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## Plotting your path through the supply crunch

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AN MMG PUBLISHING TITLE

## On the cover – February 2018

Plotting your path through the supply crunch
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## Editor's Word

### My manufactory

I've started reading Adam Smith's The Wealth of Nations. It's not an easy read given that it was first published in 1904 but I'm steadily working my way through. On one of the pages I discovered a new word for me: manufactory. It's an obsolete term for a place where tradespeople worked together, rather than individually, to improve their productivity. It evolved into factory.

I like the sound of this word and will be reintroducing it to describe my own home which, following the commissioning of a new 3D printing cell, is finally outputting products as I originally planned. Three decades ago I was dragged off the factory shop floor to write about manufacturing. Well I'm back and now I get to actually make things and write about making things, all at the same time.

The rattle of a keyboard mixed with rhythmic whine of triple stepper motors is the new soundtrack to my working day, and I love it.

It's rather good news for *Electronics Sourcing* magazine too. Why? Because although I was always buying components for tinkering and repairs, I'll now be purchasing a much wider range of products from a bigger and more diverse supplier base. What I learn will have a direct impact on what I write.

I'll be flipping a coin to see which project goes first but it will likely be a remote controlled, servo driven zoom control for a DSLR camera lens. The gear train is printed, a rather unusual 720deg servo motor has been sourced (a story in itself) and the code for the Arduino Uno is written. Fingers crossed.

Jon Barrett

# Risk mitigation trumps cost-reduction in 2018

***Political uncertainty and a changing business climate place risk mitigation and brand protection front and center for buyers and supply managers***

**Victoria Kickham is a freelance writer specializing in manufacturing, distribution and supply chain issues**

Risk Mitigation • By Victoria Kickham

A changing global business climate is causing a shift in priorities for buyers and supply managers, as risk mitigation takes center stage for companies large and small. The need to protect against a range of supply threats and disruptions–including regulatory issues, natural disasters, and safety and environmental concerns–is causing buyers to focus more on brand protection strategies while tried-and-true issues such as cost-reduction take on a lesser, though still important, role, industry watchers say.

"Historically, procurement and supply organizations would have cost reduction as their primary goal," says Brian Alster, global head of supply and compliance at Dun & Bradstreet. "What we're seeing more and more is that they are shifting toward risk mitigation and brand protection."

An uncertain political climate is contributing to the shift. Alster cites negotiations around the North American Free Trade Agreement, Brexit in the European Union, and one-on-one country negotiations in Asia as key examples, as organizations prepare for potential changes that could affect their supply strategies.

"The challenge here is we're not sure what these negotiations will result in, but every single one has to do with cross-border business. As results start to come in, the uncertainty itself is a risk," Alster said in an early January interview. "In terms of global supply chains, the biggest challenge is around the political environment. It is the most critical risk right now heading into 2018."

Others agree, citing an escalation in risk mitigation strategies since the financial crisis of 2009, when manufacturing organizations, in particular, began diversifying their supply sources and building excess capacity, according Jim Wetekamp, chief executive officer at global procurement software provider BravoSolution.

"[Organizations] are beginning to think more about how to incorporate risk into supplier management," Wetekamp explains. "Certainly this is growing quickly, and many larger organizations, especially, have processes around this."

Growing Regulations, Consumer Demands

Alster cites two primary reasons for the shift toward risk management and brand protection in the purchasing and supply department: A more complex global regulatory environment and public demand for more responsible supply chains.

"When you see companies getting caught in the media for using a supplier who used a supplier who had forced labor, it [affects] the large corporation that ends up putting the product on the market," Alster explains. "Our customers are starting to realize they need to put stronger due diligence in place–to onboard, continuously monitor, and if needed, offboard vendors or suppliers. [They have to] monitor for things like forced labor, sanctions, and other issues. They are also looking at principal owners [of their supply partners], trying to better understand who they are and screen them as well."

And he says the issue is affecting companies of all sizes.

"This is definitely becoming more of a challenge, and not just with the largest companies," says Alster. "The largest companies that have global footprints in terms of their supply chains are definitely ones that are moving quicker, but I will tell you that we have customers whose supply chain footprint does not exceed a given country but are realizing they need to do this as well–because they are becoming too dependent on the success of a few suppliers."

Wetekamp agrees, adding that companies up and down the supply chain are taking action–if only to ensure they have policies and procedures in place to address the issues that may affect their companies, either directly or indirectly.

Such policies start with asking good questions at the outset of any new business relationship.

As Alster explains: "The number one thing [companies should] do … is make sure they are continuously building a sound, defensible due diligence program that ensures when they are onboarding a company, they are asking the right questions."

# N ES News

## View current editions online

*www.electronics-sourcing.co.uk*






## Line-card highlights extreme expertise

Charcroft Electronics has published a new line-card highlighting specialist components for use in sectors where reliability and precision are critical in harsh and high-end applications. The line-card provides a guide for buyers to source commercial off-the-shelf, high-reliability and sector-approved components suitable for use in the following industries: avionics, high-end audio, industrial, instrumentation, defence, oil and gas, rail and space.

Director of Charcroft Electronics, Debbie Rowland, said: "The combination of the new line-card, with support from field-based product specialists and comprehensive quality documentation, will simplify the design process, from component selection to volume production."

The new literature will also introduce the strapline, 'Charcroft: Challenge Accepted,' which was suggested by sales support, Beverley Turner, following an in-house competition to find a phrase that encapsulates the company's key differentiator.

Alongside devices such as RF and microwave components, power supplies, sensors and high-reliability semiconductors, the line-card also outlines components that operate at the extremes of temperature, power, voltage, current and precision.

*www.charcroft.com*


## Relays ready to ship

TTI now holds stock in Europe of Sensata Crydom's CX series SIP solid state relays, designed for high density PCB applications where a maximum of 5A current is required. The products utilise a back-to-back silicon controlled rectifier output, which is said to enhance reliability in commercial and heavy industrial applications. The relays benefit from a high surge current rating and are available with a zero voltage or instantaneous turn-on output. Available with a range of AC and DC outputs, the devices are UL, CSA and VDE rated.

*www.ttieurope.com*

## Forum helps purchasers stay ahead of counterfeits

The Anti-Counterfeiting Forum will hold its ninth annual seminar on 15 March, focussing on trends and developments in combating counterfeits in the supply chain, highlighting case studies from businesses that have implemented effective counterfeit management plans. The event will take place at BAE Systems Park Centre in Farnborough.

Counterfeiting in the electrical and electronics supply chain is a fact of life that almost certainly affects all companies with a range of old and modern technologies being counterfeited. Action to counter the threat is also evolving, with new best practice and solutions developing all the time.

The continued emergence of third party accreditation against international standards for managing counterfeits is therefore a welcome development.

With its focus on the latest innovations, this seminar will include presentations on work being undertaken to combat counterfeits, with case studies explaining how to set up and maintain a counterfeit management plan. It will include an update on international standards and the development of independent accreditation services, as well as other best practice to help reduce the risk of counterfeits.

Other topics include how law enforcement and direct action against counterfeiters can help reduce the threat of counterfeits, plus major trends in counterfeiting and counterfeit avoidance.

*www.anticounterfeitingforum.com*


## Colour-coded terminal blocks on the shelf

Hitaltech's new colour-printed terminal blocks are designed to facilitate quicker and more accurate wiring. Said to be speedy, detailed and cost-effective, this full colour printing capability allows legends and coded symbols to be included on standard terminal blocks. Developed to service growing customer demand, the full colour printing process can replace repeated layers of single-colour pad printing, which was expensive, or sticky labels, which were labour-intensive and time-consuming to attach.

Managing director of Hitaltech, Andy Fitzer, explained: "There is an obvious advantage to colour-coding terminal blocks. With the addition of clear legends, an electrical engineer's job is so much easier. Tasks can be completed quicker, mistakes are less common and costly mistakes avoided."

*hitaltech.co.uk*

# N ES News

## Score a goal on team building

Scheduled for Thursday 14 June next year, *Electronics Sourcing's* five-a-side football tournament will again be held at the Sussex Football Association headquarters in Lancing. The venue is tailor made for five-a side football, enabling multiple games to be played simultaneously. Results are displayed in near real-time and, more importantly, the pitches are nice and small, which means less leg work and a fast game.

So, what does the day entail? I registered to take part as an individual player and found myself placed with four other misfits, all much younger and fitter than me. Fifteen minutes each way soon separated the guys who had practiced together from those who been placed in a scratch team, but the football professionals in attendance did a great job of encouraging a stronger individual and team performance from all.

Frequent refreshment breaks encouraged banter between teams, provided an opportunity to discuss tactics, and a chance for the less fit to recover. In the end, the Premier Farnell team were very deserving overall winners.

As always, the tournament was held to coincide with the ECSN annual industry dinner, during which ECSN market analyst, Aubrey Dunford, provided an update on the global electronic components markets. This was followed by a panel discussion chaired by *Electronics Sourcing's* editor, Jon Barrett, where key industry representatives reviewed topics of the moment and tried, unsuccessfully, to avoid discussing Brexit.

*Electronics Sourcing* and ECSN are looking forward to another great industry networking event on Thursday 14 June. If you, or your organisation, would like to participate in this team building social event, please email sales@mmgpublishing.com

## Enclosures on show

Optimas' Components Division is a global supplier of c-class components planning a strong presence at Southern Electronics. The business supplies over 14,000 standard parts, mostly electro-mechanical, including cable management solutions, wiring hardware, enclosures, cable glands, conduits and fittings, threaded and non-threaded fasteners, finishing products and access hardware. Visitors to the stand can pick from a vast selection of component samples, for a first-hand appraisal of the range.

On stand highlights will include a range of specialised components for stringent hygienic applications, such as in the food processing, medical and healthcare sectors. In addition, Optimas' Components Division will be teaming up with one of its suppliers to highlight its range of conduits and fittings.

These components will be supported by parts designed specifically for automotive and lighting applications, as well as solutions for sectors such as transportation, domestic appliances and HVAC. Engineers will be on hand to discuss specific components or requirements.
*www.optimascomponents.com*

## Terminal block acquisition cuts complexity

TE Connectivity has entered exclusive negotiations with ABB to acquire the company's entrelec terminal block business. The business, which has manufacturing sites in France and Poland, would help TE offer a complete system for power, signal and data connectivity, with special focus on harsh environments.

President of ABB's electrification products division, Tarak Mehta, said: "Our combined portfolios will be more competitive on a larger scale under TE's ownership, providing greater opportunities for customers and employees. Combining our terminal block business with TE's strength demonstrates ABB's commitment to active portfolio management, a key element of our strategy."

Senior vice president and general manager of TE's industrial business unit, Lars Brickenkamp, added: "This intended acquisition is an important step in TE's ability to offer a broader and more complete product platform to help customers reduce complexity and drive innovation. Moreover, the expansion of our industrial team with employees from ABB will enhance TE's collaboration with customers on their innovation and automation projects."
*www.te.com*

## Distribution deal expands design-led opportunities

Stadium Group has signed a global agreement with Mouser Electronics covering the distribution of Stadium's standard technology products, including power supplies, human machine interface modules and wireless internet of things devices.

The deal marks another step in Stadium Group's strategy to grow its customer base and reach into new markets. The company has been bolstering both its worldwide presence and product portfolio, especially in power products and technologies. Stadium recently acquired PowerPax UK, a specialist value-add manufacturer and distributor of power supplies, battery chargers and LED products. In 2017, Stadium also acquired UK-based Cable Power, adding further electronic, power and single-board computing solutions to its portfolio. Both these companies have been integrated into the group's power technology division.

Chief executive officer of Stadium Group, Charlie Peppiatt, said: "The agreement with Mouser Electronics is a key component of our strategy to expand. Mouser's supply-chain services and support have all the capabilities we need to quickly put our products in the hands of design engineers and reduce time to market."

Vice president, supplier management, products at Mouser Electronics, Andy Kerr, added: "Stadium has put itself on the map in terms of its significantly expanded power portfolio, as well as its fast-growing business in wireless IoT products and technologies."
*www.stadiumgroupplc.com*

# Be sure to back a winner

*Buyers should check component lifecycles to identify winning devices in the fast-paced IoT network market, says RS Components' Mark James*

With the internet of things now firmly a growing market, rather than just a buzzword or futuristic notion, the IoT network components market has gathered pace and is a fast-moving sector. Commissioned by Arm and IBM, the Economist Intelligence Unit's internet of things business index 2017 backed up this trend. More than half of the 800 global company leaders surveyed reported continued planned investment in IoT, expecting it to make them more profit by 2020.

Consumer uptake in the adoption of IoT is also gaining momentum, with smart devices, such as Google Nest for home heating control, becoming more common in the home. Amazon's Echo, for instance, can be used to connect a variety of home appliances and functions including lighting and entertainment control, demonstrating the expansion of new sensor to gateway network technologies. Keeping these trends in mind, it's clear to see the reason behind the fast evolution.

**Avoid supply snags**

Buyers in this sector who previously enjoyed a relatively stable wider electronic components market must keep pace with the changes and exercise due diligence before going into production, if they want to avoid a potential supply nightmare. While the sensor components within any IoT design may be commodity items, with longer lifecycles and more interchangeability, buyers need to consider that the network and interface chipsets at the heart of IoT designs may have just a 12 to 24-month lifecycle.

Additional factors to consider include the increased use of meshed 'local' networks and continual development of on-chip network security. The growing demand for lower power components with greater operational network range is also a consideration for buyers looking to invest in the right products for chipset designs.

Overall, there needs to be a greater focus on component lifecycles and volume availability. Working with distributors that have close manufacturer relationships ensures access to technical knowledge in order to keep abreast of component revisions. This, plus a robust obsolescence process, are key to an efficient and successful buying process for the business.

**Anticipate availability**

Recognising the need to look to the future when designing IoT products, RS Components has created a tool, in conjunction with a third party, to help buyers and engineers understand the potential of using specific components over the lifecycle of a project. The tool, which is based on manufacturers' source data, helps illustrate anticipated availability of components over one or more years.

As this sector develops, the pace of development and the evolution of the internet of things is not expected to diminish, so electronics purchasers need to review any IoT chipset design choices via a commercial lens in terms of availability and supply. Although the IoT network struggle won't be as polarised as VHS versus Betamax, it's clear there will be winners and losers. Purchasing professionals therefore need to ensure they have a buying process that enables them to identify the winning components and subsequently back them.

uk.rs-online.com

Northern Europe product manager, automation and control at RS Components, Mark James


Examine anticipated component availability when designing IoT products


Network and interface chipsets may have just a 12 to 24-month lifecycle

# Learning to live with lead-times

*Buyers will have to work smarter to stay on schedule in the coming year, advises supply chain director at Esprit Electronics, Paul Handley*

**Q** ESUK reader research confirms rising lead-times are a major concern. Why is this?

**A** Thanks to the burgeoning internet of things, automotive and mobile markets, plus rapid growth in Asian markets, lead-times for many semiconductors and passive products now exceed 30 weeks, with some product lines stretching to over 50. Most analysis suggests growth in these markets will pick-up from 2017 levels and continue to increase in 2018. Combine this with optimistic global GDP forecasts for Europe, China, Japan and the United States, as well as an emerging Asian market, and you start to see the extent of the problem.

**Q** Have extended lead times and allocation affected production at Esprit?

**A** We've been on the front foot to mitigate delays where possible. We did have one customer, however, that was forced to redesign a PCB when faced with a considerable lead-time issue. This enabled the client to 'design out' the problem parts to meet their customer requirements.

**Q** What strategy does Esprit follow for extended lead-times?

**A** Communication is key, so we make sure to relay timely and relevant extended lead-time information to clients. Software helps us to analyse product lifecycles and supports part selection. This means we can suggest multiple manufacturers and generic options. We also work closely with our franchised distributor network to provide information on new projects. This allows for project lifecycles and launch dates to be discussed with both the distributor and the manufacturer, and for realistic assessments to be made on material availability. In 2016, Esprit had the foresight to monitor the market to analyse trends. Armed with this research, in Q1 2017 we met with key suppliers and manufactures to learn their views on how the growth and demand would impact the marketplace. This meant we could enter into discussions regarding how best to support long-term contracts by identifying, isolating and finding solutions to issues.

**Q** What is driving extended lead-times?

**A** Component demand is soaring in line with the global IoT and automotive infotainment explosions. There's also an increase in mobile and industrial markets, and when supplies are tight these big spending customers demand to move to the front of the line. The semiconductor industry is now expected to register a 20 percent increase this year, up five percentage points from the 15 per cent growth rate forecast in mid-year. Constraints of passive supply are set to last until mid-2018, but we're experiencing lead-times of automotive grade devices exceeding 52 weeks.

**Q** Are brokers ever contacted to find a component sourcing solution?

**A** We subscribe to a leading online sourcing database which provides access to over 900 billion components, alleviating the requirement to ever source through an agent. Owing to the importance of quality and supply chain integrity, however, we only use these options in extreme circumstances, and with customer approval.

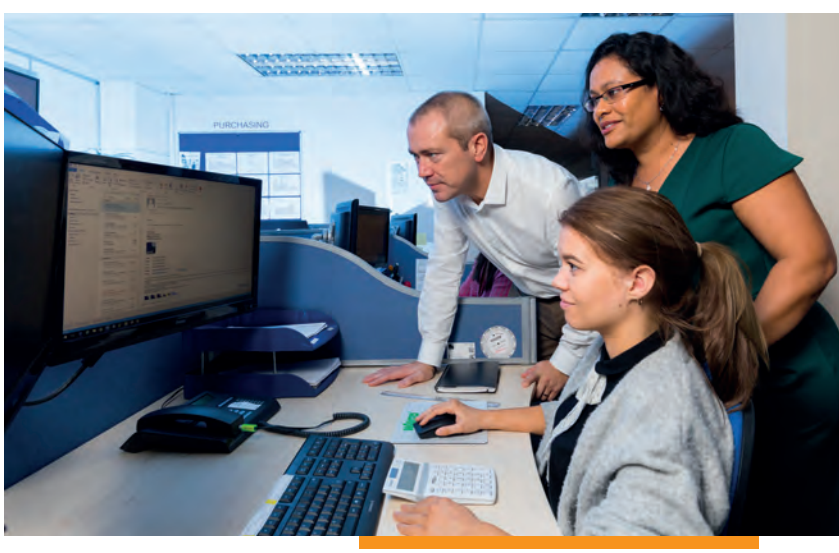
**Q** What advice would you give to readers regarding managing lead-times?

**A** If we're to provide the service levels our customers require, we must maintain focus on lead-time trends, worldwide economic influences and product developments. In light of turbulent lead-time issues, organisations are going to have to continue to work smarter to meet forecasts and expectations.

*www.aeiuk.com/esprit-electronics*

Supply chain director, Paul Handley

**Lead-times for many semiconductors and passive products now exceed 30 weeks**



Software helps analyse product lifecycles and supports part selection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The power of distribution

# Distributors see opportunities in automotive, IoT and industrial in 2018

*Tight supply of some components in the first half will help drive more customers to distributors*

James Carbone

The bad news for electronics purchasers is that lead times for components which stretched last year may stay long through at least the first quarter of the year and perhaps through the first half.

Supply is expected to remain tight as component manufacturers are not expected to be aggressive about adding new capacity despite healthy demand, according to distributors.

The good news is that buyers who had forged close relationships with a few key distributors and have inventory programs with them should be in a better position to weather the supply crunch than those buyers have more transactional relationships with distributors and purchase from numerous distributors based on which one has the best price.

Distributors say they expect to see increased demand from traditional customers as well as non-traditional OEMs that may be using electronics for the first time in the equipment they design and manufacture. In addition, demand is expected to continue to rise from the automotive segment as electronics content in vehicles increases because of the proliferation of safety features and infotainment systems in more models of vehicles.

Many distributors will also likely see greater component demand from large OEM and EMS providers, which usually purchase direct from component manufacturers.

However, when parts are in short supply many large electronics manufacturers turn to distribution because distributors often have shortage parts in stock. In fact, large OEMs and EMS providers turned to distributors for components that were in short supply last year and that was one reason many distributors posted strong sales increases in 2017.

One such distributor is Mouser Electronics. Mouser saw a more than 29 per cent increase in revenue in 2017 because of strong design activity and a 10 per cent increase in the number of active customers which resulted in more orders for the distributor, said Kevin Hess, senior vice president of marketing. However, while Mouser focuses on design, when parts are in short supply many buyers at electronics manufacturers purchasing parts for volume production turn to the distributor because Mouser has inventory and a wide breadth of parts. The company increased its inventory of components by about 20 per cent in 2017, according to Hess.

**Expect tight supply**

Distributors indicate that tight supply for components is likely to continue in the first quarter and there could be price increases for memory ICs, MOSFETs and some passives such as multilayer ceramic capacitors.

Murdoch Fitzgerald, vice president of engineering and supplier marketing at Arrow Electronics, said that semiconductor prices would rise because of limited supply of silicon wafers. He said that there are four major manufacturers of wafers which control about 90 per cent of the silicon wafer market. Those manufacturers have started to increase prices. In some cases, prices have increased 25-40 per cent. In addition, prices for other raw materials used in electronics are increasing.

As a result, semiconductor and other component manufacturers are going to pass price increases on to the distribution channel and to customers, according to Fitzgerald. "I don't think anyone is at the point now where they have the ability to absorb these increases," he said.

While prices will increase, demand for many parts will also rise for several reasons including the Internet of Things (IoT), which is an "exciting opportunity" for distribution, according to Fitzgerald. He said IoT is not just about wearable electronics such as smart watches and Fit Bits. There is also a lot of growth opportunity with industrial IoT.

"I think many of the major industrial players are starting to see the real benefit of IoT whether it is predictive maintenance or having the ability to monitor vibration on a piece of factory equipment which is a first sign of potential failure," said Fitzgerald. He said there are a lot of operational efficiencies that IoT can provide the industrial

> **"I think many of the major industrial players are starting to see the real benefit of IoT whether it is predictive maintenance or having the ability to monitor vibration on a piece of factory equipment which is a first sign of potential failure"**

Murdoch Fitzgerald, vice president, engineering and supplier marketing for Arrow Electronics

space.

Avnet is also bullish about IoT because it cuts across many vertical markets and requires a wide range of products including microcontrollers, sensors, power management ICs, resistors and other passives and actors.

**IoT opportunities**
Phil Gallagher, president electronic components for Avnet, said there are opportunities with IoT from existing customers that manufacture traditional products as well as nontraditional customers.

"For instance, there's a beer manufacturer that wants to use IoT tracking devices on taps and kegs that are going into bars and pubs, so they can track each pour of beer, and if beer is being poured correctly or if the bars are giving away free beer," he said. He said Avnet has the products and software to provide an integrated solution to industrial IoT customers.

"We have the size, the scale and the reach to take the solutions of our suppliers" to small and medium size customers, he said "Our line card is rock solid. It is perfect for us," said Gallagher. Another key trend for distribution that is driving component demand is automotive, which has become a bigger customer segment for distribution. Automotive traditionally has been a direct business, but distributors often supply components to automotive suppliers that build systems and subsystems for major automakers. At the same time electronic content in vehicles is growing, noted Fitzgerald. More vehicles are equipped with advanced driver assistance systems (ADAS) such as lane change and collision avoidance systems as well as infotainment systems. In addition, automakers and other companies are developing autonomous vehicles which will drive themselves.

Such systems use a wide variety of electronics including sensors, power management ICs, microcontrollers discretes and other components and devices.

"We are seeing really good growth in the automotive market. Automotive is the fastest-growing segment for us," said Gallagher. "We have expanded our presence there and it has become a very nice vertical for us. Our line card is solid in automotive. We are covered there."
Other traditional customer segments of distribution will also help drive growth in 2018 and beyond, including medical, industrial and defense and aerospace.

**"We are seeing really good growth in the automotive market. In fact, automotive is the fastest-growing segment for us"**

Phil Gallagher, president electronic components for Avnet Inc

Kevin Hess, senior vice president of marketing for Mouser Electronics

**"I don't see anything that could limit growth next year. "We expect the first quarter to be good and then slow down and growth will be less going to the rest of the year"**

Medical tends to be high-mix and lower-volume business which aligns with the business models of many distributors. "Then you have the steady as she goes industrial marketplace. Industrial has always been core," said Gallagher. "Defense and aerospace are also very good."

**Innovation drives distribution**
One key trend is the sustained level of innovation that is resulting in the greater use of distribution, said Dave Doherty, president and chief operating officer for Digi-Key. He said it is easier than ever to design a new product and to find funding to build it.

One reason is the availability of boards such as Raspberry Pi and Arduino. Such boards cut down development time and make it easier to bring a product to market. It is also easier for makers or companies to get funding for a project through crowd funding sources such as Indiegogo.

"All the elements that were hurdles in the past in bringing a product to market in this incubator environment are becoming greatly reduced," he said. That's good news for small volume distributors such as Digi-Key, Mouser and other distributors that focus on product introduction.

Innovation, greater use of distribution by the automotive segment and the trend of connecting more products to the Internet will be important drivers for distribution to 2018 and beyond. Many distributors expect to see 10 per cent or more sales growth next year.

"I don't see anything that could limit growth next year," said Hess. "We expect the first quarter to be good and then slow down and growth will be less going to the rest of the year," he said. However, strong growth may continue into the third quarter before slowing down.

# The power of paperwork

*Authorized distributors are many steps removed from conflict minerals mining, yet their efforts to provide a chain of custody for raw materials will help save lives, Bernard Gizzi, President, Electronic Connector Company explains*

Electronic distributors are often asked to fill out lengthy forms to verify the origins of where materials are sourced. In the quest to properly disclose this information, distributors may need to fill out forms such as the conflict minerals reporting template, or subscribe to audit websites to comply with conflict mineral disclosure standards for the products they sell.

Of course, most authorized distributors are many steps removed from the mining of conflict minerals and do not purchase in the covered countries. Distributors work closely with suppliers to identify products at risk of having conflict minerals and provide as much documentation as possible to provide chain of custody and originating sources for raw materials. Arrow and Avnet have spent considerable time and resources to address this problem and many suppliers approach conflict minerals similarly.

**Understanding origins**

Despite the inherent costs in reporting, disclosure requests are important and serve a vital purpose. That's because the conflict in 'conflict minerals' refers to ongoing wars and atrocities occurring in and around the Democratic Republic of Congo in Africa where mining for minerals used in electronics manufacturing occurs. These minerals are primarily tungsten, tantalum, tin and gold.

Conflict minerals reporting helps to disclose the origins of minerals that may come from this war-torn area. In the United States and some European countries, government bodies have enacted laws to bring attention to and prohibit products that have 'conflict minerals' in them if they came from mining operations in this area of Africa.

**Change trading patterns**

In the electronics industry, the issue really came to the fore after the passage of the Dodd-Frank Act in 2012. Section 1502 made it a requirement for companies to enact due diligence in the sourcing and chain of custody reporting when sourcing products that might contain conflict minerals.

For clarity, this legislation does not apply to everyone, however all distributors want to prevent and eradicate those organizations that contribute to conflicts that accelerate the emergency humanitarian situation in Africa's Congo region. Identifying these minerals and their source will help de-fund the armed groups that commit offences against human rights.

Of course, there are many supply chain layers that separate distributors from smelters and mines, often making it impossible to verify if conflict minerals are present when ores are smelted, refined, and converted to ingots that are combined at operations outside the conflict area. Distributors still have a key role to play, however, as they continue to raise awareness and to improve sourcing from conflict-free regions.

With the guidance of the Electronic Components Industry Association, and the efforts of the authorized distributor community, the trading environment around these minerals will improve, reducing the problems for those living in and around the DRC.

*www.eccoconnectors.com*

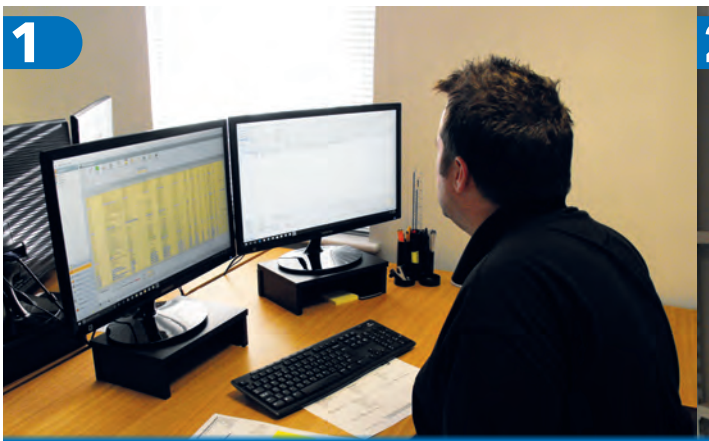
President, ECCO Electronic Connector Company, Bernard Gizzi

> **There are many supply chain layers that separate distributors from smelters and mines**

This MIL-DTL-38999 circular connector features gold plated contacts

# Life of a connector order

*Most distributors stock finished parts, so if the MIL-DTL-38999 III connector you need is not in stock, you might face a lead-time of up to 12-weeks. NYK Component Solutions stepped into the world of value add distribution with approval from the Defense Logistics Agency to assemble MIL-DTL-38999 III connectors for Conesys. NYKCS can service 38999 III requirements in three to five days. Read on to witness the process*



**Monday 10am**
Dedicated internal sales contact takes customer call. Availability, price and delivery are checked. Customer receives a verbal quotation, followed by an official e-mailed quotation, which is recorded in the company system.

**Monday 1pm**
Customer accepts quotations and emails the order. Order is checked and contract reviewed. Order is entered into the sales processing system. Stock is allocated to the works order for the customer's requirement. Order confirmation is emailed to the customer.

**Monday 2pm**
Works order is sent to the bonded store for kitting. This is a controlled area which is regularly audited to ensure component parts meet approval requirements.

**Monday 3pm**
Order is kitted, checked and sent to assembly. Contacts are checked for correct specification and quantities versus the order requirements and then packed.

**Monday 4pm**
Shells are part-marked and date-coded. This process is critical to ensure the finished component can be accurately identified and traced throughout its life. Part-marking is oven cured for 30-minutes.

**Tuesday 9am**
Insert is retained and bonded into the shell, insert location is check on QA.

**Tuesday 10am**
Bonding is oven cured for 2-hours.

**Tuesday 12am**
Connectors are removed from the oven and air cooled for 1-hour.

**Tuesday 1pm**
Once connectors have cooled they are backfilled and sealed. Following this the connectors rest for 24-hours to ensure backfilling is fully cured.

**Wednesday 1pm**
Order goes to QA for final inspection. Finished and passed items are received and booked into stores.

**Wednesday 3pm**
Customer order pick list is generated. Connectors are picked from stock and the dispatch note is raised. Connectors are packed and dispatched for next-day delivery to the customer.
*www.nykcs.com*

## Tough connectors drive motorsport innovation

Lane Motorsport can now supply hermetically sealed versions of Souriau's 8STA circular connectors. Designed with a glass to metal insert specifically for fuel tank installations, the connector is resistant to racing fuels and fluids, and withstands pressure differential without reducing electrical performance.

Featuring a stainless-steel shell, the hermetically sealed connectors boast shock and vibration resistance, along with a wide operating temperature range. When mated, the connector is sealed to IP67 while its low-profile design makes a heat shrink boot easy to fit.

According to Lane, these hermetically sealed connectors are often used in tandem with Souriau's 8STA fuel immersible connectors featuring a fuel resistant insert that allows continuous immersion without loss of electrical performance.

Examples of the new Souriau 8STA hermetic connector range include a small circular five-way PC tail connector weighing just 3g. This size 02 hermetic connector is designed specifically for use with motorsport sensors.
*www.fclane.com*



## Lighting up switch selection

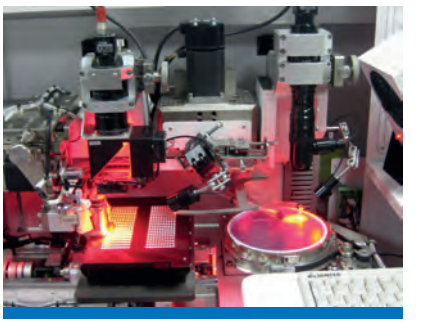
Schurter has expanded its Metal Line switch series to include an illuminated 16mm version. This compact mechanical push button switch boasts a sleek look, accentuated with homogeneous illumination in a ring, or complete surface area illumination. Colour options for illumination include red, blue, green, yellow and white. Standard supply voltage for the illuminated area is 24V DC.

Featuring a robust anti-vandal design, the new 16mm MSM switch includes a housing made of stainless steel with a mechanical actuator for tactile feedback. It also carries IP67 seal protection and IK07 impact resistance ratings, making it especially suited for use in harsh environments.

As a further benefit, the new MSM includes signal switches designed for voltages of up to 30V DC at 100mA. The power switches are rated up to 250V AC at 10A, making it particularly versatile for panel designs combining both power and signal switches.
*uk.schurter.com*

# Weighing the options

*Deciding whether to outsource PCB production to China is still a major concern for purchasers. Thorough research and approval processes are essential, whatever your volume and technology requirements*



Purchasers need to find a supplier that is technically able to support the various PCB technologies required

Several drivers affect the decision to purchase printed circuit boards, as well as the process of selecting the most suitable supplier. Some elements are set in stone; regular and accurate communication of the correct information, for example, enables accurate production planning. Likewise, an experienced technical sales team can save time and money by helping to make the best choices, as well as providing quick responses to all queries.

Suppliers must be approved to a minimum of ISO 9001 standards. This provides confidence that the company is committed to good levels of service and highlights organisations that continually strive for improvements.

Financial strength is another must-have. This ensures suppliers will continue to support requirements for years to come and usually means they can support the best cost options. Finally, purchasing managers need to find a supplier that is technically able to support and supply all the different PCB technologies they may require.

**Understand the variables**

In addition to these factors, there are also some aspects of the decision that can be more challenging, particularly when considering using Chinese PCB suppliers.

Pricing in China is increasing as the effects of copper shortages increase raw material costs, however the delta between Chinese and European prices continues to be significant. Even if China PCB pricing

was to increase so that it became less attractive, the capacity to manufacture in the West has been so badly reduced over recent years that it would be impossible to source PCBs in the volumes required.

China can also support all PCB volumes, including prototypes delivered in around five days. Lead times can vary, however, taking up to six to eight weeks depending on the technology, and can be even more challenging in the lead up to the Chinese New Year holiday period.

Looking back to the 1980s many PCB manufacturers set up in Hong Kong to cater for the explosion in PCB requirements for the personal PC and gaming electronics. During the nineties, PCB companies began to develop in mainland China, and as capability improved the variety of technologies available there improved. Today, all technologies can be sourced in China and in many cases, PCB manufacturers in China are better equipped than those companies that remain in the West.

**Enjoy the benefits**

In summary, there are many aspects to consider when sourcing the best PCB purchasing options and each buyer will have their own demands. Working with Chinese suppliers can present many challenges, but it can also be very beneficial. If the correct research is undertaken and a careful approval exercise is carried out, then the process should run smoothly.

As Prestwick Circuits suggests, selecting an experienced local partner can play a vital role in the success of outsourcing PCB production.

*www.prestwickgps.com*

> **Pricing in China is increasing as the effects of copper shortages increase raw material costs**

> **There are many aspects to consider when sourcing the best PCB purchasing options and each buyer will have their own demands**

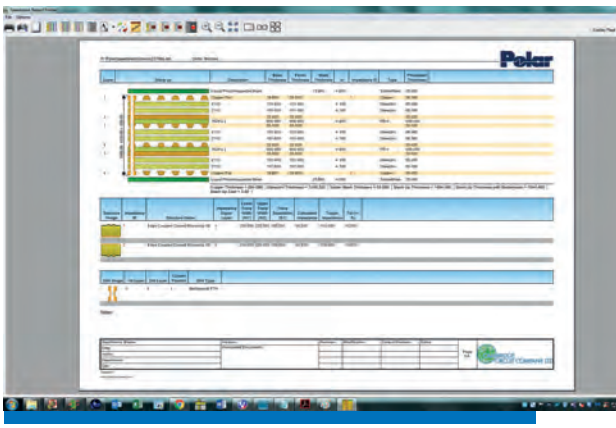
# Putting test first

*Increased demand for impedance testing has seen Cambridge Circuit Company invest in enhanced test equipment at its PCB manufacturing facility*

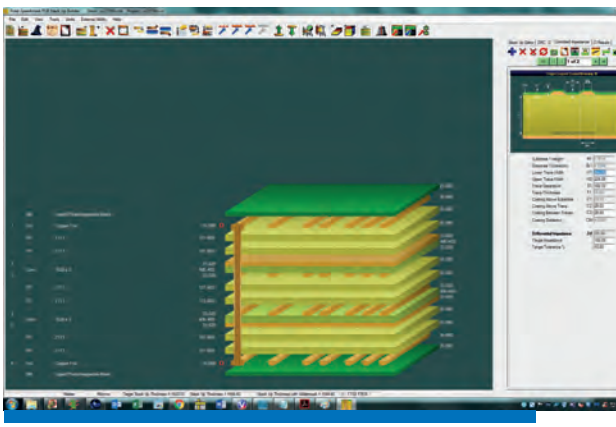
As a printed circuit board manufacturer specialising in prototype PCBs, Cambridge Circuits has seen a growing trend in the tech sector for impedance testing requirements. To further improve its services in response to this demand, the company has invested in a new impedance test system from Polar Instruments, along with associated Speedtrack PCB and CGEN software.

Defined as the effective resistance of an electric circuit or component to alternating current, impedance arises from the combined effects of ohmic resistance and reactance. The CITS880s controlled impedance test system promises to make impedance measurement easy, enabling testing of both shorter and fine line traces. This will ensure Cambridge continues to offer a cost-effective, responsive and reliable in-house PCB manufacturing service.

Working in unison with the test equipment, the Speedstack PCB software allows Cambridge to check and advise on customer impedance calculations. Cambridge can then liaise with clients to make any changes to the design to ensure optimum manufacturing. The company's list of materials and material suppliers can help with this. Finally, the CGEN software helps create a test coupon from the design, to test that the PCB matches requirements.




Speedstack PCB software allows Cambridge to check and advise on customer impedance calculations



Cambridge liaises with clients to make any changes to the design to ensure optimum manufacturing

With its focus on PCB prototyping, Cambridge Circuit Company believes that from the start of the journey, it's vital to prepare for a seamless transition from prototype, through new product introduction, into mass production. Investing in new technology and processes reinforces this commitment, helping Cambridge remain at the forefront of PCB manufacturing.

*www.cambridge-circuit.co.uk*

# Supply crunch to continue

***Last year was no picnic for purchasers buying passives and discretes and 2018 is looking like it will be challenging as well.***

By James Carbone

Electronics purchasers say buying conditions for many passives and discretes have gone from bad to worse as lead times that stretched to more than 70 weeks for some parts and component manufacturers are raising prices.

"Market conditions only continue to erode," said Frank Crispigna, vice president, supply chain for electronics manufacturing services company KeyTronicEMS, based in Spokane Valley, Wash. "We now have electronic original component manufacturers that are not committing to deliver orders until 2019, while others have ceased accepting purchase orders for their parts," Crispigna said in early January. Some of these manufacturers include Rohm, Panasonic, Kemet, TDK and Vishay, he said.

Lead times for many components remain long. Omron sensors are now in excess of 45 weeks. Other impacted commodities include fixed resistors and resistor networks from Rohm, Vishay and Panasonic. Parts from the manufacturers are either on allocation or constrained, according to Crispigna.

Stephanie Martin, senior vice president global supply for EMS provider Vexos, based in Markham, Ont., Canada said the electronics supply market is "worse than it was earlier in 2017 and continues to worsen. Manufacturers are running at 95 per cent or more capacity" but there is not enough capacity to meet demand, she said.
She said her company is having the most trouble with resistors, multilayer ceramic capacitors (MLCC) and discrete semiconductors. Lead times for CRCW series of resistors from Vishay are more than 70 weeks and the manufacturer canceled orders and is now rebooking for 2018. Lead times for a similar part from Rohm are out over 40 weeks and Yageo's lead times are more than 25 weeks, said Martin. Panasonic's ERJ series resistors are on allocation.

She said the problem is not limited to resistors and MLCCs. "We are seeing some problems with sensors, diodes, and some LEDs."

Because component lead times have stretched, the average lead time to procure a bill of materials is over 20 weeks, she said.

Besides long lead times buyers are facing price increases. "We had been successful in refusing them up to now," said Crispigna. "Some of the increases are very large."

"We're seeing price increases on the number of different product lines," said Martin. Multilayer ceramic capacitors are in full market allocation and prices have increased 10-25 per cent for some MLCCs, said Martin. Resistor prices have increased 10-15 per cent.

**More capacity needed**

Electronic component supply is so tight because, while component manufacturers saw the increase in demand last year, they did not initially add capacity, said Crispigna. He added that mergers and acquisitions in the electronics industry in recent years have also contributed to serious supply issues.

"Many of the acquired companies' manufacturing facilities were shuttered and folded into the acquiring companies' existing facilities in order to increase margins through operational efficiencies," said Crispigna.

Increases in demand from the auto industry for electronics components is "another major factor in the electronics market crisis," he said. There has been "a boom in electronic componentry that is used in the automotive industry," said Crispigna. Automobiles and trucks are equipped with new electronic systems that require "large quantities of electronic components. This consumption has broken what was an already over-burdened supply chain," he said.

Martin agrees that the auto industry is a major reason for the current supply crunch. She said in addition to increasing electronics content in vehicles, automakers had a substantial increase in demand for cars being sold in third world countries. As a result, component demand by automakers increased sharply.

Because of such strong demand from automakers and their suppliers, component manufacturers are "pulling production of components that normally supported commercial or industrial business and shifted production to build automotive components," said Martin. That has impacted the amount of parts available for commercial and industrial customers, she said.

– Dave Valletta, executive vice president worldwide sales for Vishay Intertechnology

**Capacity has also been impacted by the recent mergers and acquisitions in the electronics supply base**

Components manufacturers say increased demand for passives and other parts from the automotive segment is not the only reason that some components are in short supply. Dave Valletta, executive vice president worldwide sales for Vishay Intertechnology, based in Malvern, Pa., said automotive was a "catalyst," but demand was also strong from industrial equipment manufacturers and computer makers. Although notebook computer business "leveled off", there was still plenty of demand for components by computer makers. Unexpected strong demand from several key customer segments and the lack of investment in new capacity in recent years by component manufacturers resulted in shortages of some passives and discrete semiconductors.

**Dealing with shortages**

To deal with the supply crunch, buyers are employing several strategies and tactics including looking for alternate suppliers, identifying substitute parts for shortage components and purchasing parts from more distributors than usual, both franchised and independent.

Martin said Vexos is identifying component manufacturers that don't supply to the auto industry in an effort to find needed parts.

She said Vexos spoke with some manufacturers that don't do business with automotive manufacturers and is trying to shift some of its OEM customers to those component manufacturers and "we are having some success there." As an EMS provider, Vexos needs to get the approval of OEM customers if it wants to use components from a component manufacturer not on the OEM's approved vendor list (AVL).

She said Vexos is also looking for smaller component manufacturers in Asia. "We are looking at third and fourth tier Asian lines. We are trying to get some of those qualified."

She added Vexos' strategic sourcing team is spending more time assisting tactical buyers to find parts. "We are also utilizing our component engineering continuously. We had to add component engineering services to support all the alternate sourcing that we need when we run into problems," said Martin.

Vexos is also qualifying more independent distributors in an effort to locate shortage parts.

Crispigna says KeyTronicEMS uses its "preferred franchised distribution partners" whenever possible. "Given these awful market conditions, we have frequently been forced to either pursue available supply from alternate sources, or had to present our customers with fit/form/function (alternate components) that had available supply," said Crispigna.

In such supply conditions, counterfeit parts are a concern. "To ensure we minimize the risks of procuring counterfeit components," KeyTronicEMS uses preferred independent distributors when its preferred franchised partners are unable to supply the EMS provider with a component. He noted that buying parts from independent distributors is always done with the approval of the OEM customer.

**When will short supply end?**

How long the current tight supply conditions will continue remains to be seen and will partially depend on to what degree demand increases. While it is hard to forecast demand, component manufacturers and distributors say they expect component demand from automotive and industrial Internet of Things segments will rise in 2018 and beyond. That should mean increasing demand for passives, including capacitors and resistors.

"Bourns continues to forecast high demand for its resistive products throughout Q1/Q2 2018," said Clement Shu, product line manager for resistors for Bourns, headquartered in Riverside, Calif."

As a result of continued strong demand, some resistor suppliers are extending their lead times up to 50 weeks and "even as much as 80 weeks on certain resistor models and a few suppliers are on allocation for chip resistors," he said.

However, growth in demand may be slower in 2018 than 2017. "We anticipate growth will slow in 2018, although it will still climb at a steady rate," said Shu. He said besides chip resistors Bourns is forecasting an increase in demand for shunt resistors in automotive and server applications. "We have also seen lead times extended because of higher demand," said Shu.

He added if demand stays strong and resistor manufacturers are at full capacity, "we expect a few of the major suppliers will continue to increase their prices." He added one major supplier in chip resistors increased their price twice in 2017, which constituted a more than 30 percent increase from 2016."

Shu said Bourns' strategy is to maintain its existing cost to "support our customers' growing demand."

– Clement Shu, product line manager for resistors for Bourns


**"Bourns continues to forecast high demand for its resistive products throughout Q1/Q2 2018,"**

**"We're seeing price increases on a number of different product lines,"**

– Stephanie Martin, senior vice president global supply for EMS provider Vexos

Buyers are not optimistic that supply conditions will improve anytime soon, but some distributors say conditions could get better in the second quarter. It depends on demand and to what degree suppliers will add capacity.

"Every indication that we have from talking to several component manufacturers and distributors is we are not expected to see any relief before the end of the second quarter and some are projecting all of 2018," she said.

Crispigna said supply of electronic components will remain extremely constrained in 2018. "The best forecasts claim that some relief could happen around October of this year," he said.

He added that the new tax reform legislation may impact supply. "No one is completely certain what the impacts of the new tax reform legislation will be. However, if it is as stimulative as some economic analysts believe, the current market could continue well into 2019," said Crispigna.

**Being judicious**

Component manufacturers say they that supply conditions will improve later in the year as more capacity is added. However, they also say they will be judicious about the amount of capacity that they add.

"There was a little bit of caution to invest over the past year or two because we did not see fast growth in some of these product areas where there was a lot of price pressure," said Valletta. He said with downward price pressure, component manufacturers' profits get squeezed and "it impacts investment." Manufacturers are reluctant to add more capacity for products that have declining profit margins.

Capacity has also been impacted by the recent mergers and acquisitions in the electronics supply base. As competitors merged some capacity was taken out of the market for some products, said Valletta.

"All those things led to a sudden mismatch of supply and demand as orders started going through the roof," he said. In some cases, there was double ordering of parts because some buyers panicked and place orders with multiple suppliers in an effort to make sure their companies got all the parts that were needed for production.
Double ordering makes it harder for component manufacturers to understand real demand for parts, which can impact capacity decisions.

"With panic ordering as a supplier you're always wrestling with how do you respond? You want to add capacity, but you want to satisfy real increases in demand, but you don't want to go overboard and then all of a sudden you're stuck with too much capacity," he said.

"We do have plans to expand capacity. Resistor chips for instance we are expanding in some areas," said Valletta. He said tight supply conditions will ease a bit later in 2018 as capacity increases. "We are bringing capacity judiciously. We do worry a little bit about a correction. If too much capacity is added, then all of a sudden a point comes where everyone has plenty of inventory and we don't need any more."

# Switch tactics

*Contactless switch technologies are evolving rapidly, but there will always be a need for isolated, e-mech switches. As technology develops, choices for the purchaser multiply, says EECO Switch*

Over the past few years, the biggest developments in switches and associated products have been in the contactless sector, focussing on piezo, capacitive and inductive sensing technology. Touch panels, for example, are typical of this kind of application.

Despite these developments, however, there will always be a need for switches that provide total isolation, both for safety and security. In applications such as process control panels and medical apparatus, for instance, isolation is essential for operator safety.

**E-mech advantages**

For this reason, electromechanical switches are essential in applications that require high reliability in areas of extreme hazard, such as in military equipment. These manually operated switches are far less susceptible to electromagnetic compatibility issues, high radio frequency radiation and gaseous atmospheres. EECO Switch Sealed thumbwheel switches, for example, provide reliable service in airborne cockpit controls, marine and submarine controls and ground forces equipment.

Yet the switch sector will continue to advance and embrace innovative technologies to cater for applications such as proximity, movement and fluid level detection, or data input. Switch selection will be determined by many factors, but with the switch sector expanding, the choice for purchasers will obviously become more comprehensive.

**Data input developments**

Keypads and keyboards are still a viable media for data input and are a further example of new switch technology providing a wider choice to purchasers. Early keypads used electromechanical pushbutton switches that were susceptible to ingress of dirt, grime and moisture, potentially causing early contact failure. Now, however, keypads can incorporate conductive elastomer rubber switches, touch panels using resistive, capacitive or piezo sensors or sealed tact switches. Furthermore, all these technologies can be used to create custom designed products.

Naturally, choosing between off-the-shelf and custom products can impact delivery times. Off-the-shelf switches remain easily accessible, whereas custom layout products, such as fire control panels, are tending to a lead time of around eight to 10 weeks. Tooling and tool proving time is obviously a separate issue, with a further delay of about eight weeks before first samples are available from the tool.

Once the best option has been selected for the application in hand, EECO Switch can deliver globally, thanks to its factories in the USA and Taiwan and its distributors, which are located throughout Europe and Asia.

*www.eecoswitch.com*

Delivery of switch products is dictated by which switch is chosen

**Early keypads used electromechanical pushbutton switches that were susceptible to ingress of dirt, grime and moisture**

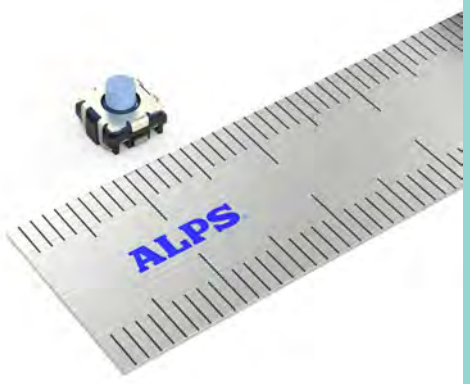
## Quieter cars demand enhanced switch design

Alps Electric has begun production of its SKTQ series TACT switch, designed to combine quiet operation with a 5N operating force and a definite clicking feel for today's premium automotive market.

Thanks to an increasingly airtight chassis and the emergence of hybrid and electric vehicle technologies, automobile cabins are becoming quieter. Touch technology is also replacing mechanical input in many navigational and in-vehicle systems, especially for premium vehicles in the European market.

In response to these trends, Alps Electric's SKTQ series retains the compact dimensions of the existing SKSU series while enabling quiet operation, with a high 5N operating force and definite click, ideal for automotive use. This helps prevent accidental operation while driving and realises a pleasant and clear-cut operating feel, compatible with touch panel control. Furthermore, the pre-stroke design prevents play during initial operation for a premium feel from this switch.

*www.alps.com*




## Get smart design on junction box

With Panasonic's new TL and TB1 automotive power relays, junction box manufacturers can reduce the size of smart junction boxes by replacing plug-in relays with space-optimised printed circuit board relays.

The new TL model has a fuse rating of 40A and outline dimensions of 14.4 by 11.0mm. This is said to be 12 per cent smaller than comparable 40A PCB relay solutions. For applications requiring lower currents, the TB1 power relay claims to save even more PCB space, with outline dimensions of 14.0 by 9.2mm.

By combining both relays, Panasonic believes designers of smart junction boxes can realise an optimised space-saving design. Typical high-current applications for the TL relay are fan motors, ignition, and starter motor solenoids, while the TB1 relay is ideal for applications like air conditioning, magnetic clutches, fuel pumps, fog lamps, electric gasoline injection and defoggers.

*www.panasonic-electric-works.com/uk/*

# Supply conditions for memory ICs and other semiconductors should improve in second half

*Large increases in capital spending by chip companies in 2017 should result in more supply and stable to declining prices later in 2018*

James Carbone

Electronics buyers can expect more semiconductor capacity in 2018, especially for DRAM and flash memory chips, because of hefty capital expenditure investments by chip companies in 2017.

Robust investment means that overall supply of semiconductors will increase in the second half of the year, which should result in shorter lead times and more stable pricing.

Total capital spending by semiconductor companies in 2017 increased by 35 per cent from 2016 to $490.8 billion, according to researcher IC Insights. The biggest investments were made by memory IC manufacturers. DRAM capital expenditures (capex) increased 86 per cent to $15.8 billion in 2017, while flash memory capital spending rose 93 per cent to $27.6 billion, according to the researcher.

Samsung increased capital spending the most among semiconductor companies. The South Korean chipmaker more than doubled its capital spending to $26 billion, including $14 billion for 3D NAND flash, $7 billion for DRAM and $5 billion for its foundry business, said IC Insights.

While memory IC manufacturers invested the most, other chipmakers also boosted capital expenditures. For instance, analog IC manufacturers increased capex by 25 per cent to $7.2 billion. Microprocessor and microcontroller capital spending increased 6 per cent to $10.6 billion and semiconductor foundry capital outlays rose 7 per cent to $23.5 billion, the researcher said.

However, capital spending for logic, which includes general-purpose logic, application-specific integrated circuits, programmable logic devices and gate arrays declined 11 per cent in 2017. However, logic chip manufacturers still spent $6.1 billion on capital expenditures.

While capex by chip companies increased 35 per cent in 2017, 2018 will be another story. "In 2018 there will be a 5 per cent decrease in capital spending, so most of the spending will have already taken place," said Brian Matas, vice president of market research for IC insights. Semiconductor capex will total $86.7 billion in 2018, he said. He noted that a decrease in capital spending is common after a year in which capital expenditures increase.

The good news for memory chip buyers is that the investments made by semiconductor manufacturers will result in lower prices for DRAM later in 2018. Memory IC prices increased sharply in 2017.

Susie Inouye, research director for semiconductor research firm Databeans, based in Reno, Nev., said the average price of a DRAM increased 78 per cent in 2017 compared to 2016. In 2016 the average price was $2.63. By December 2017, the DRAM average selling price had increased to $4.67. The average price for flash increased from $2.14 for 2016 to $2.57 at the end of 2017, according to Inouye.

However, new capacity coming online in the second half should result in some price relief for buyers. The DRAM average price is likely to continue to increase in the first quarter, but the "rate of growth will slow, hit its peak, and start to arc downward maybe in the beginning of the second quarter, but surely in the third and fourth quarters as capacity comes online ramps up," said Matas.

**300mm wafer investment**

Higher capital spending may also impact pricing of other semiconductor prices because some chipmakers are making investments to transition from 200mm wafers to 300mm wafers. Switching to 300mm wafers results in more chip supply as semiconductor manufacturers can produce more usable die per wafer with the larger size silicon disks.

Texas Instruments has already transitioned a lot of production of analog chips to 300mm wafers and says it gives the chip maker a cost advantage over competitors, according to Matas.

## By the Numbers

**$490.8 billion**
*The amount of capital spending made by semiconductor manufacturers in 2017. Source: IC Insights*

**78%**
*The percentage increase of the average DRAM price in 2017. Source Databeans*

**35%**
*The growth rate of capital spending by semiconductor companies in 2017. Source: IC Insights*

**6.1%**
*The expected percentage growth rate for analog semiconductors in 2018. Source: World Semiconductor Trade Statistics*

**$524.9 billion**
*The forecasted size of the global semiconductor market by 2021. Source: Databeans*

Having such an advantage is important because while semiconductor revenue increased about 20 per cent last year, unit shipments were in the single digits for many semiconductors, indicating the increase in revenue for the industry was largely due to higher prices not overwhelming demand, especially for memory ICs.

World Semiconductor Trade Statistics (WSTS, which collects data concerning semiconductor sales revenue, pegged sales growth for the 2017 semiconductor market at 20.6 per cent as sales grew to $409 billion from $338.9 billion in 2016.

Inouye said most of the revenue growth in 2017 was from DRAM. She noted that DRAM is the largest memory market segment. "In 2016 DRAM was $40 billion and flash was $33 billion. Now we have DRAM at $70 billion and flash is $45 billion out of a $400 billion overall semiconductor market," she said.

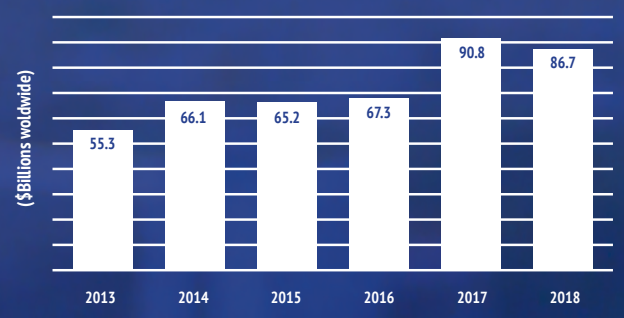
**Capacity restricted**

While the memory market is huge it is also "an oligopoly," she said. Samsung, SK Hynix and Micron are the three dominant memory IC manufacturers. "What happened was that there was restricted capacity for DRAM and prices went through the roof," said Inouye. Prices for other memory devices followed suit. "It wasn't necessarily a capacity crunch. Prices for flash also increased as well as for other memory including EPROM, SRAM, everything," she said.

As a result of increasing prices, DRAM revenue increased about 70 per cent and flash memory rose about 35 per cent. However, unit shipments for memory ICs only grew about 6 per cent, according to Inouye. The rest of the integrated circuit market grew only about 7 per cent because prices for many chips were flat or suffered some price erosion, although they had stronger unit growth rates than DRAM. For instance, unit shipments of analog chips grew 17 per cent, but sales only increased 10 per cent because of price declines, according to Inouye. In 2018, semiconductor revenue should grow about 8 per cent and much of that growth, will be due to increasing prices for DRAM in the first half of the year.

"Right now, prices are still increasing for memory," Inouye said in late December. "I suspect this is going to continue through the first quarter of 2018 which is going to give us much higher growth than typical for a year following a major sales increase," she said.

## Semiconductor capex to dip in 2018




Capital spending by semiconductor manufacturers increased 35% in 2017, but will decline about 5% in 2018. *Source: IC Insights*

However, as more capacity comes online later in the year prices will likely fall and DRAM revenue growth will not be as strong as 2017.

Memory chip demand from computer and mobile phone manufacturers is not as strong as the past because of slowing sales for PCs, laptops and cell phones. Shipments of PCs declined from 452 million in 2016 to 440 million in 2017. Shipments will increase modestly to 449 million in 2018, according to IC Insights. Cell phone shipments are also expected to rise marginally from 1.84 billion in 2017 to 1.855 billion in 2018, the researcher said. The impact of the new iPhone X and Samsung smart phones will have little overall impact on cell phone shipments.

In addition to tepid growth in computer and cell phone shipments, there is "no new application that's coming out requiring a lot of DRAM," said Inouye.

**Slower growth for memory ICs**

As a result, the memory IC market will grow only about 9 per cent in 2018 after rising 60 percent in 2017, according to WSTS. Growth rates for other semiconductors in 2018 will be less. For instance, analog chips will post a 6.1 per cent growth rate, microprocessor sales will rise 3.5 per cent and logic will increase 7 per cent, WSTS said. The overall semiconductor market will increase 7 per cent from $409 billion in 2017 to more than $437 billion in 2018.

While demand growth for semiconductors from the computer and cell phone industries will be sluggish, demand is supposed to be more robust from other segments such as automotive, medical and industrial.
Inouye said the semiconductor industry is getting "a bit of a boost" from automotive because there are more chips going into cars.

She said semiconductor content in vehicles now average is about $370-$300 per vehicle. The automotive chip market totaled $32 billion in 2016, said Inouye.

"Automotive is one of the few areas where there is significant growth for semiconductors," she said. However, automotive only represents about 12 per cent of the global integrated circuit market and that percentage has not increased much over the past 20 years.

Growing demand for semiconductors by the auto industry is obviously good news for chipmakers that focus on the automotive segment. Once such semiconductor company is ON Semiconductor which makes power management ICs, analog chips, sensors, LEDs for automotive manufacturers as well as other industrial OEMs

David Somo, senior vice president, corporate strategy, marketing and solutions engineering at ON Semiconductor, said his company's "traction in high growth areas such as advanced driver assistance systems, electric vehicles, machine vision and industrial power management, continued to accelerate in 2017 and we remain very optimistic for 2018."

ON Semiconductor is in the early stages of "realizing benefits of our investments in the automotive and industrial end-markets, and increased adoption of ADAS, electric vehicles and hybrids, machine vision, robotics etc. should drive further acceleration of ON's sale revenues," said Somo.

He noted the growth in the amount and value of "general electronic content throughout passenger vehicles shows no signs of slowing." Increasing semiconductor content in vehicles is being driven by more body and interior systems, LED lighting, and most notably, advanced driver assistance systems (ADAS), that now seem certain to lead us to SAE level 4 autonomous driving within the next decade," said Somo.

# Staying one step ahead

*ESUK caught up with Dynamic EMS supply chain manager, Paul Freeman, to quiz him about the sourcing difficulties of 2017 and how he plans to tackle the challenges that lay ahead in 2018*

**Q** What were the main component sourcing concerns in 2017?

**A** Last year we felt the knock-on effect of previous actions. We experienced challenges in allocation, obsolescence, price increases and increased demand.

But why is allocation back on the agenda? From 2015 onwards, component manufacturers continued to grow via aggressive mergers and acquisitions, especially semiconductor manufacturers. Furthermore, over recent years, component manufacturers of parts such as tantalum capacitors and silicon die have closed their higher cost locations in search of lower cost manufacturing bases.

When combined, these events result in a market with fewer manufacturers, at a time when demand is increasing. Where once you would have had several choices, now you only have one or two. This allows the remaining players to set their own pricing structure where a monopoly exists. When demand exceeds supply, this can lead to a situation where component prices escalate.

**Q** What's driving demand?

**A** New and emerging technology, the rise of the internet of things and the electronic content within the automotive market. Quite simply, there is not enough stock in the market to support everyone's manufacturing needs. As an electronics manufacturing service provider, we have had to stay ahead by securing a long-range supply network to fulfil our customers' build requests and to do this, we've worked relentlessly to remove barriers.

**Q** What has Dynamic done to help customers manage supply challenges?

**A** As component parts go into allocation, the natural result is lead-time extension. At best it's around 16 weeks for most component parts, but the worst we've been quoted is two years for a tantalum capacitor. This could be a show-stopping problem, but dealing with demand planning is what Dynamic EMS does, and has done for the past 60 years. To keep ahead of other EMS providers and the market, we take a sustainable approach to relationships.

We maintain an open book policy with our original equipment manufacturing partners. Our role is to fulfil their forecast, while being flexible, agile and responsive to their volume fluctuations. To be proactive, we need to share a common approach to transparency and traceability. This often results in Dynamic's involvement from the design stage to identify any components that may be challenging to secure. If we can design with an alternative component in mind, that we can obtain easily or that isn't approaching end of life, we will. This has been a major advantage to OEMs. It helps them create a stable and robust design, planned for supply chain procedures, that compliments their commercialisation needs.

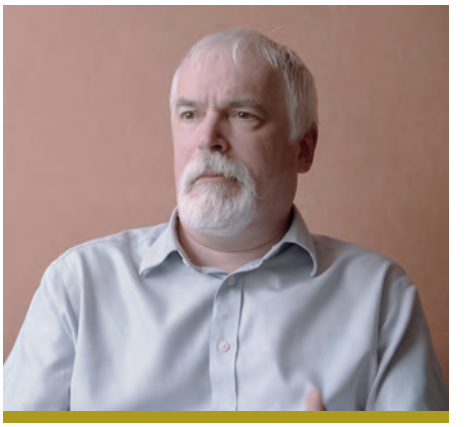
**Q** What are component suppliers doing to help regarding extended lead-times?

**A** We collaborate with our supply chain network to identify long lead-time parts in real-time. As soon as there is an issue, we know about it, often before other UK EMS companies. This gives us an advantage to source and secure ahead of other manufacturers. For example, we take existing stock into inventory, we look for alternative component parts and we review the design of the product with the OEM to consider alternatives.

**Q** What advice would you give other purchasers in the industry?

**A** Reduce or eliminate risk. Take control of the supply chain elements that can be controlled. Dynamic EMS has evolved its supply chain to work with like-minded suppliers, which results in a two-way relationship. To achieve this, we had to make a small reduction in our supply chain network, but this guarantees that all parties benefit. Reducing touchpoints reduces risk.

We are also working with our supply chain to reduce waste. Going into 2018, we plan to address waste with our suppliers at our next dedicated supplier day event. This will cover component waste, e-waste, packaging and process inefficiencies. We will also continue to work with OEM partners to design their products with the circular economy in mind. This is becoming more important to our business model and customers often request our mission statement regarding environmental issues and policies.



Supply chain manager, Dynamic EMS, Paul Freeman

**Q** What will the next five years bring?

**A** Having worked in supply chain for over 35 years, I believe it is a cycle. Reviewing the trends over time, I expect we will see new, smaller, component manufacturers emerging and slowly growing. These companies are born as developmental spin-offs from larger existing companies, with the talent, experience, and resources in place to transform and disrupt the market once more.

www.dynamic-ems.com

# Regulation underpins results

*Finding a manufacturing partner that understands the complex regulatory environment is vital in the medical electronics market, as ESUK discovered when talking to G&B managing director, Laura McBrown*

G&B managing director, Laura McBrown

**Q** Medical electronics is a huge growth sector. How is it evolving?

**A** The most significant thing is the speed of increase and change of regulatory requirements. ISO standard 13485 is being upgraded, the Canadian CMDCAS regulation is being replaced with MDSAP, which is being introduced for other territories, and own brand labelling is being replaced with virtual manufacturing. Many of our customers' products are non-invasive class two products and much of our new business is driven by our knowledge of the regulation.

**Q** Why do overseas medical companies choose a UK CEM?

**A** Many medical device OEMs opt for UK and European partners because European standards are slightly quicker and cheaper to navigate. Europe is also the second largest market for medical devices after America, so attacking this territory first makes good commercial sense.

G&B is compliant to European, American, Japanese and Canadian standards for medical device manufacture and we are often audited as part of our customer's audit. The accreditations we hold have helped customers break into these markets, which represent around 80 per cent of the world's market for medical devices.

**Q** What is the procedure when a prospective medical client engages with G&B?

*(continued on page 34)*

> **We are seeing some unbelievable lead times, often for parts you would not expect**

**A** The first step is the contract review. We like to establish where the client is with their regulatory compliance work and be sure we control the supply chain in a way that is suitable for their product classification. We then set up systems and controls for the data, from component level traceability to management of critical suppliers.

During prototyping we'll complete a manufacturing validation report to authenticate the accuracy of the manufacturing data. Once approved, we'll produce a validation batch to prove that the product can be consistently manufactured over a typical batch size.

Once everything is in place and the OEM has received their certification, we transfer to manufacture where, if required, we can configure to end user requirements and ship direct. Often, we'll provide non-warranty product support for these products in the field. In fact, we have just invested in a service and repairs department. Many of the products we manufacture are rented and are often returned for recalibration, retest and new enclosures.

**Q** How do you tackle increasing lead-times?

**A** We are seeing some unbelievable lead times, often for parts you would not expect, such as resistors and capacitors. Planning and communication is key; the best way to mitigate these issues is to place a long-term order commitment, but you need to ensure your demand is visible in the manufacturing queue and not just perceived as an inflated forecast. There also needs to be flexibility in the manufacturing contract, so communication is vital to ensure both parties' requirements are managed successfully.

**Q** What advice would you give to those looking for a CEM to make medical products?

**A** Make sure your manufacturing partner understands your regulatory environment for all the territories you plan to sell into and audit their complaint handling procedure. Then ensure that their range of services complements yours and that their culture gives you a sense of confidence.

*www.gandbelectronics.co.uk*


Europe is the second largest market for medical devices after America

# The search is over

*Whether you're sourcing components or subcontract production services, this month's Southern Manufacturing and Electronics exhibition, running 6 to 8 February, may just hold the solution you're looking for*

With its vibrant mix of components, production and test and subcontract services, electronics is a major focus of innovation at the *Southern Manufacturing and Electronics Show*, taking place this month at the Farnborough International exhibition centre. In fact, electronics will occupy roughly half the show floor, once again demonstrating the strength of this exciting sector of the UK industrial economy.

Naturally, a significant cross-section of UK electronics business will be present at *Southern Electronics*. Many familiar names return for 2018, including Easby Electronics, Camden Boss, North Devon Electronics, Wurth Electronics, Lemo, Fischer Connectors and Harwin.

Service providers and contract electronics manufacturers represent another core element of the show, with UK providers such as JJS Manufacturing, Bytesnap Design, SouMac Assembly Services, Turner Electronics, York EMC and Wrekin Circuits amongst hundreds of others.

This year will also see several European EMS providers present at the show, including CICOR Romania, an electronics service provider offering a range of production capabilities in printed circuit board assembly, system assembly and box build. From Lithunia comes Volburg SIA, an EMS with international experience and Selteka, an established manufacturer offering EMS services, including the design and development of custom test equipment.

There's also a wealth of production hardware to see, as well as a significant contingent of international exhibitors. German firms exhibiting in 2018, for example, include connector manufacturers, ODU and Yamaichi Electronics Deutschland, power supply maker, Cosel Europe, and environmental test equipment manufacturer, Binder.

These are, of course, just a few of the companies taking part. A full list of firms can be found at exhibitors.industrysouth.co.uk. Visitors registering online for free tickets will also receive a preview magazine to help plan their visit.

www.industrysouth.co.uk

# Pick up inside info

*Running across all three days, the seminar programme for Southern Manufacturing and Electronics features an impressive line-up of presenters and topics, sure to provide must-have know-how for purchasers*

Structured to provide a blend of technical and business topics, the free seminar programme at *Southern Manufacturing and Electronics* is a key feature of the show, drawing hundreds of delegates each year. From understanding lithium ion batteries and Industry 4.0, to the forthcoming data protection regulations and life after Brexit, the sessions deliver vital insight that buyers will be sure to benefit from.

Two perennially popular speakers return for 2018. Director of ALC, Tim Scurlock, will highlight the benefits of lean, including eliminating waste from existing processes, together with the pitfalls of introducing lean practices. Ailsa Carson of Onsite Insights also shares the best practice methodologies and key activities that help top firms remain innovative and produce quality product in terms of design, cost, performance, quality and delivery.

More technical topics include Nick Aitken and Dr Alex Martin's session on lithium-ion batteries; explaining their benefits and application while raising awareness of potential failings and regulatory matters. Colin Cater of Tri-Tech 3D looks at the benefits of 3D print technology, while Dr John Loftus of HMK Automation and Drives looks at the future role of collaborative robots in the workplace.

Business management and strategy also comes under the spotlight. The General Data Protection Regulations will come into force this May, affecting all personal data, and introducing new requirements and fines for transgressions.

Dave Smith of Corpdata shares essential knowledge to help keep organisations compliant and safe. In other sessions, delegates can gain an overview of intellectual property law and the tangible value of IP protection.

In total, the seminar programme includes 34 sessions, all of which are free to both visitors and exhibitors. A complete listing and pre-registration form can be found online.

seminars.industrysouth.co.uk

## Source interconnect advice

Lemo will exhibit its latest range of electrical, electronic and fibre optic interconnect solutions. A range of products will be showcased, along with the company's value-added cabling services, giving customers an opportunity to view the latest innovations and meet the team. With the ability to serve a range of end markets from auto-sport, military, and measurement through to medical and broadcast, Lemo UK boasts an experienced team of industry specialists who will be on-hand to offer advice.

**Stand E180**
*www.lemo.com*



## Watch out for waterproof additions

Interconnection and enclosures specialist, CamdenBoss, is showing its latest products at Southern Manufacturing and Electronics 2018. New products will include IP68 flat sheet plastic technology custom enclosures, a range of circular connectors, electrical enclosures, 2.54mm and screwless CamBlock Plus terminal blocks, plus additional enclosures in the Takachi range.

Thanks to a new joining technique, CamdenBoss's FSPT custom enclosures are now suitable for use in harsh environments. Designed to be completely watertight, this offers an IP68 rating, enabling customers to deploy custom enclosures in more applications, including outside.

Staying with the waterproof theme, new circular connectors include the premium CamCirc IP68 multi-pole range, ideal for applications such as broadcasting, military, food processing, industrial, medical, rail and robotics. With a rugged, high quality interconnection solution from two to over 20 poles, CamCirc products do not disconnect when the cable is under load or stress and are colour coded to ensure correct mating.

Other new products from CamdenBoss include the latest PCB terminal blocks in the company's CamBlock Plus range, including a new 2.54mm pitch rising clamp terminal block offering two to 12 poles for use in applications with limited space or for low power products. Competitively priced and UL approved, the new terminal block is ideal for lighting, fire and security products where space is at a premium.

**Stand N120**
*www.camdenboss.com*

## Washable keyboard helps control hygiene

Diamond Electronics will showcase a range of dishwasher safe, antimicrobial coated, easy clean keyboards for use in applications including food processing, semiconductor manufacturing, laboratories, point of sale systems, public area data input and clinical and home use medical systems.

Sealed keyboards in the iMTC range are waterproof to IP68. They meet medical approval EN60601-1-2 and can be supplied with an approved antimicrobial coating, nano silver or ionic silver antibacterial technology.

Options include full qwerty keyboards with either number pad or tracker pad, small footprint keyboards with integral pointing device, number pad keyboards with pointing device and a mouse with touch-scroll. Optional adjustable backlighting is available and the devices can be connected to host systems via USB cable or wireless link.

Sales director of Diamond Electronics, Peter Hall, commented: "A growing number of end users are taking steps to limit the transfer of contamination or disease though the use of industrial, medical and public human machine interface systems."

Diamond's full range of electromechanical and HMI solutions including switches, panel PCs keyboards, keypads and displays will also be on show.

**Stand H115**
*www.diamondelec.co.uk*

## Discuss the options

Independent distributor, JPR Electronics, will display products from over 70 manufacturers at Southern Manufacturing and Electronics. Many key component and enclosure manufacturers are among the 70 plus brands stocked, all shipped from the company's EN ISO 9001:2008 approved warehouse.

Major suppliers on display include Schützinger, a manufacturer of Kelvin four-wire measurement connectors, as well as global relay suppliers, Hongfa and Finder, and opto-electronic specialists, Kingbright and Winstar.

Also of interest to purchasers from a host of industries, JPR offers over 1,000 different models of Salecom switch, including toggle switches, rocker switches, push buttons and slide switches. Salecom products are available in many variants from ultra-miniature to miniature, with sealed, washable and dustproof options.

**Stand L135**
*www.jprelec.co.uk*

# Less power, more functionality

Solid State Supplies has introduced a new low-power FPGA designed to offer integrated functionality for applications from defence to smart factories.

Said to require around 50 per cent less power than competing mid-range FPGAs, Microsemi's PolarFire is described as the industry's lowest power, cost-optimized, field programmable gate array. The device includes between 100 and 500K logic elements, with high-performance 12.7Gbps transceivers supporting its small physical size. Low-power Flash*Freeze mode yields low standby power, while a 28nm non-volatile CMOS process ensures one-tenth the static power requirements of competing devices. Further benefits are offered by PolarFire's high-speed serial connectivity, up to 33Mbits of RAM, and up to 1,480 18 by 18 multiply accumulate blocks with hardened pre-adders. Devices also feature integrated dual PCIe, high-speed I/Os supporting 1,600Mbps DDR4, and general purpose I/O for serial gigabit Ethernet.

All this ensures the PolarFire FPGA family addresses a variety of market needs, including high-bandwidth radio and image signal processing, with anti-tamper and data security capabilities for defence applications such as secure embedded systems, guidance, radar and avionics.

Cost-effective bandwidth processing ensures the device is suitable for wireless access and wireless backhaul, smart optical modules and communication networks, while the small physical footprint, 3.3V I/Os and packet-based interfaces make it suitable for smart factories. A built-in Athena crypto graphic processor means no additional resources are required to implement security-conscious applications.

In-built SmartDebug features and a Libero system on chip design suite ensure ease of use. An evaluation kit is also available from Solid State Supplies for full development and testing.

**www.sssltd.com**


Microsemi's PolarFire is a low power, cost-optimized FPGA

# Shaped for success

*Telegärtner Group has enhanced its production capabilities with a new semi-rigid bending machine designed to support a variety of semi-rigid cable assembly requirements*

Using the latest AutoCAD 3D software, the Telegärtner Group can design and construct semi-rigid cable assemblies according to customer requirements. Cable length is accurately calculated using the AutoCAD 3D software and once drawn, Telegärtner's experienced production engineers utilise automated semi-rigid bending equipment to bend the cable assembly to any shape. Investing in a new bending machine further ensures the company can offer a high quality and accurate solution first time, every time. Specifically, the new bench top CNC coax cable bending machine can bend semi-rigid cable up to a diameter of 6.35mm. This fully programmable system utilises Windows-driven software to import drawings straight from AutoCAD Inventor. The 3D projection software ensures step-by-step bending for prototypes and the system also boasts quick change tooling.

With purpose-built production facilities in the UK and Slovakia, Telegärtner UK describes itself as a leader in the cable assembly field. All production staff work to IPC620A standard and the company is ISO 9001:2015 and ISO 14001:2015 certified. Due to Telegärtner UK's position as a manufacturer of cable assemblies, but also as a supplier of products across connectors, cables and speech communication devices, the company is perfectly positioned to service various industry sectors. Drawing on these skills, it promises the opportunity for both vendor reduction and effective supply chain management.

During the Southern Manufacturing 2018 exhibition, Telegärtner UK will present a selection of products designed to meet customer needs. Visit stand C125 to learn more about the products and services on offer and to find 'the best contacts for your success.'

**C125**
*www.telegaertner.co.uk*





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Amphenol Anytek
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Electroswitch
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Emerson Connectivity Solutions
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FLIR
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Foxconn Optical Interconnect Technologies
Free2move
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Fujitsu Electronics America, Inc.
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Insight SiP
Inspired LED
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Interconnect Systems - a Molex company
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Littelfuse
LMB Heeger, Inc.
LOCTITE / Henkel
Logic PD, Inc.
Logical Systems
LSR (Laird - Embedded Wireless Solutions)
LTW (Amphenol LTW)
Lumberg Automation
Lumex, Inc.
Lumileds
Luminary Micro / Texas Instruments
Luminus Devices
Luna Optoelectronics
Luxo
MACOM Technology Solutions
Macraigor Systems LLC
Macronix
Maestro Wireless Solutions
Mag-LED Solutions
Magnasphere Corp.
Mallory Sonalert Products
Marktech Optoelectronics

Marlow Industries, Inc.
Martel Electronics
Marutsuelec
Master Appliance Corp.
Matrix Orbital
MaxBotix Inc.
Maxim Integrated
MaxStream (Digi International)
Maxwell Technologies, Inc.
MCB Industrie / Vishay
McGraw-Hill Education
MEAN WELL
Measurement Specialties / TE Connectivity
MEC switches
Mechatronics
MegaChips
Melexis
Memory Protection Devices
MEMSIC
Menda
Mentor Graphics
Metelics (MACOM Technology Solutions)
METZ CONNECT
MG Chemicals
Micrel / Microchip Technology
Micrium
Micro Commercial Components (MCC)
Microchip Technology
microEngineering Labs Inc.
Micro-Measurements / Vishay Precision Group
Micron Technology
Micronas / TDK
Microsemi
Microwave Technology
Midcom / Wurth Electronics
Mide Technology
Midwest Microwave / Cinch Connectivity Solutions
MikroElektronika
Mill-Max
Mills / Vishay
Milwaukee / Vishay
MMB Networks
Molex
Molex Affinity Medical Technologies
Molex Beau Interconnect
Molex Brad Harrison
Molex FCT Electronics
Molex Flamar
Molex GWConnect
Molex Interconnect Systems
Molex NuCurrent
Molex Oplink Communications, LLC.
Molex Phillips-Medisize
Molex PolyMicro Technologies
Molex Temp-Flex
Molex Woodhead
Monnit
Monolithic Power Systems
MPD (Memory Protection Devices)
MPS (Monolithic Power Systems)
Mueller Electric Co.
Multicore / Henkel
Multi-Tech Systems, Inc.
Murata Electronics
Murata Power Solutions
Nakagawa Manufacturing USA, Inc.
National Semiconductor / Texas Instruments
Navman Wireless (Telit)
NDK
Nearson
Neohm Resistors / TE Connectivity
Neonode
Nesscap Co., Ltd
NetBurner, Inc.
Newava Technology
Newhaven Display, Intl.
Nexperia
Nichicon
Nidec Copal Electronics
NimbeLink
Nippon Chemi-Con
NJR Corporation / NJRC
NKK Switches
NMB Technologies Corp.
NorComp
Nordic Semiconductor
NOVACAP
NovaSensor / GE Measurement & Control
NuCurrent - a Molex company
Nuvoton Technology Corporation America
NVE Corporation
NXP Semiconductors / Freescale
O.C. White Co.
Octavo Systems
OEG Relays / TE Connectivity
Ohmite
OK Industries (Jonard Tools)
Olimex
Omron Automation & Safety
Omron Electronic Components
ON Semiconductor
On-Shore Technology, Inc.
Oplink, a Molex company
Optek Technology / TT Electronics
Option NV
Opto Diode Corporation
Opulent Americas
O'Reilly Media, Inc.
Orion Fans
OSRAM Opto Semiconductors, Inc.
Packet Digital LLC
Paladin Tools (Greenlee Communications)
Panasonic
PanaVise
Panduit
Parallax, Inc.
Parlex Corp.
Particle
Patco Electronics
Patco Services
PCD / Amphenol
Peerless by Tymphany
Pentair
Peregrine Semiconductor
Pericom Semiconductor Corp. (Diodes Incorporated)
Pervasive Displays
PHIHONG USA
Phillips-Medisize - a Molex company
Phoenix Contact
Phoenix Mecano
Phoenix Passive Components / Vishay
Phyton, Inc.
Pimoroni
PolyMicro Technologies - a Molex company
Polytech / Vishay
Pomona Electronics
Pontiac Coil, Inc.
Portescap
Potter & Brumfield Relays / TE Connectivity
Power Integrations
Powerex, Inc.
Power-One (Bel Power Solutions)
PowerStor (Eaton)
PRD Plastics
Preci-Dip
Precision Design Associates, Inc.
Precision Electronic Components Ltd.
Precision Technology, Inc.
ProAnt
Products Unlimited Transformers & Relays / TE Connectivity
Protektive Pak
PUI Audio, Inc.
PULS
Pulse Electronics Corporation
PulseCore Semiconductor / ON Semiconductor
PulseLarsen Antennas
Q-Cee's / TE Connectivity
QT Brightek
Quadcept
Qualcomm
Qualcomm (RF360 - A Qualcomm & TDK Joint Venture)
Qualtek Electronics Corp.
Quatech / B+B SmartWorx
Rabbit Semiconductor (Digi International)
Radial Magnet, Inc.
Radiocrafts
RAF
RAFI
Ramtron (Cypress Semiconductor)
Raspberry Pi
Raychem Cable Protection / TE Connectivity
RayVio
RECOM Power
Red Lion Controls
REDEL / LEMO
Renesas Electronics America
RF Digital
RF Solutions
RF360 - A Qualcomm-TDK joint venture
Richco, Inc. (Essentra Components)
Richtek
Riedon
Rigado
Roederstein / Vishay
ROHM Semiconductor
Rose Bopla
Rose Enclosures
Rose+Krieger
Rosenberger
Roving Networks / Microchip Technology
RPM Systems
Rubycon
RushUp
Sagrad
Samsung Electro-Mechanics
Samsung Semiconductor
Samtec, Inc.
Sanken Electric Co., Ltd.
Sanyo Denki
Sanyo Semiconductor / ON Semiconductor
Schaffner EMC, Inc.
Schrack Relays / TE Connectivity
Schroff / Pentair
Schurter
SCS
Seeed
Segger Microcontroller Systems
Seiko Instruments, Inc.
Semflex / Cinch Connectivity Solutions
Semtech
Sensata Technologies, Airpax
Sensirion
Sensitron Semiconductor / SMC Diode Solutions
Seoul Semiconductor
Serious Integrated
Serpac Electronic Enclosures
SGX Sensortech
Sharp Microelectronics
Sierra Wireless
Sigma Designs
Sigma Inductors / TE Connectivity
Signal Transformer
SII Semiconductor Corporation
Silego Technology
Silicon Labs
SINE Systems / Amphenol
Siretta
SiTime
SkyeTek
Skyworks Solutions, Inc.
SL Power Electronics - Manufacturer of Condor / Ault Brands
SMC Diode Solutions
Soberton, Inc.
Socle Technology Corporation
SolidRun
Souriau Connection Technology
Spansion (Cypress Semiconductor)
SparkFun
Spec Sensors
Spectra Symbol
Spectra-Strip (Amphenol Spectra-Strip)
Sprague Goodman
SSI Technologies, Inc.
Stackpole Electronics, Inc.
Staco Energy Products Co.
Standex-Meder Electronics
Stanley Electric
Steinel
steute Wireless
Stewart Connector
STMicroelectronics
Storm Interface
Sullins Connector Solutions
Sumida Corporation
SunLED
Sunon
Susumu
SV Microwave (Amphenol SV Microwave)
Swanstrom Tools
Swissbit
Switchcraft / Conxall
Syfer
Synapse Wireless
Tag-Connect
Taitien
Taiwan Semiconductor
Taiyo Yuden
Talema
Tallysman Wireless
Talon Communications, Inc.
Tamura
Taoglas
TAOS / ams
TDK Corporation
TDK InvenSense
TDK Micronas
TDK RF360
TDK-Lambda Americas, Inc.
TE Connectivity
TE Connectivity Aerospace Defense and Marine
TE Connectivity ALCOSWITCH Switches
TE Connectivity AMP Connectors
TE Connectivity Corcom Filters
TE Connectivity DEUTSCH Connectors
TE Connectivity DEUTSCH ICT
TE Connectivity DEUTSCH INDUSTRIAL & COMMERCIAL TRANSPORTATION
TE Connectivity Measurement Specialties
TE Connectivity Potter & Brumfield Relays
TE Connectivity Raychem Cable Protection
TE Connectivity Raychem Circuit Protection / Littelfuse
TE Connectivity's Agastat Relays
TE Connectivity's Axicom Relays
TE Connectivity's Buchanan Terminal Blocks
TE Connectivity's CGS Resistors
TE Connectivity's CII
TE Connectivity's Elcon Connectors
TE Connectivity's Holsworthy Resistors
TE Connectivity's Kilovac Relays
TE Connectivity's Neohm Resistors
TE Connectivity's OEG Relays
TE Connectivity's Products Unlimited Transformers & Relays
TE Connectivity's Q-Cee's
TE Connectivity's Schrack Relays
TE Connectivity's Sigma Inductors
Teccor / Littelfuse
Techflex
TechNexion
Techno / Vishay
Techspray
TechTools
Telcodium
Teledyne LeCroy
Telit
Temp-Flex - a Molex company
Tensility International Corporation
Terasic Technologies
Test Products International (TPI)
Texas Instruments
t-Global Technology
Thales Visionix, Inc.
Thermometrics / GE Measurement & Control
ThingMagic
Thomas Research Products
TinyCircuits
TOKO / Murata
Torex Semiconductor Ltd.
Toshiba Memory America, Inc.
Toshiba Semiconductor and Storage
Touchstone Semiconductor
TPI (Test Products International)
TPK America LLC
Transphorm
Trenz Electronic
Triad Magnetics
TRINAMIC Motion Control GmbH
Tripp Lite
Trompeter / Cinch Connectivity Solutions
Tronics
TRP Connector
TSC (Taiwan Semiconductor)
TT Electronics
TT Electronics / BI Technologies
TT Electronics / IRC
TT Electronics / Optek Technology
TT Electronics / Welwyn
Tuchel / Amphenol
Twin Industries
TXC Corporation
Tyco Electronics
Tymphany (Peerless by Tymphany)
U.S. Sensor/Littelfuse
UDOO
Ultra Librarian®
Ungar / Weller
United Chemi-Con
US-Lasers, Inc.
Varitronix International Ltd.
VCC (Visual Communications Company)
VEAM
Vector Electronics & Technology, Inc.
Verivolt
VersaLogic Corporation
VersaSense
Vicor
Vifa (Peerless by Tymphany)
Viking Technology
Virtium Technology Inc.
Vishay
Vishay / BCcomponents
Vishay / Beyschlag
Vishay / Cera-Mite
Vishay / Dale
Vishay / Huntington Electric, Inc.
Vishay / Semiconductor - Diodes Division
Vishay / Semiconductor - Opto Division
Vishay / Sfernice
Vishay / Siliconix
Vishay / Spectrol
Vishay / Sprague
Vishay / Thin Film
Vishay / Vitramon
Vishay Foil Resistors
Vishay Precision Group
Vishay Precision Group / Micro-Measurements
Visual Communications Company, LLC
Vitelec / Cinch Connectivity Solutions
Volgen / Division of Kaga Electronics USA
Voltronics (Knowles)
VPG / Micro-Measurements
Wakefield-Vette
Walsin Technology
Wandboard
WeEn Semiconductors Co., Ltd
Weidmuller
Weller
Welwyn / TT Electronics
Wickmann / Littelfuse
Wiha
Winbond Electronics Corporation
Winchester Electronics
Wintec Industries
Wiss
WIZnet
Wolfspeed - a Cree company
Woodhead - a Molex company
Wurth Electronics
Wurth Electronics iBE
Wurth Electronics Midcom
Xcelite
Xeltek
Xilinx
XMOS
XP Power
Xsens
Yageo
Zentri (Silicon Labs)
Zetex Semiconductors (Diodes Incorporated)
ZF Electronics
Zilog

# DIGIKEY.CO.UK LINECARD

## Buyers' Guide

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CABLE ASSEMBLY & HARNESSING** | | | | | | | | | | | |
| FTDI | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| Molex | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 300 | N/A | £0 | 97% | 50 | 1,500+ | Y |
| **CIRCUIT PROTECTION** | | | | | | | | | | | |
| Bourns | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5000 | N/A | £0 | 58% | 50 | 1,500+ | Y |
| EPCOS/TDK | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5000 | N/A | £0 | 58% | 50 | 1,500+ | Y |
| Littelfuse | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 35000 | N/A | £0 | 67% | 50 | 1,500+ | Y |
| **DISPLAYS & LEDs** | | | | | | | | | | | |
| NLT Technologies Ltd | Review Display System Ltd | 01959 563345 | www.review-displays.co.uk | Y | All | N/A | £0 | N/A | 6 | 25 | Y |
| **ELECTROMECHANICAL** | | | | | | | | | | | |
| ALPHA WIRE | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 26,919 | N/A | £0 | 97.04% | 150 | 3500+ | Y |
| CINCH CONNECTIVITY/Bel | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 31,120 | N/A | £0 | 78.21% | 150 | 3500+ | Y |
| CUI INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 17,410 | N/A | £0 | 92.21% | 150 | 3500+ | Y |
| DELTA PRODUCT GROUPS | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 3,215 | N/A | £0 | 99.95% | 150 | 3500+ | Y |
| KEYSTONE ELECTRONICS | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 6,315 | N/A | £0 | 95.17% | 150 | 3500+ | Y |
| Laird | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 15,187 | N/A | £0 | 97.20% | 150 | 3500+ | Y |
| Murata | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 66,179 | N/A | £0 | 99.79% | 150 | 3500+ | Y |
| OMRON ELECTRONICS INC-EMC DIV | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 74,369 | N/A | £0 | 95.47% | 150 | 3500+ | Y |
| Panasonic | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 154,777 | N/A | £0 | 94.42% | 150 | 3500+ | Y |
| TDK | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 60,769 | N/A | £0 | 99.20% | 150 | 3500+ | Y |
| TE | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 338,106 | N/A | £0 | 79.40% | 150 | 3500+ | Y |
| **ENCLOSURES** | | | | | | | | | | | |
| Bud | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,500 | N/A | £0 | 80% | 50 | 1,500+ | Y |
| Hammond | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 12,500 | N/A | £0 | 100% | 50 | 1,500+ | Y |
| Metcase Enclosures | OKW Enclosures | 01489 583858 | www.metcase.co.uk | N | 288 | £40,000 | £0 | N/A | 5 | 22 | Y |
| OKW Enclosures Ltd | OKW Enclosures | 01489 583858 | www.okw.co.uk | N | 1,955 | £40,000 | £0 | N/A | 5 | 22 | Y |
| Rolec Enclosures | OKW Enclosures | 01489 583858 | www.rolec-enclosures.co.uk | Y | 935 | £40,000 | £0 | N/A | 5 | 22 | Y |
| Teko Enclosures | OKW Enclosures | 01489 583858 | www.teko.co.uk | Y | 1,860 | £40,000 | £0 | N/A | 5 | 22 | Y |
| **FREQUENCY MANAGEMENT** | | | | | | | | | | | |
| ABRACON | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,000 | N/A | £0 | 91% | 50 | 1,500+ | Y |
| AEL Crystals Ltd | AEL Crystals Ltd | 01293 789200 | www.aelcrystals.co.uk | N | N/A | £200,000 | £50 | 100% | 3 | 15 | Y |
| ECS | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| Epson | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 59% | 50 | 1,500+ | Y |
| Golledge Electronics Ltd | Golledge Electronics Ltd | 01460 256 100 | www.golledge.com | N | N/A | £800,000 | £0 | 100% | 3 | 24 | Y |
| Jauch Quartz | | 01276 605900 | www.jauch.co.uk | | | £3M | | 100% | 15 | 130 | Y |
| **HEATSINKS** | | | | | | | | | | | |
| Aavid | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 67% | 50 | 1,500+ | Y |
| **ICs & SEMICONDUCTORS** | | | | | | | | | | | |
| ALLEGRO MICROSYSTEMS, LLC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 3,090 | N/A | £0 | 87.22% | 150 | 3500+ | Y |
| Altera | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,600 | N/A | £0 | 60.00% | 50 | 1,500+ | Y |
| ALTERA | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 10,901 | N/A | £0 | 84.86% | 150 | 3500+ | Y |
| ANALOG DEVICES INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 52,308 | N/A | £0 | 73.79% | 150 | 3500+ | Y |

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICs & SEMICONDUCTORS** (continued) | | | | | | | | | | | |
| Analog Devices Inc. | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 9,500 | N/A | £0 | 83.00% | 50 | 1,500+ | Y |
| Atmel | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,700 | N/A | £0 | 58.00% | 50 | 1,500+ | Y |
| Avago Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 84.00% | 50 | 1,500+ | Y |
| AVAGO TECHNOLOGIES US INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 16,512 | N/A | £0 | 91.38% | 150 | 3500+ | Y |
| Broadcom | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 69% | 50 | 1,500+ | Y |
| Cirrus Logic | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 300 | N/A | £0 | 80.00% | 50 | 1,500+ | Y |
| Cypress Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,400 | N/A | £0 | 63.00% | 50 | 1,500+ | Y |
| CYPRESS SEMICONDUCTOR CORP | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 27,423 | N/A | £0 | 92.54% | 150 | 3500+ | Y |
| DIGI INTERNATIONAL | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 4,355 | N/A | £0 | 95.30% | 150 | 3500+ | Y |
| Diodes Incorporated | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,600 | N/A | £0 | 98% | 50 | 1,500+ | Y |
| DIODES INCORPORATED | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 38,292 | N/A | £0 | 90.02% | 150 | 3500+ | Y |
| Exar | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,100 | N/A | £0 | 95.00% | 50 | 1,500+ | Y |
| Fairchild Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,500 | N/A | £0 | 90.00% | 50 | 1,500+ | Y |
| Freescale Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,500 | N/A | £0 | 42.00% | 50 | 1,500+ | Y |
| FTDI | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 97% | 50 | 1,500+ | Y |
| FTDI | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 569 | N/A | £0 | 100.00% | 150 | 3500+ | Y |
| IDT (Integrated Device Technology) | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,100 | N/A | £0 | 97% | 50 | 1,500+ | Y |
| Infineon | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 800 | N/A | £0 | 66.00% | 50 | 1,500+ | Y |
| INFINEON TECHNOLOGIES | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 28,850 | N/A | £0 | 93.70% | 150 | 3500+ | Y |
| Intel | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 78% | 50 | 1,500+ | Y |
| International Rectifier | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 600 | N/A | £0 | 87.00% | 50 | 1,500+ | Y |
| Intersil | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,900 | N/A | £0 | 50.00% | 50 | 1,500+ | Y |
| ISSI | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 98.00% | 50 | 1,500+ | Y |
| Laird | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 15,187 | N/A | £0 | 97.20% | 150 | 3500+ | Y |
| Lattice | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 69% | 50 | 1,500+ | Y |
| LINEAR TECHNOLOGY | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 37,479 | N/A | £0 | 77.62% | 150 | 3500+ | Y |
| Maxim Integrated | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 11,200 | N/A | £0 | 67.00% | 50 | 1,500+ | Y |
| MAXIM INTEGRATED | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 68,021 | N/A | £0 | 78.22% | 150 | 3500+ | Y |
| Microchip | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 12,600 | N/A | £0 | 91.00% | 50 | 1,500+ | Y |
| MICROCHIP TECHNOLOGY | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 86,517 | N/A | £0 | 86.12% | 150 | 3500+ | Y |
| Microsemi | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 90% | 50 | 1,500+ | Y |
| Monolithic Power Systems (MPS) | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 600 | N/A | £0 | 40% | 50 | 1,500+ | Y |
| NEXPERIA USA INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 23,513 | N/A | £0 | 99.29% | 150 | 3500+ | Y |
| NXP | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,900 | N/A | £0 | 91% | 50 | 1,500+ | Y |
| NXP USA INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 36,258 | N/A | £0 | 93.55% | 150 | 3500+ | Y |
| ON Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5,100 | N/A | £0 | 87% | 50 | 1,500+ | Y |
| ON SEMICONDUCTOR | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 87,298 | N/A | £0 | 85.61% | 150 | 3500+ | Y |
| Power Integrations | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 600 | N/A | £0 | 59% | 50 | 1,500+ | Y |
| Qorvo | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.c o.uk | Y | 300 | N/A | £0 | 90.00% | 50 | 1,500+ | Y |
| Rohm | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 55,139 | N/A | £0 | 99.85% | 150 | 3500+ | Y |
| ROHM Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,400 | N/A | £0 | 55.00% | 50 | 1,500+ | Y |
| Samsung | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 37,336 | N/A | £0 | 100.00% | 150 | 3500+ | Y |
| Silicon Laboratories | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,500 | N/A | £0 | 96% | 50 | 1,500+ | Y |
| SILICON LABORATORIES INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 19,667 | N/A | £0 | 96.54% | 150 | 3500+ | Y |
| Skyworks | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 300 | N/A | £0 | 91% | 50 | 1,500+ | Y |
| Spansion Inc. | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 600 | N/A | £0 | 93.00% | 50 | 1,500+ | Y |
| STMicroelectronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,500 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| STMICROELECTRONICS | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 39,201 | N/A | £0 | 97.79% | 150 | 3500+ | Y |

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **ICs & SEMICONDUCTORS** (continued) | | | | | | | | | | | |
| TDK | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 60,769 | N/A | £0 | 99.20% | 150 | 3500+ | Y |
| Texas Instruments | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 36,900 | N/A | £0 | 41% | 50 | 1,500+ | Y |
| TEXAS INSTRUMENTS | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 180,012 | N/A | £0 | 91.94% | 150 | 3500+ | Y |
| Toshiba | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 100.00% | 50 | 1,500+ | Y |
| Vishay | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 581,798 | N/A | £0 | 87.71% | 150 | 3500+ | Y |
| XILINX INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 8,213 | N/A | £0 | 51.46% | 150 | 3500+ | Y |
| **INDUSTRIAL GRADE MEMORY MODULES** | | | | | | | | | | | |
| InnoDisk | Simms | 01622 852 848 | www.simms.co.uk | N | 300+ | N/A | N/A | N/A | 3 | N/A | Y |
| **INTERCONNECTION** | | | | | | | | | | | |
| 3M | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,100 | N/A | £0 | 16% | 50 | 1,500+ | Y |
| 3M | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 62,421 | N/A | £0 | 93.42% | 150 | 3500+ | Y |
| Amphenol | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 25,600 | N/A | £0 | 53% | 50 | 1,500+ | Y |
| AMPHENOL RF DIVISION | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 443,368 | N/A | £0 | 75.92% | 150 | 3500+ | Y |
| Anderson Power Products | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 800 | N/A | £0 | 50% | 50 | 1,500+ | Y |
| Cinch Connectivity Solutions | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,900 | N/A | £0 | 82% | 50 | 1,500+ | Y |
| CINCH CONNECTIVITY/Bel | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 31,120 | N/A | £0 | 78.21% | 150 | 3500+ | Y |
| Delphi Connection Systems | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,300 | N/A | £0 | 67.00% | 50 | 1,500+ | Y |
| FCI | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,300 | N/A | £0 | 94% | 50 | 1,500+ | Y |
| Glenair | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,900 | N/A | £0 | 76.00% | 50 | 1,500+ | Y |
| HARTING | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,700 | N/A | £0 | 31% | 50 | 1,500+ | Y |
| Harwin | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,200 | N/A | £0 | 79% | 50 | 1,500+ | Y |
| Hellermann Tyton | Lane Electronics | 01403 790661 | www.fclane.com | Y | N/A | N/A | N/A | N/A | N/A | N/A | Y |
| Hirose Electric | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 6,100 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| HIROSE ELECTRIC CO LTD | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 37,215 | N/A | £0 | 90.98% | 150 | 3500+ | Y |
| Huber+Suhner | Lane Electronics | 01403 790661 | www.fclane.com | Y | 766 | £116,000 | £0 | 100% | 6 | 38 | Y |
| ITW McMurdo | Lane Electronics | 01403 790661 | www.fclane.com | Y | 866 | £219,000 | £0 | 100.00% | 6 | 38 | Y |
| JAE Electronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,200 | N/A | £0 | 32% | 50 | 1,500+ | Y |
| JST SALES AMERICA INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 5,109 | N/A | £0 | 84.32% | 150 | 3500+ | Y |
| Kycon | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| LEMO | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,900 | N/A | £0 | 65% | 50 | 1,500+ | Y |
| Molex | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 16,900 | N/A | £0 | 75% | 50 | 1,500+ | Y |
| MOLEX, LLC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 120,034 | N/A | £0 | 97.98% | 150 | 3500+ | Y |
| Neutrik | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,000 | N/A | £0 | 86% | 50 | 1,500+ | Y |
| Phoenix Contact | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 12,000 | N/A | £0 | 99.00% | 50 | 1,500+ | Y |
| PHOENIX CONTACT | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 54,845 | N/A | £0 | 99.99% | 150 | 3500+ | 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 |
| SAMTEC INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 427,448 | N/A | £0 | 99.99% | 150 | 3500+ | Y |
| Souriau | Lane Electronics | 01403 790661 | www.fclane.com | Y | 1,929 | £806,000 | £0 | 100% | 6 | 38 | Y |
| Switchcraft | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,200 | N/A | £0 | 69% | 50 | 1,500+ | Y |
| TE | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 338,106 | N/A | £0 | 79.40% | 150 | 3500+ | Y |
| TE Connectivity | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 30,900 | N/A | £0 | 40% | 50 | 1,500+ | Y |
| **OBSOLESCENCE / HARD TO FIND** | | | | | | | | | | | |
| | America II Europe | 01462 707070 | www.americaiieurope.com | N/A | 1,900 | $1B | £0 | 75% | 59 | 500+ | Y |
| | Cyclops Electronics | 01904 415 415 | www.cyclops-electronics.com | N/A | 177,232 | £5M | £100 | 75% | 3 | 78 | Y |

## Buyers' Guide

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **OPTO ELECTRONICS** | | | | | | | | | | | |
| Avago Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 8,200 | N/A | £0 | 89% | 50 | 1,500+ | Y |
| Cree, Inc. | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 22,500 | N/A | £0 | 74% | 50 | 1,500+ | Y |
| Dialight | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 9,800 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| Kingbright | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,100 | N/A | £0 | 100% | 50 | 1,500+ | Y |
| Lumileds | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,100 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| NEC | Review Display System Ltd | 01959 563345 | www.review-displays.co.uk | Y | 200 | £200,000 | £0 | 100% | 5 | 20 | Y |
| Newhaven Display | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 65% | 50 | 1,500+ | Y |
| Osram Opto Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,800 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| VCC | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5,000 | N/A | £0 | 92% | 50 | 1,500+ | Y |
| Vishay | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,100 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| **PASSIVES** | | | | | | | | | | | |
| ABRACON LLC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 41,991 | N/A | £0 | 100.00% | 150 | 3500+ | Y |
| AVX | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 70,700 | N/A | £0 | 58.00% | 50 | 1,500+ | Y |
| AVX CORPORATION | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 70,131 | N/A | £0 | 89.28% | 150 | 3500+ | Y |
| Bourns | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 49,500 | N/A | £0 | 98% | 50 | 1,500+ | Y |
| BOURNS INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 59,314 | N/A | £0 | 82.47% | 150 | 3500+ | Y |
| CINCH CONNECTIVITY/Bel | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 31,120 | N/A | £0 | 78.21% | 150 | 3500+ | Y |
| Coilcraft | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 10,400 | N/A | £0 | 98% | 50 | 1,500+ | Y |
| Cornell Dubilier | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 33,000 | N/A | £0 | 65.00% | 50 | 1,500+ | Y |
| EPCOS / TDK | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 31,000 | N/A | £0 | 74.00% | 50 | 1,500+ | Y |
| Fair-Rite | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,000 | N/A | £0 | 94.00% | 50 | 1,500+ | Y |
| HONEYWELL MICROELECTRONICS & PRECISION SENSORS | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 28,560 | N/A | £0 | 89.87% | 150 | 3500+ | Y |
| Kemet | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 135,800 | N/A | £0 | 93% | 50 | 1,500+ | Y |
| KEMET | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 101,257 | N/A | £0 | 91.57% | 150 | 3500+ | Y |
| KOA Speer | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 107,900 | N/A | £0 | 82% | 50 | 1,500+ | Y |
| Laird | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 15,187 | N/A | £0 | 97.20% | 150 | 3500+ | Y |
| Laird Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,800 | N/A | £0 | 50.00% | 50 | 1,500+ | Y |
| LITTELFUSE INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 59,517 | N/A | £0 | 91.54% | 150 | 3500+ | Y |
| Murata | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 66,179 | N/A | £0 | 99.79% | 150 | 3500+ | Y |
| Murata | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 67,300 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| Nichicon | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 21,600 | N/A | £0 | 47.00% | 50 | 1,500+ | Y |
| NICHICON | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 39,747 | N/A | £0 | 96.70% | 150 | 3500+ | Y |
| Ohmite | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 17,300 | N/A | £0 | 99.00% | 50 | 1,500+ | Y |
| Panasonic | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 154,777 | N/A | £0 | 94.42% | 150 | 3500+ | Y |
| Panasonic | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 67,900 | N/A | £0 | 69.00% | 50 | 1,500+ | Y |
| Rohm | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 55,139 | N/A | £0 | 99.85% | 150 | 3500+ | Y |
| Samsung | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 37,336 | N/A | £0 | 100.00% | 150 | 3500+ | Y |
| Taiyo Yuden | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 6,400 | N/A | £0 | 82% | 50 | 1,500+ | Y |
| TAIYO YUDEN | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 21,540 | N/A | £0 | 99.97% | 150 | 3500+ | Y |
| TDK | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 60,769 | N/A | £0 | 99.20% | 150 | 3500+ | Y |
| TDK | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 25,300 | N/A | £0 | 85.00% | 50 | 1,500+ | Y |
| TE | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 338,106 | N/A | £0 | 79.40% | 150 | 3500+ | Y |
| TT Electronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 32,800 | N/A | £0 | 55% | 50 | 1,500+ | Y |
| United Chemi-Con (UCC) | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 13,900 | N/A | £0 | 99.00% | 50 | 1,500+ | Y |
| Vishay | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 581,798 | N/A | £0 | 87.71% | 150 | 3500+ | Y |
| Vishay | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 119,800 | N/A | £0 | 76% | 50 | 1,500+ | Y |
| Wurth Electronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,500 | N/A | £0 | 63% | 50 | 1,500+ | Y |

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **PASSIVES** (continued) | | | | | | | | | | | |
| WURTH ELECTRONICS INC | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 23,733 | N/A | £0 | 100.00% | 150 | 3500+ | Y |
| Yageo | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 45,300 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| YAGEO | Digi-Key Electronics | 0800 587 0991 | www.digikey.co.uk | Y | 147,833 | N/A | £0 | 84.31% | 150 | 3500+ | Y |
| **POWER & BATTERIES** | | | | | | | | | | | |
| Bel Power Solutions | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,400 | N/A | £0 | 94.00% | 50 | 1,500+ | Y |
| Cincon | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5,500 | N/A | £0 | 60% | 50 | 1,500+ | Y |
| Cosel | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 11,800 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| CUI Inc. | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,900 | N/A | £0 | 100% | 50 | 1,500+ | Y |
| FRIWO Gerätebau GmbH | Haredata Electronics | 01423 796240 | www.haredata.co.uk | Y | 250 - 500 | €1M | £250 | 100% | 7 | 14 | Y |
| Mean Well | Ecopac (UK) Power Ltd | 01844 204420 | www.ecopacpower.co.uk | Y | 6,000 | £2M | £0 | 100% | 8 | 30 | Y |
| Mean Well | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,500 | N/A | £0 | 75% | 50 | 1,500+ | Y |
| Murata | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5,200 | N/A | £0 | 93% | 50 | 1,500+ | Y |
| RECOM | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 23,300 | N/A | £0 | 92% | 50 | 1,500+ | Y |
| Schaffner | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 900 | N/A | £0 | 98% | 50 | 1,500+ | Y |
| SL Power | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,100 | N/A | £0 | 87% | 50 | 1,500+ | Y |
| TDK-Lambda | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 4,600 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| TRACO Power | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 3,400 | N/A | £0 | 95% | 50 | 1,500+ | Y |
| **SENSORS** | | | | | | | | | | | |
| All Sensors | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,300 | N/A | £0 | 70.00% | 50 | 1,500+ | Y |
| ams | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 77% | 50 | 1,500+ | Y |
| Analog Devices Inc. | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 78% | 50 | 1,500+ | Y |
| Bosch | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 94.00% | 50 | 1,500+ | Y |
| Freescale Semiconductor | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,000 | N/A | £0 | 66% | 50 | 1,500+ | Y |
| Honeywell | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 15,500 | N/A | £0 | 80% | 50 | 1,500+ | Y |
| Maxim Integrated | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 900 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| Melexis | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| Omron | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 5,700 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| Sensirion | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| TE Connectivity | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,100 | N/A | £0 | N/A | 50 | 1,500+ | Y |
| **SWITCHES & KEYBOARDS** | | | | | | | | | | | |
| ALPS | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 70.00% | 50 | 1,500+ | Y |
| Apem | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 96% | 50 | 1,500+ | Y |
| C&K Components | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,500 | N/A | £0 | 84% | 50 | 1,500+ | Y |
| Carling Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 300 | N/A | £0 | 87% | 50 | 1,500+ | Y |
| CHERRY | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 200 | N/A | £0 | 77% | 50 | 1,500+ | Y |
| EAO Ltd | EAO Ltd | 01444 236000 | www.eao.co.uk | N | 5,000 | £500,000 | £150 | 100% | 6 | 22 | Y |
| E-Switch | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 94% | 50 | 1,500+ | Y |
| Grayhill | EAO Ltd | 01444 236000 | www.eao.co.uk | Y | 2,300 | £150,000 | £150 | 99% | 6 | 22 | Y |
| Grayhill | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 84.00% | 50 | 1,500+ | Y |
| Honeywell | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 700 | N/A | £0 | 98% | 50 | 1,500+ | Y |
| NKK Switches | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 1,100 | N/A | £0 | 94% | 50 | 1,500+ | Y |
| Omron | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 900 | N/A | £0 | 68% | 50 | 1,500+ | Y |
| TE Connectivity | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 400 | N/A | £0 | 98% | 50 | 1,500+ | Y |

## Buyers' Guide

| Manufacturer | Distributor | Telephone | Website | Franchised Distributor | No. of Lines for Principle | Stock Value for Principle | Minimum Order Value | % Lead Free for Principle Range | No. of Technical Support Staff | Total No. of Staff | Buffer Stock Facility |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **TERMINAL BLOCKS** | | | | | | | | | | | |
| Marathon Special Products | Global Supply Services | 01904 436 488 | www.global-supply-services.com | Y | 8,000 | £800,000 | £100 | 100% | 3 | 11 | Y |
| **THERMAL MANAGEMENT** | | | | | | | | | | | |
| 3m / Laird / Henkel / Brightview / Luminit / Universal Science | Materials direct 247 | 01908 222211 | www.materialsdirect247.com | Y | N/A | N/A | N/A | N/A | N/A | N/A | Y |
| ADDA | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 800 | N/A | £0 | 59.00% | 50 | 1,500+ | Y |
| Delta Electronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 500 | N/A | £0 | 28% | 50 | 1,500+ | Y |
| ebm-papst | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 2,200 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| Sanyo Denki | EAO Ltd | 01444 236000 | www.eao.co.uk | Y | ,300 | £150,000 | £150 | 99% | 6 | 22 | Y |
| Sanyo Denki | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | | 2,900 | N/A | £0 | N/A | | 1,500+ | Y |
| Sunon | G.English Electronics Ltd | 0208 855 0991 | www.gelec.co.uk | Y | 3,500 | £1,000,000+ | £0 | 100% | 10 | 28 | Y |
| Sunon | Thermaco Ltd | 01684 566163 | www.thermaco.co.uk | Y | 3,500 | £230,000 | £100 | 100% | 6 | 12 | Y |
| **TRANSFORMERS & INDUCTORS** | | | | | | | | | | | |
| Best Windings | Best Windings | 0044 (0)1394 448424 | www.bestwindings.co.uk | N | 300 | N/A | £100 | N/A | 2 | 14 | Y |
| **WIRELESS SOLUTIONS** | | | | | | | | | | | |
| Anaren | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 86.00% | 50 | 1,500+ | Y |
| B&B Electronics | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 87% | 50 | 1,500+ | Y |
| Bluegiga Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 93.00% | 50 | 1,500+ | Y |
| Digi International | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 200 | N/A | £0 | 92% | 50 | 1,500+ | Y |
| Laird Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 76% | 50 | 1,500+ | Y |
| Linx Technologies | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 99% | 50 | 1,500+ | Y |
| Microchip | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 85% | 50 | 1,500+ | Y |
| Murata | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 100% | 50 | 1,500+ | Y |
| Panasonic | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 91% | 50 | 1,500+ | Y |
| Redpine Signals | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 94% | 50 | 1,500+ | Y |
| RF Digital | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 100% | 50 | 1,500+ | Y |
| Texas Instruments | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 75% | 50 | 1,500+ | Y |
| Wi2Wi | Mouser Electronics | 0044 (0)1494-467490 | www.mouser.co.uk | Y | 100 | N/A | £0 | 36% | 50 | 1,500+ | Y |

## Contract Manufacturers Buyers' Guide

| Manufacturer | Telephone | Website | Turnover | Location | Employees | Number of Surface Mount Lines | Approvals | BGA Capacity | Lead Free Manufacturer | Prototyping | Design Capability | Full Turnkey | Cables and Harnessing |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AWS Electronics Group | 01782 753200 | www.awselectronicsgroup.com | £40m | UK & Slovakia | 430 | 11 | AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP | Y | Y | Y | Y | Y | Y |
| Axiom Manuf. Services | 01495 242130 | www.axiom-ms.com | £40m | SW | 300 | 3 | ISO9001, AS9100, ISO13485, ISO14001, SC21, IPC610E, BSI Kitemark, NADCAP, ISO27001 | Y | Y | Y | Y | Y | Y |
| Briton EMS Ltd (OSI Electronics) | 01234 266300 | www.britonems.co.uk | £12m | Bedford & Singapore | 100 | 3 | ISO: 9001, 13485, 14001. AS9100. BSI Kitemark IPC610 | Y | Y | Y | Y | Y | Y |
| Challenger Solutions Ltd | 01245 325252 | www.challengersolutions.com | £5m | Essex/SE | 55 | 7 | ISO 9001,14001, UL IPC-610, SC21 | 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 | N | Y | Y | Y | Y | Y |
| Contract Production Limited | 01751 475950 | www.contract-production.co.uk | £1.9m | North Yorkshire | 20 | 2 | ISO9001:2008, IPC-A-610 Class 3 | Y | Y | Y | Y | Y | Y |
| Corintech Ltd | +44 (0)1425 655655 | www.corintech.com | £7.5m | UK | 72 | 3 | AS9100, ISO9001, IPC-A-610 Class 3 | Y | Y | Y | Y | Y | Y |
| CSI EMS Ltd | 01376 500050 | www.csiems.co.uk | £5m | Essex | 50 | 3 | ISO 9001, UL, IPC610 | Y | Y | Y | Y | Y | Y |
| CT Production Ltd | 01202 687633 | www.ctproduction.co.uk | £4.5m | Poole, Dorset | 55 | 3 | ISO9001:2015, AS9100, SC21 Bronze Award | Y | Y | Y | Y | Y | Y |
| Custom Interconnect Ltd | 01264 321321 | www.cil-uk.co.uk | £14m | Andover (Hampshire) | 130 | 6 | ISO 9000, IPC610, ISO 13485 | Y | Y | Y | Y | Y | Y |
| DJ Assembly | 01904 436 456 | www.djassembly.com | £1.25m | North Yorkshire | 15 | 2 | ISO9001:2008, IPC-A-610 Class 3 | Y | Y | Y | Y | Y | Y |

## Contract Manufacturers Buyers' Guide (continued)

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dynamic EMS Ltd | 01383 822911 | www.dynamic-ems.com | £9m | Scotland | 94 | 3 | ATEX, ISO9001:2015, OHSAS18001, IPC-610-F class 3, ISO14001, ISO 13485, UL | Y | Y | Y | Y | Y | Y |
| Electronic Technicians Ltd | 01202 897722 | www.etluk.co.uk | £3.5m | SE | 55 | 2 | AS9100, ISO9001, ISO14001, IPC610/620 Class 3 | Y | Y | Y | Y | Y | Y |
| Elite Electronic Systems Ltd | 028 6632 7172 | www.elitees.com | £20m | UK | 200 | 5 | ISO9001, ISO13485, UL, IPC610/620 Class 3 | Y | Y | Y | Y | Y | Y |
| Esprit Electronics Ltd | 02380 455411 | www.espritelectronics.com | £9m | S/Malaysia | 80 | 4 | ISO9001:2008, IPC610 to Class 3 | Y | Y | Y | Y | Y | Y |
| Exception-Fabrinet | 01249 814081 | www.exceptiongroup.com | £21m | UK/Thailand/US | 210 | 5/31/2 | AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX | Y | Y | Y | Y | Y | Y |
| FermionX Ltd | +44(0)1903 524600 | www.fermionx.com | £5m | Worthing, W. Sussex | 40 | 4 | ISO9001, ISO14001, IPC-A-610 | Y | Y | Y | Y | Y | Y |
| G&B Electronic Designs Ltd | 01420 474188 | www.gandbelectronics.co.uk | £4.2m | Hampshire | 60 | 2 | ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721, BS EN 61340-5-1/2 (ESD) | Y | Y | Y | Y | Y | Y |
| Hallmark Electronics Ltd | 01782 562255 | www.hallmarkelectronics.com | £2m | M | 26 | 2 | ISO9000/UL, IPC610/D | Y | Y | Y | Y | Y | Y |
| Icon Electronics Limited | 01423 798294 | www.iconelectronics.co.uk | £6.5m | Hampshire & Yorkshire | 70 | 6 | AS9100, ISO9001, BS EN ISO/IEC 80079-34:2011 ATEX, IPC-A-610 Class3 | Y | Y | Y | Y | Y | Y |
| Industrial Electonic Wiring Ltd. | +44(0)1793 694033 | www.iew.co.uk | £4.5 m | Swindon, UK | 60 | N/A | ISO9001:2008, IPC610, IPC620 | N | Y | Y | N | Y | Y |
| Jaltek | 01582578170 | jaltek.com | £8m | UK | 80 | 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 |
| JJS Manufacturing | 01455 555500 | www.jjsmanufacturing.com | £23m | M/CZ Republic | 270 | 3 | ISO9001:2008 and IPC610 to Class 3 | Y | Y | Y | Y | Y | Y |
| Lacon Electronic | +44 (0) 7836 338122 | www.lacon.de/en | 50m | Germany/Romania | 500 | 13 | ISO9001, ISO14001, ISO13485, TS16949, OHSAS18001, VG96927, UL | Y | Y | Y | Y | Y | Y |
| Nemco Limited | 01438 346600 | www.nemco.co.uk | £11.25m | SE | 120 | 6 | AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21 | Y | Y | Y | Y | Y | Y |
| NOTE | 01453 797580 | www.note.eu | £100m | UK/EU/China | 1,000 | 14 | ISO9001, 13485, 14001, 18001, IPC-610 Class 3 | Y | Y | Y | Y | Y | Y |
| M-TEK (Assembly) Ltd | 01189 455377 | www.mtek.co.uk | £2.4m | SE | 30 | 4 | ISO9001-2008/IPC-A-610 Class 3/WHMA-620/ISO14001-2004/ IPC-7711/7721 | Y | Y | Y | Y | Y | Y |
| Pektron | 01332 832424 | www.pektron.com | £50m | E-Midlands | 350 | 8 | ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL | Y | Y | Y | Y | Y | Y |
| Protronix EMS | 01582 418490 | www.protronix.co.uk | £2.5m | Luton | 10 | 2 | UKAS ISO9001:2008, IPC-A610 | Y | Y | Y | Y | Y | Y |
| Season Electronics Limited | 02392 452222 | www.seasongroup.com | £5m/£95m | Havant/Global | 65/1800 | 2/18 | (AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites) | Y | Y | Y | Y | Y | Y |
| Sedgewall | 01582 475555 | sedgewall.com | £1.2m | Bedfordshire | 25 | 2 | | Y | Y | Y | Y | Y | Y |
| Simtek EMS Ltd | 01843 233120 | www.simtekems.co.uk | £6m | SE | 60 | 3 | ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711 | Y | Y | Y | Y | Y | Y |
| Speedboard Assembly Services | 01753 746700 | www.speedboard.co.uk | £12.5m | Windsor, SE | 99 | 4 | IPC610 to Class 3, ISO9001:2015 | Y | Y | Y | N | Y | Y |
| Tenkay Electronics Ltd | 01903 855455 | www.tenkay.co.uk | £4.1m | West Sussex | 50 | 1 | ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 | N | Y | N | N | Y | Y |
| TEXCEL TECHNOLOGY PLC | +44(0)1322621700 | www.texceltechnology.com | £12m | SE | 105 | 7 | ISO9001, ISO14001, IPC610 Class 3, | Y | Y | Y | Y | Y | Y |
| Tioga Limited | 01332 360884 | www.tioga.co.uk | £15m | Derby | 110 | 6 | ISO 9001:2015, ISO 13485:2016, IPC 610, IPC 7711/7721 | Y | Y | Y | Y | Y | Y |
| Trojan Electronics Limited | 01792 469020 | www.trojanelectronics.co.uk | £2m | South Wales | 20 | 2 | BS EN ISO 9001 2008, ISO 14001 2007 | Y | Y | Y | Y | Y | Y |
| Wilson Process Systems | 01424 722222 | www.wps.co.uk | £12m | SE | 100 | 4 | ISO9001:2008, IPC-A-610 Class 3 | Y | Y | Y | Y | Y | Y |

## PCB Buyers' Guide

| Manufacturer | Telephone | Website | Service Provided (ie Broker, Manufacture &/or Repair) | Location | Approvals | Volume - Small, Medium, Large | Double-sided | Multi-layer 4-10/10-20-20-30 | Metal PCBs | Flexi / Flexi-Rigid | Obsolescence Solutions | Modifications | Prototyping |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ABL Circuits Ltd | 01462 894312 | www.ablcircuits.co.uk | M | SE | ISO 9001:2008 | SML | Y | 4-10 | Y | Y | Y | Y | Y |
| Cambridge Circuit Company Ltd | 01223 423100 | www.cambridge-circuit.co.uk | M | SE | ISO9001:2015, UL | SML | Y | 4-16 | Y | Y | Y | Y | Y |
| CS Electronics (UK) Ltd | 0116 242 4058 | www.cs-electronic-pcb.co.uk | B | M | UL, ISO 9001, TS16949 | SML | Y | 4-32 | Y | Y | Y | Y | Y |
| Daleba Electronics Ltd | +44(0)1992 510000 | www.daleba.co.uk | B/M | SE | ISO9001:2008, TS, UL | SML | Y | 4-30 | Y | Y | Y | Y | Y |
| DK Thermal Ltd | +44(0)1992 514200 | www.dkthermal.co.uk | M/R | UK, Europe, Asia, USA | UL, ISO9001:2008, TS16949:2009 | SML | Y | N | Y | N | Y | Y | Y |
| GSPK Circuits Ltd | +44(0)1423 321100 | www.gspkcircuits.ltd.uk | M/R | UK, Europe, Asia | BSEN, ISO9001:2008, TS16949:2009, UL, CECC release, Queens Award | SML | Y | 4-16 | Y | Y | Y | Y | Y |
| LEF Circuits | 0116 2891122 | www.lefcircuits.co.uk | M/R | M | ISO 9001:2008, UL | SML | Y | 4-30 | Y | F/R | Y | Y | Y |
| Photronix Group | 01903 231901 | www.photronix.co.uk | B | SE | ISO9001:2008, ISO14001:2004, AS9100-B, NADCAP, TS16949:2002 | SML | Y | 4-58 | Y | F, F/R | Y | Y | Y |
| Prestwick Circuits GPS Ltd | 01294 224631 | www.prestwickgps.com | B | UK, Portugal, China | ISO 9001, ISO-TS16949, AS9100, IPC610 Class II/III, UL | SML | Y | 4-48 | Y | Y | Y | Y | Y |
| Stevenage Circuits Ltd | 01438 761811 | www.stevenagecircuits.co.uk | M/B | UK/China | ISO 9001:2008, ISO 14001, EN9100:2009, UL, JOSCAR | SML | Y | 4-44+ | Y | F, F/R | Y | Y | Y |
| Tate Circuit Industries Ltd | 01889 583627 | www.tatecircuits.com | B | UK/China | ISO 9001:2015, UL | SML | Y | 4-20 | Y | Y | Y | Y | Y |
| Tecbridge Circuits | 0207 993 6503 | www.tecbridgecircuits.co.uk | M Rep. | UK Europe | UL, TS16949(2009), ISO14001(2004), ISO9001(2008) | SML | Y | 4-16 | Y | N | Y | Y | Y |


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