor change.

www.rocelec.com

Protection against thermal runaway

Schurter explains how to combat thermal runaway which can occur where more power is packed into smaller spaces

A thermal runaway can destroy devices and lead to a fire or explosion. The cause is ever-higher power density in electronic wiring and the trend towards miniaturisation. Even slightly excessive currents in power electronics can lead to elevated temperatures of some 200°C. Possible consequences are damage or disconnection of surrounding components, PCB damage or even fire.

With a power semiconductor, if the elements are not sufficiently cooled, heat can no longer be sufficiently dissipated, which increases the transmission resistance. This process escalates and ultimately leads to the component's destruction.

System cooling must dissipate at least as much energy as supplied. Overcurrent during a thermal runaway is too low to cause a conventional fuse to trip. In principle, thermal circuit breakers or PTCs could be used but the products available for the assembly of an SMD PCB are too complicated or unsuitable.

Schurter has developed the RTS Reflow Thermal Switch. The RTS can be reflow soldered at 260°C after which it is mechanically activated and can still effectively trip at 210°C. Available with an integrated shunt, which enables precise current measurement, the RTS is optimised for standard SMD processes like pick and place.

Features include operating current up to 130A, 50VDC rated voltage, 120μOhm resistance and 400A breaking capacity.

www.schurter.com

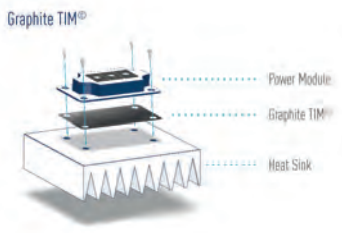
Thermoelectric coolers offer reliability and long-life

Laird Thermal Systems' new UltraTEC UTX series thermoelectric cooler is designed to deliver precise spot cooling to maintain peak performance of lasers and optoelectronics. Thanks to solid-state operation, the product provides low maintenance and long-life operation. The company claims UltraTEC UTX series offers a 10 per cent boost in heat pumping capacity and a higher coefficient of performance over standard grade thermoelectric materials.

Solid-state thermoelectric coolers use the Peltier effect to create a temperature differential when transferring heat from one side of the module to the other. With no moving parts, the device can cool electronics to well below ambient temperatures while reducing maintenance requirements and operation costs.

The UltraTEC UTX series has a heat-pumping capacity up to 296W. Proprietary module construction features a higher thermal insulating barrier compared to standard thermoelectric coolers, achieving a maximum temperature differential of 72°C. The coolers can be mounted directly onto the laser diode for temperature stabilisation. For greater heat loads, the ambient liquid cooling system may employ multiple thermoelectric coolers in an array.

www.lairdthermal.com



Handling heat the modern way

Panasonic Industry has introduced a new type of graphite thermal interface material for efficient thermal dissipation on power modules.

Handling heat is a challenge when operating power modules in demanding environments. Mounted on heat sinks, heat dissipation is traditionally achieved with a layer of grease that has to be replaced from time-to-time.

Panasonic has solved this problem with its graphite material. The company has released its highly compressible EYGR type which reduces thermal resistance by filling surface gaps and unevenness.

Thermal resistance is 0.2 Kcm^2/W (at 600 kPa); while thermal conductivity in X and Y direction is from 200 to 400W/mK and 28W/m·K in Z-direction. The material is an option for cooling in the range -55 to 400°C. Applications include inverters, converters, automotive control units, medical equipment or server infrastructures.

industry.panasonic.eu

Quiet fans making noise in industry

In this article, Gelec helps buyers purchase fans which are technically up to the job, without overspending

A common requirement for fans is low noise, especially for applications located near people such as in offices or homes. Selecting the correct fan bearing is key to minimising noise levels.

The low cost choice is usually a sleeve bearing, which initially should offer low noise levels. However, after time, due to the nature of the bearing, the fan will become gradually noisier. It is worth noting that the noise rating on the datasheet may not be the real-life noise level after hours of operation. There is also the general opinion that sleeve bearings should only be mounted vertically (blowing air horizontally) otherwise there is risk of early failure.

Ball bearings are at the costlier end and generally regarded as a more robust choice. A ball bearing is preferred for high end applications requiring faster speeds (higher airflow), longer life expectancy and freedom to mount in all orientations. However, ball bearings are not the lowest noise option.

If low noise is the target, alternate bearings are available. One example is Sunon's patented, near frictionless MagLev bearing system. A key feature of this bearing design is a magnetic plate which removes contact between the impeller and bearing wall. This versatile bearing offers life expectancy closer to a ball bearing, at a cost closer to a sleeve.

Another factor is space. The general recommendation is to use the largest frame size at the lowest speed, which should minimise noise at a given airflow, plus prolong fan life.

If the application is located in a harsh environment, added levels of protection should be considered. These can start from IP21 conformal coatings to protect from moisture, all the way to fully enclosed IP68 rated fans which are submersible in water. Sunon also offers environment specific protection, such as GR47 salt fog for marine applications.

If the correct protection level is not considered, the fan's life expectancy will be compromised. A common issue is dust impregnating the bearing, mixing with the lubricating oils and congealing into a sludge which reduces the fan speed and eventually stops rotation. If fan failure is a concern, most are now available with additional wires for tacho feedback or locked rotor detection.

As protection level increases, so does cost. Finding the correct balance between sufficient protection without over-specifying the fan can usually be best achieved with transparency and discussion with the supplier. Working with an official distributor who has direct access to the manufacturer and can offer support on design and selection should help to avoid unwanted servicing or replacement costs down the line.

www.gelec.co.uk

Taking enclosure cooling seriously

Rittal explores four excuses some companies make to avoid investing in the thermal management of their electronic equipment

It is suggested that one of the UK's largest automotive manufacturers could lose up to £480,000 per hour if it experiences downtime on its paint plant. Not every manufacturer's overheads are as substantial as the above example, but that doesn't take away from the fact that regardless of your industry and the product you manufacture, production downtime is a crucial performance indicator to monitor because of the direct impact it can have on the bottom line.

More downtime equals increased spares/maintenance costs, taken directly from profit which could have been invested in more pertinent business objectives, such as purchasing new machinery.

The following is a list of excuses not to tackle climate control provision in production and automation facilities.

Excuse one: Fix the problem when it occurs

In the past, reactive maintenance was seen as acceptable for most businesses. However, times have changed. The key goals of any sized business are now becoming: increased throughput; cost efficiency; and continuous improvement.

> **More downtime equals increased spares/maintenance costs, taken directly from profit which could have been invested in more pertinent business objectives**

Potential roadblocks to output targets need to be addressed early and nobody wants to be the person in the morning meeting explaining why yesterday's targets weren't met.

Implementing a semi-regular maintenance schedule doesn't have to be time-consuming. Something as simple as a weekly visual check of cooling equipment filter mats or system alarms can provide time to call the experts for a more detailed review.

Excuse two: Just open the enclosure door for a while

This is treating the symptoms rather than the illness. Companies resorting to using large fans to blow ambient air into an open enclosure could be doing more harm than good. This is also a dangerous solution regarding health and safety.

An enclosure's purpose is to create an environment in which electrical equipment is protected from contaminants. Opening the door allows a constant stream of dirty air to be pulled into the enclosure. Dirt can gather in switchgear, cause short circuits or block on-board fans in turn resulting in damaged componentry, reduced life and possible critical part failure.

If this course of action is required it suggests the existing cooling equipment is not adequate for the installation or requires maintenance to bring it back into working order.

Rittal's free RiAssure cooling review service offers a solution where a local climate control expert will appraise the existing equipment, provide honest feedback on whether the equipment is adequate and also provide details/quotations for a service contract to suit ongoing needs.

Excuse three: The equipment is currently operating and I haven't serviced it in months/years

Problems may be 'out of sight, out of mind' for now but the longer cooling equipment is left unchecked, the higher the risk.

For example, if a fan unit is in a dusty environment and the filter mat becomes clogged, this will reduce its effectiveness to cool the electrical equipment due to the reduced air throughput. This can increase the enclosure's internal temperature. As a rule of thumb, for every 10°C of internal enclosure temperature increase, the equipment life is halved and there is an increase in the likelihood of an unexpected failure.

Excuse four: The company doesn't have the manpower or outsources the work

Many companies outsource their servicing to a third party. However, the question is what checks they are performing, given there has already been a callout to an enclosure which is overheating.

On one occasion, a customer was asked to speak with its current service provider to understand what checks were being undertaken because the cooling units were in disrepair. During the discussion, it became clear that the supplier serviced the air conditioning in the offices but didn't do any work in the factory.

Climate control equipment is becoming increasingly efficient as new technology is launched every year. The only guarantee of the highest level of checks and service will come from engineers who have been trained by the manufacturers about the technology and its detailed workings.

Rittal has been manufacturing climate control equipment for 30-years and all of its service staff are trained on the whole portfolio to ensure they can remedy any customer's issues.

Everyone has budgets and savings targets to hit, so ask yourself, can you afford not to have correct maintenance in place?

www.rittal.co.uk

Shrink your way to EMI/RFI solutions

In this article, ECCO introduces shielded conductive heat-shrink tubing as a quick, cost effective solution to electromagnetic interference or radio frequency interference problems

The proliferation of electronic circuits can be witnessed virtually everywhere from our homes to the industrialised Internet of Things found in factories, transportation, food processing equipment and medical devices. Conductive surfaces, like the wires or metallic enclosures housing these circuits generate unexpected current and electrical energy when exposed to electromagnetic waves coming from a variety of natural and artificial sources. When electromagnetic energy disrupts the expected electrical performance of a device or material it's called electromagnetic interference (EMI) or radio frequency interference (RFI). In today's world of sophisticated electronic systems, this susceptibility can affect performance in one of two ways: conducted EMI/RFI which causes the system to malfunction from within, or radiated EMI/RFI, which causes nearby equipment to malfunction.

Cables often need shielding to mitigate EMI or RFI problems. Common solutions include a metal or metallised plastic connector and soldering the cable shield to the connector or, alternatively, wrapping the junction with copper tape and soldering it to the cable shield. More robust solutions involve metal braided sleeving and tubular expandable braided cable shielding which is used primarily in the electrical wire interconnect industry to protect cables from electrostatic and electromagnetic interference. Even though these types of solutions may work, they can be costly and labor-intensive.

A cost-effective solution to this problem is shielded conductive heat-shrink tubing with a metallic conductive ink coating on the inside of the tube. The inner coating provides electrical continuity and EMI, RFI and ESD shielding around the joints being connected. This tubing can solve a number of EMI/RFI problems easily and inexpensively.

In use, the appropriate diameter of tubing is placed over the components or assemblies to be shielded, and heat from a heat gun, oven or other conventional heating device is applied to the tubing. After the tubing shrinks, the inner metallic layer provides an electrical connection between the outside surface of the objects that are joined by the tubing, thereby creating an almost 100 per cent effective, 360 deg circumferential shield.

The versatility of heat-shrink tubing and its shielding effectiveness have been demonstrated in diverse applications. One military application is in a soldier's high-tech helmet. The manufacturer had developed a new design incorporating advanced systems such as night vision, heat sensing and two-way communications. However, when the helmet was manufactured the various electronic systems were in proximity and were interfering with each other. Resulting crosstalk was so bad it was virtually impossible to use more than one system component at a time.

Using heat-shrink tubing to cover the cables running inside the helmet easily solved the crosstalk problem. That simple solution avoided the design and fabrication of custom cable shields or metal enclosures, thus reducing the helmet's complexity and weight. The heat-shrink tubing also withstood the rapid thermal changes experienced where warfighters need to work and perform their duties in support of freedom.

In conclusion, shielded heat-shrink tubing offers a cost-effective and easily implemented solution to EMC challenges.

www.eccocconnectors.com

Cables often need shielding to mitigate EMI or RFI problems

ShrinkMate™ transition boots

Trends in mil circular connectors

TTI's director mil/aero connectors, Kenny Vigil and business development manager, Steve Brahosky, explore trends impacting military-grade circular connector design and selection

TTI's director mil/aero connectors, **Kenny Vigil**

TTI business development manager, **Steve Brahosky**

Military-spec D38999 circular connectors are used in defense and aerospace applications for reliable, standards-grade performance to military specifications. These rugged connectors deliver high grade protection from the elements, maintain mission-critical signal integrity and protect sensitive electronics from environmental hazards. These characteristics lend themselves to heavy-duty/harsh-environment industrial applications, medical instrumentation, marine electronics, ground vehicles and applications where reliability and dependability are required.

Most mil-circular connector manufacturers are accommodating higher performance and higher speeds. Suppliers now offer high-speed variations, incorporating quadrax contacts, differential twinax contacts and even fiber for increasing demands for video, audio, Gigabit Ethernet and other high-speed communication protocols.

While often associated with aerospace applications, D38999 connectors with high power/high voltage contacts are also finding use in ground vehicle applications thanks to their ruggedness and ability to transmit the amount of energy required.

Electrification in military and heavy industrial vehicles currently lags the commercial space. However, economic pressures and government mandates likely will speed the transition and we will see high-power/high-voltage, mil-spec circular connectors finding their way into products and applications for military and civilian vehicles alike.

Micro 38999 connectors provide many of the same benefits while being smaller and lighter. Originally designed for wearable military applications, allowing soldiers to connect communications and other devices, these connectors also suit ground vehicles, UAVs and other systems.

Finally, as more companies deploy satellite constellations and small-size cubesats, we're seeing increasing demand for hermetically sealed connectors chosen for their performance in low Earth orbit (LEO) along with deep space. The sealing requirements of emerging marine applications, such as offshore wind power generation, make 38999 circular connectors an ideal choice for these wildly different types of applications, protecting sensitive electronics from moisture and outgassing in a vacuum.

The proliferation of both marine and space/LEO applications means almost every connector manufacturer has a hermetic line on offer.

Authorised distribution helps ensure access to these connectors and also helps reduce lead-times and mitigate supply chain risk by holding inventory. We work closely with suppliers to make sure connector customers' needs are readily available, even when those orders require custom pin configurations.

In addition to stocking available-to-sell completed connectors, TTI is approved for value-add connector assembly for a range of mil-spec and commercial connector product families. This capability provides maximum flexibility and customer support.

To combat market uncertainty, a distributor partner with industry knowledge and design skills can make sure customers get these specifically engineered mil-spec connectors quickly. With so many options to choose from, a distributor partner can help navigate the breadth of available inventory and find the right product to add durability and reliability to your next design.

tti.com

Popular high pin-count connectivity

EDAC introduces its 516 series connectors, designed to offer reliable interconnect in demanding conditions

Even in the modern age of microelectronics, rack and panel connectors still offer a popular solution, providing engineers with a flexible and reliable method of achieving high pin-count connectivity.

EDAC's 516 series connectors offer an enviable track record of high performance in harsh environments. With applications across most industrial sectors, the 516 design makes it an invaluable tool for customers who need connectors they can rely on, even under tough conditions.

The hermaphroditic design uses forked blades to provide four points of contact, ensuring a reliable connection even when subjected to shock and vibration. Available with accessories including metal back shells to provide protection and EMI shielding, the 516 series suits applications requiring flexibility and reliability.

For cable mounted applications, the gold-plated contacts are available with crimp termination and can be supplied individually or reeled for high-volume production. Panel mounting options include wire hole and wire wrap. Printed circuit board installations are made easy with through-hole solder tails.

When reliability and flexibility under demanding conditions are vital, the 516 series from EDAC delivers a complete solution.

edac.net

Panel Mount 516

Buyers can expect component manufacturers to add capacity

The impact of capital spending by chipmakers won't be felt until 2022 so supply will remain tight because of continued strong demand for integrated circuits, discretes and passive components

Electronics purchasers can expect long lead times, allocations, and some price increases for many semiconductors to continue through 2021 although chipmakers and component manufacturers are increasing capital spending and adding more production capacity.

Semiconductor capital expenditures (capex) will increase 10 per cent in 2021 rising from $108.2 billion $122.2 billion, according to researcher Omdia. In 2020 capex increased 8 per cent. "2021 will be a record year for capital expenditures," said Chris Welch, principal analyst for Omdia.

The increases in capital spending will contribute to an expansion of chipmaking capacity. IC Insights forecasts total worldwide installed capacity will increase 9 per cent in 2021 to 270.1 million wafers (200mm-equivalent). In 2020 installed capacity saw an increase of 6.5 percent to 247.8 million wafers.

While increases in capital spending and production capacity by semiconductor companies is welcome news for buyers, the bad news is that long lead times and allocations are expected to continue through the year and won't be alleviated until later in 2022. Semiconductor demand is expected to be strong through the year and will outpace supply as economies across the world recover from the impact of COVID-19, according to industry analysts.

While buying conditions for semiconductors is dire, many purchasers are hopeful that lead times for some parts will shrink later in the year even if they don't return to normal levels.

"We have many semiconductor products on formal allocation programs and with lead times that now extend to 52 weeks," said Vincent Cellard, vice president of commodity management for EMS provider Flex. He said there are bottlenecks at every step of manufacturing from equipment to dies, back-end assembly and testing.

Most semiconductors are impacted, he said. "It is not just one specific technology like we saw in previous tight markets," said Cellard. He said major supply challenges are for "products dedicated to specific segments that are growing very fast with large upsides within lead times."

Utilization is nearly maxed

Capacity utilization by chipmakers is close to the maximum in most cases and any small disruption can worsen the supply situation, he said. "Fires, earthquakes, storms, and logistic issues are creating major challenges on specific products, particularly for single-source devices," said Cellard.

Supply and demand will remain unbalanced for the next couple of quarters even if there are improvements in supply and adjustments in demand on specific segments, according to Cellard.

He added some suppliers are increasing prices as a result of increased cost of raw materials, logistics and "exceptional expenses" they are incurring to deal with the current challenges. "Some are raising prices on legacy products, some are focusing on product or technologies that are particularly tight or disrupted, and others are keeping things stable and

Fires, earthquakes, storms, and logistic issues are creating major challenges on specific products, particularly for single-source devices

Vincent Cellard, vice president of commodity management for EMS provider **Flex**

capitalizing on long-term partnerships," Cellard said.

He added prices for passives have been relatively stable, while prices for cables and connectors have been impacted by increasing costs of raw materials. Cost of materials is obviously going up when the only solution is to do some spot buys though different sources, including brokers, according to Cellard.

Nicole Kosmowski, electronics category sourcing executive for GE Healthcare, said prices are increasing for some semiconductors, printed circuit boards and assemblies that contain resin. "Lead times for electronic components are stretching to beyond 52+ weeks in some technologies. We are seeing extended lead times for relays, connectors and printed circuit boards," she said.

A common challenge

Pierre Brossier, director, regional supply chain for EMS provider Sanmina, said stretching lead times are a "common challenge" across most electronic commodities. "We are especially seeing the impact across the semiconductor industry, as demand for active components that enable smarter functionality in products like mobile phones and cars continues to increase," he said.

Lead times for active components increased approximately 20 per cent each quarter over the past 12 months and the trend is expected to continue, according to Brossier. Prices for some components are increasing while others are staying flat, he said.

"Price increases occur when we request volume increases within the chipmaker's component manufacturing lead times that make them have to launch production lots in a short turnaround time," said Brossier.

He said most chipmakers and passive component manufacturers are "in the process of increasing capacity significantly and are also building new plants to address the long lead time issue." However, it takes a while for new fabs to come on-line so lead times will be an issue until next year.

Welch said chipmakers are increasing capital spending for two reasons: to boost production capacity and because of technology transitions. Welch said a lot of investment will be for memory ICs.

"There's a lot of work happening with DRAM. The feature sizes are shrinking and are down to 10 nm, said Welch. Such a feature size requires new, expensive toolsets that are different than tools used before.

More capex for memory

Such a technology transition is driving some memory market capital expenditures, but there are also capacity increases with memory as companies build new fabs. For instance, memory IC leader Samsung will spend about $28 billion in capex this year.

"Memory capital expenditures tend to dwarf everything else," said Welch. He noted that a memory fab is expensive to build and equip. Once the new memory fab is built, a chipmaker wants to "crank out as many units as fast as possible. Those fabs are massive and cost a lot of money. They try to slam as many units through there as possible," to recoup the cost, he said.

Most of the new fabs coming on-line will be for production on 300mm wafers rather than 200mm. In fact, there have only been two new 200mm fabs built over the last five years, said Welch. One was built by SMIC, a Chinese foundry and the other was built by Hynix in China to service the China market, said Welch.

"There are no integrated devices manufacturers (IDMs) building 200mm fabs," he said. "There's a reason for that. "The equipment that 200mm fabs has been running on is hand-me-down equipment. Most of it's been out there for more than 20 years," said Welch.

Semiconductor equipment manufacturers will make tools for 200mm wafer production "but you're going to pay a premium because their bailiwick is 300mm," said Welch. "That is where they're making their money right now." Building a new 200mm fab is too expensive for many chipmakers. Some analog and discrete semiconductor companies are switching production to 300mm wafers, said Welch.

Analog, discretes and sensors to some degree have historically been built on 200mm wafers However, in the last five years, Infineon, STMicroelectronics, Bosch and others have all built 300mm fabs, said Welch. "They have seen the light," he said.

"Texas Instruments figured that out about 10 years ago when they picked up some used 300mm hand-me-down equipment and moved to 300mm with some analog products," said Welch. Now TI has two factories and another one ready to take equipment when the demand requires, he said. "Since they've done that they are printing money. Their margins are in the low 60s," he said.

Because 300mm wafters are larger than 200mm, chipmakers can produce

We are seeing extended lead times for relays, connectors and printed circuit boards

Nicole Kosmowski, electronics category sourcing executive for **GE Healthcare**

more chips per wafer to boost profitability.

To invest or not to invest

Because adding capacity is expensive, many chipmakers are hesitant to make the huge investment necessary for new fab buildings and equipment needed for production. "New fabs cost $10-$14 billion," said Jim Feldhan, president of Semico Research. "The days of let's just build capacity for capacity sake is gone," said Feldhan.

Semiconductor companies are more focused on capacity utilization and pricing," he said. There is risk involved in building a $14 billion fab. "All of a sudden there could be a downturn" and product lines could go idle, said Feldhan. "The financial market does not like that."

However, the production disruption last year caused by the pandemic, continuing rising demand and the cessation of chip production at several fabs because of the Texas freeze and a fire at the Renesas factory has resulted in severe shortages and many chipmakers see a genuine need for more capacity.

One reason chip companies see the necessity of more capacity is even large OEMs that buy direct from component companies are facing shortages for some parts. That's unusual because OEMs such as Apple "tend to get the lion's share of allocations" during shortages because of their huge purchasing volumes, said Feldhan. However, even Apple is seeing some shortages.

Another reason chipmakers see the need for capacity expansion is component shortages seem to be across the board. Often shortages are limited to specific products at a given time such as memory chips or MLCCs. But now shortages are across the board and include memory, microcontrollers, diodes, power semiconductors, voltage regulators, and other parts, said Feldhan.

As a result, foundries and IDMs see the need for additional capacity and are responding. For instance, TSMC, the world's largest foundry, is boosting its capital spending from about $17 billion in 2020 to between $25-$28 billion and will build a $12 billion fab in Arizona.

Samsung's semiconductor capital spending has been very strong since 2017 with outlays reaching $21.6 billion in 2018, $19.3 billion in 2019, and $28.1 billion last year, according to IC Insights. The researcher said Samsung's capex in 2021 will be about $28 billion again.

Intel will spend $20 billion to build two new fabs in Arizona. The fabs won't begin production until 2024 about the same time that TSMC's new fab in Arizona is expected to go on-line.

Intel enters foundry biz

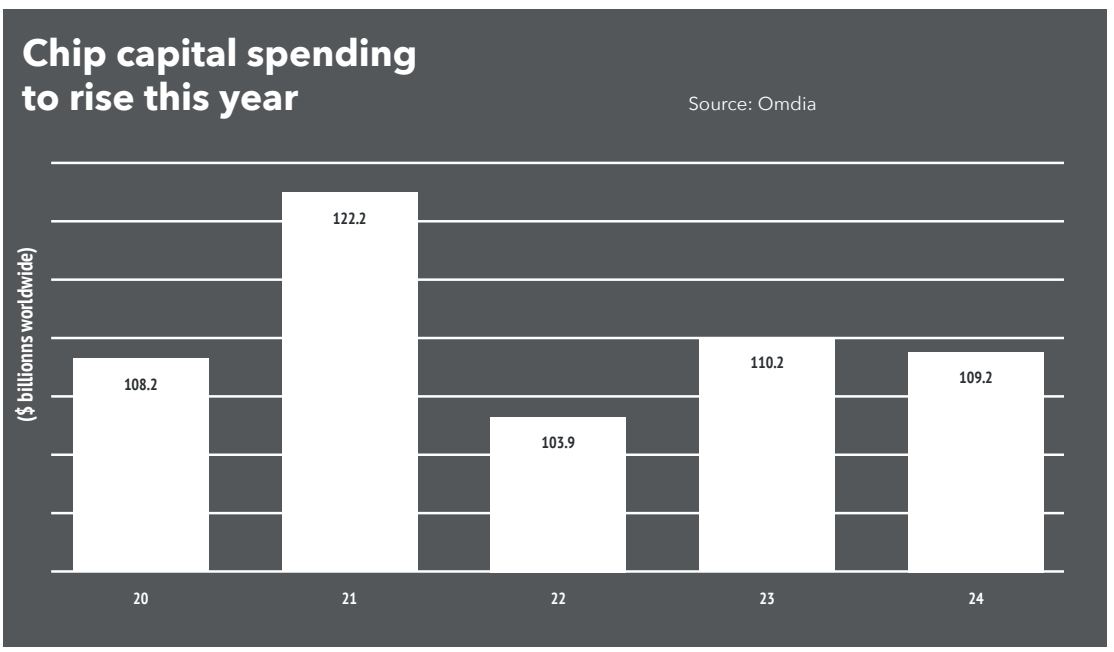
In addition to building new fabs, Intel also said it would enter the foundry business with a new business unit called Intel Foundry Services (IFS). The new business will manufacture chips for other companies and the two new fabs in Arizona will support the foundry business.

It is not known how much of an impact Intel's foundry business will have on overall semiconductor capacity. Matas said Intel could have an impact on the foundry industry if it decides to stick with the foundry business long-term. That would involve committing huge resources to this foundry business year after year to quickly ramp volume production of 7, 5, and 3nm technologies.

"However, by the time they build their foundries in Arizona and presumably start running 7/5nm technology, TSMC will have been two or three years at 3nm or smaller," said Matas. He noted that prior to its foundry announcement, Intel was already planning to spend $15 billion on its own wafer fab lines this year. "So, it is expanding into foundry by adding another $5 billion to set up this business, he said.

Meanwhile, TSMC plans to spend $28 billion this year exclusively on foundry operations. TSMC has spent more than $20 billion for a few years in a row. "That's one thing Intel really needs to consider if it intends to be a player in leading-edge foundry," said Matas.

If Intel expects to win business from leading OEMs, it needs to prove they can be a reliable, high-volume manufacturing partner for leading-edge processes if they expect to win business. "Apple, Qualcomm, Broadcom and others can afford to have production hiccups for their newest application processors. The chipmakers need to prove they can manufacture something other than their own x86 type designs," said Matas. 'However, if any company can do it, I think Intel can."



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

Services Sourcing

CEM

DEVICE PROGRAMMING

INTERCONNECTION

TAPE REELING

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

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Souriau	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,300	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	41,850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,650	N/A	0 €	N/A	50	2,500+	Y
MEDICAL CERTIFIED											
Review Display Systems		01959 563 345	www.review-displays.co.uk				£100				
OBSOLESCENCE / HARD TO FIND											
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£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											
Broadcom Limited	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,800	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
Osram Opto Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
PASSIVES											
AVX	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17850	N/A	0 €	N/A	50	2,500+	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	15,100	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,750	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,450	N/A	0 €	N/A	50	2,500+	Y
KEMET	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	23,650	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18700	N/A	0 €	N/A	50	2,500+	Y
Ohmite	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,550	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25,450	N/A	0 €	N/A	50	2,500+	Y
Taiyo Yuden	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,100	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,050	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	11,500	N/A	0 €	N/A	50	2,500+	Y
TT Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	43850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,750	N/A	0 €	N/A	50	2,500+	Y
Yageo	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	21,450	N/A	0 €	N/A	50	2,500+	Y
POWER & BATTERIES											
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Jauch Quartz		01276 605900	www.jauch.com			£500,000	0	95	15	130	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Bel Power Solutions	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
CUI Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
MEAN WELL	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,400	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1500	N/A	0 €	N/A	50	2,500+	Y
RECOM	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
TDK-Lambda	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
TRACO Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Vicor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
XP Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
SENSORS											
ams	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Bosch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	350	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Sensirion	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	80	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	75	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	650	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	850	N/A	0 €	N/A	50	2,500+	Y
SWITCHES & KEYBOARDS											
Apem	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,850	N/A	0 €	N/A	50	2,500+	Y
C&K Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,550	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
E-Switch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
EAO	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,800	N/A	0 €	N/A	50	2,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
NKK Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Omron	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,350	N/A	0 €	N/A	50	2,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,850	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
THERMAL MANAGEMENT											
Bergquist Company	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	250	N/A	0 €	N/A	50	2,500+	Y
Delta Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	700	N/A	0 €	N/A	50	2,500+	Y
ebm-papst	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
EMI Thermal	EMI Thermal	01992 510000	www.emithermal.com	N	800	N/A	£20	100%	12	200	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	4,300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£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	24	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,900	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,500	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,200	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,400	N/A	0 €	N/A	50	2,500+	Y
WIRELESS SOLUTIONS											
DIGI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Espressif	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Laird Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	100	N/A	0 €	N/A	50	2,500+	Y
Lantronix	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
u-blox	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10	N/A	0 €	N/A	50	2,500+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£10m	Essex/SE	70	9	AS9100 Rev D, ISO9001:2015, ISO 140001:2015, UL , CCC, IPC-610-G Class 3, TUV	Y	Y	Y	Y	Y	Y
CML Innovative Technologies (uk) Ltd	01284 714700	www.cml-it.com	£12M	UK/EU/China	65		ISO9001, TS16949, UL ISO9001 2015, IATF 16949 2016	N	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£12.5m	UK & Far East	72	10	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£18.6m	Andover (Hampshire)	130	6	AS9100 ISO13485 ISO9001 IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electrica.co.uk	£2.4m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.7m	SE	50	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£11m	Hampshire	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.6m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2.4m	Staffordshire	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Incap Electronics UK Limited	01782 753200	www.incapcorp.com	€113m+	UK, Slovakia, Estonia & India	1,300	20	ISO9100, ISO14001, ISO13485, AS9100D, ISO45001 & IATF16949	Y	Y	Y	Y	Y	Y
Industrial Electonic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£10m	UK	90	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
KEY-TECH ELECTRONIC SYSTEMS	01592 597711	www.key-tech.co.uk	£5 Million	UK	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711, BS EN ISO13485:2016	Y	Y	Y	N	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£15.9m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
NOTE Group	01753 746700	www.note-uk.co.uk	£151m	UK/EU/China	1,100	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	IS9001,ISO14001, IPC-A-610 Class 3, IPC-7711/7721, WHMA-3620, Certified IPC Trainer	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
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
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£8.2m	SE	77	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£16m	Derby	130	6	ISO 9001, ISO 13485, ISO14001, IPC 610, 620, 7711/7721	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	5	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
C-CLASS COMPONENTS													
Essentra Components	0845 758 5070	www.essentracomponents.co.uk	£283.3m	UK	2500		UL / CE / IATF	N	Y	Y	Y	N	Y

PCB Buyers' Guide

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

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