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# editor's word



Front cover – May 2017  
Aerospace: Supplying peace of mind  
page 32

## Brain v brawn

Every now and then I overhear an expert make a comment which triggers my brain into a frenzy of thought. Just such an event happened last week when I was half listening to a radio programme on how robots are going to make many management and white collar jobs redundant over coming years.

In fact, it was two comments. Firstly, it was noted that robot brains are evolving faster than their bodies. Secondly, it was noted that robots regularly land passenger jets but they can't clean toilets.

If this indicates a trend which, as someone occasionally designs robots, I believe it is, I foresee a near future not littered with autonomous robots but cyborgs. I would imagine world demand for toilet cleaners massively exceeds that of pilots. I know it does in my house.

A world in which the inherent dexterity of the human body is augmented with a robot brain is closing in fast. Whether that is a virtual reality headset guiding the user's actions and measuring the results or a computer controlled exoskeleton adding further power, speed or precision, the net result is the same: humans need to get ready for a very different life experience.

Obviously, such innovation is already well under way in the medical and military fields. However, from a user perspective, systems that help a disabled person lead an easier life or a combat soldier stay safe, are somewhat removed from similar systems designed to 'help' people work harder and longer.

I watch with interest to see how humanity reacts.

*Jon Barrett*

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# Bringing the electronics industry together with sport



## View from the Top

Over recent years *Electronics Sourcing* magazine has organised electronics industry football matches at stadiums including the MK Dons, Madejski and AMEX in Brighton. The number of budding players and spectators has steadily grown and, with games played in a respectful yet competitive manner, the events have proven excellent networking opportunities for all.

For 2017, *Electronics Sourcing* is organising a five-a-side tournament at the Sussex FA headquarters in Lancing, Sussex on Thursday 25 May, the same date as the ECSN industry dinner sponsored by G English Electronics.

The tournament is nearly full, with 16 teams competing for bragging rights as the best football team in the electronics industry. With the likes of Rutronik, Farnell, Digi-Key, G English, Princeps Electronics, ISMOSYS, Eclectric Components, Avnet Abacus, Esprit Electronics, Photronix and our own *Electronics Sourcing* team, it's going to be fun!

With a growing list of individuals wanting to play I am working hard to allocate players and hopefully balance the teams: honest.

Readers and advertisers are welcome to attend the tournament. It's free to play or spectate, with refreshments provided by *Electronics Sourcing*.

### Executive penalty shootout

To add to the fun and involve spectators we are encouraging industry executives to take part in a penalty shootout with photographs published in a future issue of *Electronics Sourcing*.

Past professional players will also be playing to assist teams requiring extra players and provide a boost.

In the evening the annual ECSN Dinner, sponsored by G English Electronics, is being held at the Jurys Inn, Brighton seafront. The event starts at 6pm with the UK, European and Global Electronics Industry Components Market Update presented by Aubrey Dunford, market analyst for ECSN/managing partner at Europartners consultants.

At 6.45pm our very own managing editor, Jon Barrett, will host the Industry Panel Discussion where attendees can hear senior industry executives debate topical subjects. The session also provides an opportunity to ask your own questions and present your opinions.

The ECSN Dinner starts at 8pm, followed by Guy Butters (ex Tottenham, Brighton and Portsmouth) auctioning football memorabilia to raise money for the Albion in the Community charity. *Electronics Sourcing* is donating signed football shirts from Tottenham, Southampton, Arsenal, Portsmouth, Brighton and West Ham.

The after-dinner keynote speaker is Steven Fisher, Chairman & CEO of PEI-Genesis, who is flying in from Philadelphia to share his experience, thoughts and overview he has collated since joining PEI Genesis back in 1973. I witnessed Steven speak at an electronics industry conference in Chicago some years ago where he provided an inspiring insight into the challenges he has navigated over the years.

Dinner tickets can be ordered from ECSN at [enquiries@ecsn-uk.org](mailto:enquiries@ecsn-uk.org) or by calling 01763 274748.

I look forward to seeing as many electronics industry colleagues at the football tournament in Lancing and the ECSN dinner. It's great to be involved in bringing the electronics industry together with sport.

Mark Leary  
Publisher

Location: Lancing Stadium, BN15 9AX  
Time: 10am to 3pm



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## Put RF support to the test

Development distributor, Premier Farnell, has announced a global distribution agreement with manufacturer of precision radio frequency and microwave interconnect products, EAM. Under its ConductRF brand, EAM offers interconnect products operating from DC to 110GHz for use in demanding industries including defence, aerospace, industrial, medical infrastructure and instrumentation and test.

Under the agreement, buyers will have access to an extensive range of ConductRF solutions for RF and microwave test applications from DC to 70GHz. Among the new products stocked is the TESTeCON series of lab test cables, including low loss TSA74 versions.

Global head of test, tools and production supplies at Premier Farnell, James McGregor, added: "The expansion of the wireless industrial internet is a major growth opportunity for 2017 and beyond." [www.premierfarnell.com](http://www.premierfarnell.com)



## Core ferrite offering expanded

Gateway Electronic Components has signed an agreement with specialist ferrite manufacturer, Ferroxcube, ensuring it offers a broad profile of ferrite cores and accessories. Gateway will support its extensive UK stock profile with local sales, customer service and technical support, as well as core gapping and machining services.

The new agreement is part of the company's strategy to build on its ferrite and magnetic lines from TDK, Fair-Rite and Magnetics, which will now be complemented by over 300 Ferroxcube cores, bobbins and accessories.

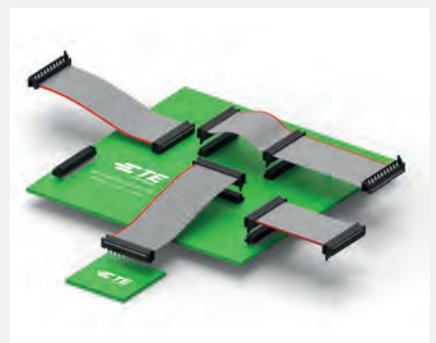
Managing director of Gateway Electronic Components, Martin Ford, said: "Gateway has a growing reputation in the ferrite sector and this will provide customers with the resource they need to increase stock availability and reduce their vendor base. Our new dedicated ferrite and magnetics website augments our expertise in this sector."

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

## More glow wire choice

RS Components has augmented its portfolio of connector products from TE Connectivity with more than 180 products from some of the most popular TE families. Several of the new connectivity devices are manufactured from 'glow wire' materials, which meet electrical safety tests required by the IEC/EN60335-1 standard. This makes them suitable for equipment in the European market, especially household appliances, but also for applications such as HVAC equipment, lighting systems, security systems and industrial controls.

Highlights of the latest additions include the glow wire compliant universal Mate-n-Lok connector housings, which have a 6.35mm-centreline pitch and offer a finger-proof egg-crate design for improved safety. Also the Val-u-Lok connector housing range, which has been expanded with



devices accommodating terminal position assurance and once again meeting glow wire standards.

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

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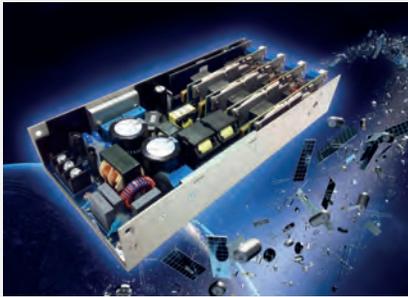
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## Powerful support for specialist markets

Excelsys Technologies has added Luso Electronics to its distributor network. Luso will distribute Excelsys power solutions throughout the UK in a variety of specialist markets including military, industrial, medical and communications.

European sales manager, Excelsys Technologies, Conor Duffy, said: "We are delighted to have Luso join our European distribution partner program. Luso has a fantastic reputation in the UK built on technical expertise and operational excellence. Luso will support all Excelsys platforms including Xgen, UltiMod, Xsolo and our recently launched CoolX series fan-less, convection cooled modular platform."

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



## Backing new ways of working

Independent distributor, Azego, has purchased its previously rented premises plus an additional neighbouring building, with the support of a £612,000 commercial mortgage loan from HSBC. The purchase has expanded Azego's warehouse and provided an opportunity to introduce new ways of working, including a more effective quality inspection process.

As part of the investment, Azego has hired five new employees and expects to hire additional members of staff in the future.

HSBC's area director of business banking in the Thames Valley, Ian Nash, said: "Azego has an impressive industrial client base and this latest investment will allow the business to continue to provide a quality service to its customers."

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



## Safety certified caps target EV market

Knowles brand, Syfer, has increased its range of 250V AC X1/Y2 safety certified capacitors to 10nF. This responds to demands in the automotive sector where multilayer ceramic capacitors used in control electronics are using different voltage ratings and component sizes, thanks to the rise in plug-in hybrid electric vehicles and electric vehicle on-board charging systems where mains AC is involved.

Available in a 2220 case size, these X7R dielectric capacitors are designed to achieve greater total capacitance on the board, or piece part count reduction. For example, they can take the place of two 4.7nF X1/Y2 capacitors connected in parallel, thereby reducing component count, size and weight.

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

## Agreement addresses frequency demands

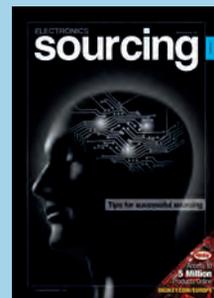
Taitien quartz monitor crystals and oscillators are now available worldwide through Digi-Key Electronics following a global distribution agreement. This will enhance access to Taitien's portfolio of frequency control products including precision OCXOs, TCXOs and VCXOs suitable for demanding applications including industrial, automotive, cellular infrastructure and networking.

Distribution manager, North America, at Taitien, Jordan Wohl, said: "Digi-Key will maintain an extensive inventory that includes a variety of part numbers across the Taitien product portfolio. With Taitien's precision frequency control products and Digi-Key's web presence, we can reach more customers, with more products, than ever before. Engineers will be able to access a broader range of products for prototyping and purchasers can more quickly access our products in production quantities."

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# Start *small* to achieve *big* on sustainability

Recent steps in the sustainability movement are aimed at taking smaller companies, even startups, along for the ride. Here are five key steps to getting started

Supply Chain Sustainability • By Victoria Kickham

**S**ustainable procurement is gaining steam; the profile of corporate social responsibility issues is increasing and there's a growing list of guidelines, standards and regulations that address economic and environmental issues. You might think that it's purely the domain of the largest companies in the electronics supply channel. Think again.

Recent steps in the sustainability movement are aimed at taking smaller companies, even startups, along for the ride. The International Standards Organization's new ISO 20400 sustainability standard is a case in point, as it seeks to create a common language for sustainable purchasing, placing the issue on a more level playing field. What's more, industry experts emphasize that sustainable procurement is a journey with many steps along the way, some of which are easier to implement in small organizations.

Senior analyst with sustainability firm Eco Vadis, Peter Rau, commented: "Just because the overall challenge of addressing sustainability is large, doesn't mean small companies can't get started."

Sustainable procurement essentially aims to minimize a company's impact on the environment, while also addressing human rights and contributing positively to society and the economy. Implementing an SP program requires time and money, but there are simple steps companies can take to get started. What's more, small companies, especially startups, have some key advantages when it comes to the initial hurdles of implementing SP.

## Vision and strategy

The first step is developing a sustainable procurement mission statement, which requires top management support and buy-in. This is often easier in small organizations because there is less red tape. Company leaders should first identify relevant sustainability issues for their industry and then find opportunities to act on them. Product disposal and recycling are good examples.

Rau explained: "Identify what customers care about. This is critical and more do-able for small companies in terms of setting that vision and strategy."

## Organization and leadership

The next step is determining who will own the SP initiative. This is another issue that is easier to tackle on a small scale because it may fall to someone who already has a leadership role in the organization. Rau added: "Getting people's input should be easier in a small business because everyone has a stake in the game."

## External communication

This involves establishing a supplier code of conduct and communicating it to partners. It's a big task, but one that is manageable if done from the outset, making it easier for startups, especially, to incorporate as they build partnerships.

Rau said: "Make sure suppliers understand why sustainability is important for you as their customer. It can even be integrated into request for proposal documents or contracts with suppliers."

Early efforts help build better programs from the customer side as well. Rau commented: "Especially with small companies that may have strong relationships with a few key customers, this can open the door to good partnerships and is another way to differentiate yourself from the pack."

## Monitoring and reporting

The final two steps, monitoring and reporting, are the most difficult aspects of implementing SP in small organizations because they require the largest investment in time and money. But as Rau explains, this should not preclude small firms from starting their SP journey. After all, a thoroughly sustainable supply chain is a goal for organizations of all sizes; it really is a journey with many steps and stages along the way.

“Sustainable procurement essentially aims to minimize a company's impact on the environment.”



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

# On-line shop gets an RF boost

**Lane Electronics' on-line store now includes a variety of radio frequency interconnection products from connectivity specialist, Huber + Suhner. Most products in the new lineup are available with same day shipment**

With connectivity solutions for electrical and optical products and systems across most major sectors, Huber + Suhner's products are supplied into a variety of markets including datacoms, communications, transportation and industrial. Its RF products are designed to be used in various high performance RF applications and include miniature, sub-miniature and microminiature connectors. The company also offers cable assemblies, including microwave and coaxial, as well as antennas and lightning and electromagnetic pulse protection devices.

In the Lane Electronics on-line store, there are many Huber + Suhner connector types and formats available including SMA, SMB, SMC, SMS and SK.

The store also includes Huber + Suhner's RF test and measurement offering which consists of a wide-ranging portfolio of test leads, adaptors, terminations, attenuators and test kits.

With today's frequency measurements getting ever higher, Huber + Suhner aims to provide the best solution for any given application since it makes both the cable and connector. Solutions include microwave test cables up to 50GHz, coaxial and electromagnetic compatibility test leads, several adaptor types including coaxial and phase matched, coaxial terminations and attenuators and a variety of test kits. Also available in the FC Lane store is a selection of coaxial cable assemblies supplied in standard lengths from stock.

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Many Huber + Suhner connector types and formats are available in the on-line store



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# Counting the cost of supply chain disruption

***Ineffective supply chain management leaves organisations open to severe disruptions and can incur high financial costs as a result***

A report published by the Business Continuity Institute and supported by Zurich Insurance Group found that one in three organisations experienced cumulative losses of over €1 million during the last year thanks to supply chain disruptions.

The report showed that, despite a decrease in the percentage of organisations who experienced disruption, down from 74 to 70 per cent, those organisations that did suffer disruptions, suffered more of them; the percentage of organisations that experienced at least eleven

disruptions during the year increased from seven to 22 per cent.

Unfortunately, the cost of disruption also increased, and this can be attributed to greater productivity losses, the cost of working and damage to brand or

Nick Wildgoose, Global supply chain product leader at Zurich Insurance Group



More than ever, it is important to focus on supply chains, identify areas of risk and deploy appropriate arrangements that increase resilience



reputation, all as a result of supply chain disruptions. Most worrying of all, 43 per cent of organisations do not insure these losses, meaning they are bearing the full brunt of the cost themselves.

**Maintain visibility**

Arguably, one of the reasons for the greater number of disruptions, is that fewer organisations are maintaining adequate visibility over their supply chain; the percentage of organisations that do so has decreased from 72 per cent in 2015 to 66 per cent. This could have major consequences when it comes to managing the supply chain and ensuring that disruptions are minimised.

According to the report, supply chain visibility remains one of the biggest challenges, with increased dependency between suppliers and downstream organisations reinforcing the need for businesses to understand their supply chain in more depth, identify key suppliers and improve disruption reporting.

Top management commitment is required to drive supply chain resilience and performance. The findings affirm how leadership input can significantly influence good practice and help build appropriate culture and structure.

**Prime suspects**

The report highlights some interesting findings, revealing that 41 per cent of disruptions occur with the immediate supplier, compared to 50 per cent last year. Only 60 per cent of respondents, however, report that they analyse the source of disruption.

When it comes to pinpointing the cause of disruption, unplanned IT and telecommunications outage remain the top reason for disruption, with loss of talent or skills moving up to second place from sixth in 2015. Other top five causes were listed as outsourcer failure, transport network disruption and cyber-attacks or data breaches.

What are the consequences of all this disruption? The top five consequences were listed as loss of productivity, increased cost of working, customer complaints, an impaired service outcome and damage to reputation or brand.

Perhaps of most concern, however, is the fact that only a little over a quarter of respondents report high top management commitment to supply chain resilience. This is a worrying decrease from 33 per cent last year.

**Business continuity**

Author of the report, senior research associate at the BCI, Patrick Alcantara, commented: “Our study reinforces observations about the growing cost of supply chain disruptions and its negative impact on an organisation’s reputation. More than ever, it is important to focus on supply chains, identify areas of risk and deploy appropriate arrangements that increase resilience. Business continuity has an essential role to play in this. Our research abundantly shows how business continuity professionals, working with their supply chain counterparts, can build supply chain resilience and direct management efforts in this area.”

Currently, just under three quarters of those questioned report that they have business continuity arrangements in place to deal with supply chain disruptions.

Global supply chain product leader at Zurich Insurance Group, Nick Wildgoose, concluded: “Adequate supply chain resilience is a prerequisite for improving organisational performance. You need senior management support to achieve this, in terms of breaking down the organisational silos and providing appropriate resources. The businesses that invested in this area have recognised there is a compelling business case to do this and are seeing the benefits.”

[www.thebci.org](http://www.thebci.org)

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# Distributor design assistance can reduce cost for OEMs

Most distributors provide some level of design help to OEM customers, ranging from maintaining data-rich websites filled with data sheets and reference designs to offering customers full-blown design services *By James Carbone*

Electronics purchasers at many OEMs often do business with a select few preferred distributors that carry the product lines the buyer needs and provide supply-chain and value-added services that can reduce cost and risk.

However, some buyers are also factoring in the design expertise and design services a distributor offers in determining which distributors will be preferred. Many OEMs are operating leaner and have smaller engineering staffs and lack the in-house expertise concerning certain technologies. They may need help in determining the most technically fit part for a new design or require assistance in designing a board for a new product.

In many cases, distributors can provide such assistance. Most distributors have robust websites chock full of data sheets and other technical information about components and technologies. Others have field application engineers (FAEs) or component engineers, who can suggest solutions to technical issues on the phone or on-site at the customer's facility. Some distributors also offer technical training for customers on certain technologies and product families. A few offer a full-fledged design service and can do turnkey design for an OEM customer.

Many distributors say they are seeing more demand for design expertise from customers. Murdoch Fitzgerald, vice president of semiconductor marketing at Arrow Electronics, said Arrow is "seeing more opportunities today to help customers with a truly comprehensive design and go-to-market solution." He added customers expect more than they did 10 years ago concerning design support.

In the past, "we may have helped to integrate a handful of cutting-edge hardware components into a new product design." However, today customers are involving Arrow very early in the design stage and the distributor's role in design and other aspects of some customers' businesses has expanded.

"We help identify design efficiencies up front and handle all of the hardware and software design, wireless connectivity, cloud integration and even the contract manufacturing and go-to-market logistics" said Fitzgerald.

He said OEM customers are also looking for more "localized engineering and training support. Customers don't want to talk to someone half way around the world. They want a hands-on experience with someone experienced and familiar with the design," said Fitzgerald.

"Future's Advanced Engineering Group serves as an extension to our customers' engineering team, and can provide a full engineering solution for any of their designs," said Todd Baker, corporate vice president, engineering for Future Electronics



## FAE co-location

FAEs are part of that support. "We often co-locate an experienced Arrow FAE on-site to help a customer soup-to-nuts with the design and production process," said Fitzgerald. The FAEs provide customers with assistance in solid-state lighting, power, passives, electromechanical devices and connectors, industrial IoT and other key areas, he said. Arrow has FAEs in 95 countries, according to Fitzgerald.

In addition to FAEs, Arrow offers turnkey board-design services, and extensive board-level support in smaller packaging and low-power requirements. "We also employ dedicated FPGA and ASIC experts who can help with a full spectrum of services from writing RTL to full test and layout capabilities to complex system on chips," said Fitzgerald. He added Arrow supports customers with online reference designs and data sheets so engineers can get answers to technical questions quickly.

Todd Baker, corporate vice president, engineering for Future Electronics, said customers need different levels of technical support. Future offers a "multitiered design services support structure," he said. For instance, Future's Advanced Engineering Group serves as an "extension to our customers' engineering team, and can provide a full engineering solution for any of their designs," said Baker. Future has system design centers around the world that offer full system design, taking ideas from inception to full production, he said.

Future also has specialist engineering teams that provide expertise on networking, RF design, displays, lighting, FPGAs, or analog design.

Future, like other major distributors, offer customers technical training sessions concerning certain technologies and products to help engineers learn and develop early designs.

“Customers get hands on experience with the products we represent, and build a foundational knowledge of how those products can be designed in their own applications,” said Baker. Future rotates the training sessions through “key markets to bring our customers quickly up to speed on the latest processor, microcontroller, FPGA, or wireless solutions,” he said.

He said startup customers and well-established OEMs look for such training as well as design assistance and services. Many of them need help with wireless design and cloud connectivity.

Avnet also offers training on certain technologies and provides FAE support for customers, but also offers fee-based design services.

“Our traditional field application engineer (FAE) model, allows us to provide design assistance on both our suppliers’ products, as well as general system architecture and overall solution development,” said Jim Beneke, vice president, global technical marketing for Avnet. FAE assistance is typically included as part of Avnet’s overall customer service.

He said Avnet’s FAEs provide basic product training for customers, keeping them up to date on technologies and products. “In addition, we provide tools and platform training for MCU, MPU, FPGA, and SoC development, said Beneke. “We will also offer workshops based on certain technologies such as power supply design, wireless connectivity and specific application such as IoT, embedded vision and software defined radio among others,” he said.

#### Fee for service

Avnet provides other design services for a fee. “We do this through our design services groups in both the Americas and Asia, and can offer a range of services including board design, FPGA design, PCB layout, PCB simulation, embedded software development, certification assistance and turnkey production,” said Beneke.

“Arrow is seeing more opportunities today to help customers with a truly comprehensive design and go-to-market solution,” said Murdoch Fitzgerald, vice president of semiconductor marketing at Arrow Electronics



Beneke said startups and established OEMs are looking for design support. Many startup companies come to Avnet for “full turnkey approach to design. Some customers approach us looking for the customization of existing boards, like Raspberry Pi, where they need minor changes followed by production support,” he said.

Baker said customers of all kinds need design assistance and services because of the “growing complexity of what’s being designed.” Boards and systems have more functions and capabilities than in the past and “are being pushed in terms of performance and power efficiency,” he said.

Designs involving multi-GHz serial interfaces, multi-GHz sample speeds, multi-core CPUs, various wireless connectivity standards, Linux (open source software), complex sensors are “stretching the knowledge base of OEM design teams. “This requires a much broader range of skills that

many customers either don’t have, or don’t have enough of,” said Baker. As a result, they need help from outside parties, including distributors.

Passives, electromechanical and connector specialist TTI does not offer design services, but often plays a role in component selection for many customers.

“Many customers used to have a function in-house called component engineering,” said Michael Knight, senior vice president, Americas for TTI. One role of the component engineer would be to identify a problem part on a bill of material (BOM) and find an alternative from a different manufacturer.

“Today distribution plays the role of a component engineer,” said Knight. “At TTI, we have component engineers on staff who our sales team calls in to help their customers.”

Component engineers are degreed, experienced engineers, but differ

from FAEs in that they do not travel. “Instead, they use on-line tools coupled with the phone,” said Knight. “It is very cost and time effective and gives them hands-on access to reference material to quickly get the sales team and their customers the information that they need,” he said.

Knight added that TTI will soon launch a BOM analysis tool that Mouser has developed and will also use to assist their customers with component evaluation.

“The tool will analyze an uploaded BOM and AVL to find hot spots and offer alternative solutions,” said Knight.” A hot spot could be a manufacturer’s part number that has gone, or is about to go, obsolete, or a part with a particularly long lead time because of a current supply issue,” he said.

“This tool will be just as useful to the design engineer who has to do some preliminary evaluation of the price and availability of the components he or she is selecting for the project they are working on,” he said.

#### What’s your question?

Randall Restle, vice president of applications engineering for Digi-Key, said the distributor does not offer design services, but has “scores of technical people that are available to answer questions. Such questions range from the difference in beryllium copper versus gold on a contact to which new microprocessor is a good fit for a particular design,” he said.

He said most of the questions that Digi-Key receives are not about semiconductors, but about connectors. Power suppliers are the second most asked about product followed by semiconductors.

He said there could be more questions about connectors because data sheets on connectors are often just a technical drawing and don’t have as much detailed information as semiconductors may have.

“Our traditional field application engineer (FAE) model, allows us to provide design assistance on both our suppliers’ products, as well as general system architecture and overall solution development,” said Jim Beneke, vice president, global technical marketing for Avnet





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## Connectors

# Get to grips with rugged connectors

**Director of engineering at Fischer Connectors, David Cianciolo, answers the questions most frequently raised by buyers when specifying rugged connections**



**Q** What types of rugged connectors are available?

**A** Fibre optic, power, signal and hybrid are all available. In fact, most commercial-grade functions, including connectors for small air or water lines, can be designed for a rugged environment. You can select an off-the-shelf solution, or modify existing connectors. Most manufacturers who focus on rugged connectors can also work with you to develop a custom connector for a specific application.

**Q** What role do IP ratings play?

**A** Ingress protection ratings measure the level of protection against dust, dirt and water. Look for IP68 ratings or above for true waterproof connectors. Most IP designations have specific conditions, but IP68 ratings can be defined differently by each manufacturer, so be sure to ask what the rating represents. There is a big difference between an IP68 rating of two hours at 20m and an IP68 rating of 24 hours at 120m. You also want to understand whether the IP rating relates to the connectors in a mated or unmated condition.

**Q** Where do I get cable assemblies for my rugged connector?

**A** Rugged connectors need to have equally rugged cable assemblies to work in tough environments. Medical device manufacturers, for example, often look for silicone cables with low-friction coatings. Very few OEMs attempt to make cable assemblies in-house. Instead, most turn to a speciality cable assembly provider, or to their connector manufacturer, to recommend specific cables, overmoulds and assemblies that will create a rugged interconnect solution.

**Q** What type of lead time do I need for my rugged connector?

**A** Like any other product, lead times will vary, based on what you order. Popular-sized connectors are often available off-the-shelf and can be ordered quickly. Creating a custom connector unique to your application could take 12 to 16 weeks. Modifying an existing connector design falls somewhere in between. The best connector solutions are specified early in the design process so you have time to select the right size and weight connector for your application, possibly allowing you to build a smaller, lighter device.

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# Connector package fuels motorsport development

**Specialist supplier, Lane Motorsport, has introduced a new ultra-miniature 8STA circular connector along with a package of accessories designed to combine weight and space savings with high performance**

According to distributor, Lane Motorsport, Souriau's new 01 8STA connector boasts a 20 per cent saving in size and weight over the popular size 02 series. Despite these reductions, it still maintains all the size 02 performance advantages, including anti-vibration features and resistance to motorsport fluids.

In fact, these size 01 connectors can accommodate three removable size 26 contacts, handling wires

from 24 to 30AWG. Other key features include seven colour-coded orientations, PCB options and a boot termination feature. For even greater weight saving, Lane Motorsport also offers a single flange version.

To maximise the potential of these tiny connectors, Lane Motorsport has put together an interconnection package featuring a range of compatible accessories from HellermannTyton and Weald Electronics. This includes

protective caps, gaskets, nut plates and heat shrink boots, as well as all the assembly tools needed to complete the application.

As an example, Weald Electronics' aluminium protective caps feature an anti-vibration locking design and are said to be about 50 per cent lighter than standard size 02 caps. They are available in 14 sizes and can be supplied with a flexible, stainless steel micro wire rope lanyard.



Motorsport connectors feature an anti-vibration design and resistance to motorsport fluids

HellermannTyton's size 01 heat shrink boots are also part of the package. Supplied in straight and 90deg versions, these heat-shrinkable, strain relieving boots for backshell to cable transitions are adhesive lined and made from fuel-proof material. They are offered in standard and elevated temperature variants.

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# Plug in to space savings

**DIN rail mounting terminal blocks from CamdenBoss are designed to simplify installation and save valuable PCB real estate inside the enclosure**

With the growth of electronics and electrical applications using DIN rail mounting systems, the need for inventive interconnection solutions is greater than ever. As such, interconnection and enclosures specialist, CamdenBoss, has launched a new range of rising clamp DIN rail mounting terminal blocks designed to provide quick and effective pluggable connections into DIN rail enclosures, while also saving PCB real estate inside the enclosure.

Traditionally, connections to units mounted on a DIN rail would be made using PCB mounted terminal blocks or by DIN rail mounted terminations. In systems where connections are made to DIN rail systems that require periodic disconnection, such as for replacement, maintenance or updating purposes, this has previously required PCB or chassis mounted pluggable terminal blocks to be housed within the DIN rail enclosure, eating into precious space and PCB real estate.

### Flexible installation

The advantage of using DIN rail mounting terminal blocks is that customers can make connections independently of the various DIN rail units within a given system. As well as giving installers the flexibility to place the DIN rail terminal blocks anywhere on the rail, CamdenBoss's new range also possesses another distinctive feature: the ability to unclip and reverse the orientation of the terminal block if necessary. This means that the installation can be rearranged for easier access once complete. This can be particularly advantageous during field installations and ensures that easy access is retained, even in the most cramped applications, or if units are added later.

Fitting terminal blocks to the DIN rail is designed to be straightforward: two mounting adaptors are clipped into place where required and the terminal block clips onto these with a positive click. Reversing the terminal block is said to be equally simple: by applying

pressure to the two clips, the terminal block can be removed by sliding upwards.

The CamdenBoss CTBPD96 range of DIN rail mounting terminal blocks is available in 5.0 and 5.08mm pitch versions, in both flanged and non-flanged options from six to 24-poles. Both vertically and horizontally-oriented versions are available and the DIN rail mount is compatible with both 35mm top hat and 32mm G-rail as standard.

Applications include lighting controllers, building management systems, energy management, power supplies, heating and air conditioning controllers, civil and industrial electrical installations and telecommunications.

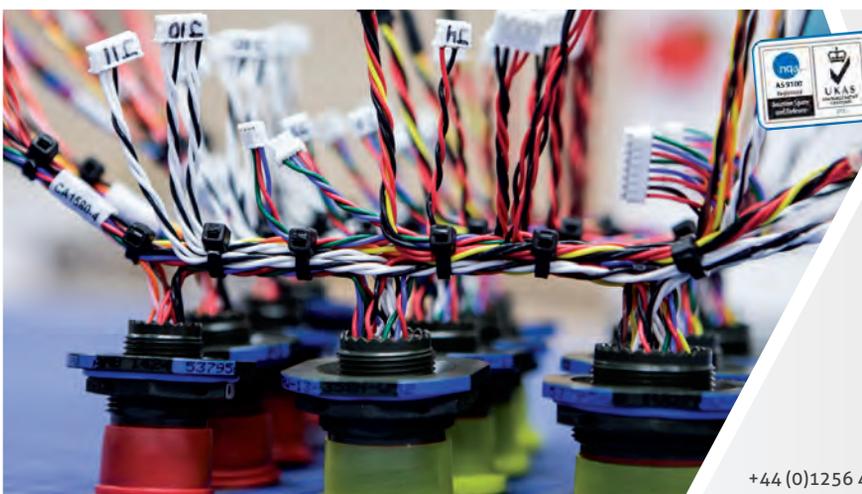
To complete the picture, CamdenBoss also offers a range of associated ancillary components for DIN rail applications including pluggable terminal blocks to match the DIN rail mounted connectors and a range of DIN rail mounted enclosures.

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



DIN rail mounting terminal blocks from CamdenBoss save precious enclosure space

**CamdenBoss's new range also possesses another distinctive feature: the ability to unclip and reverse the orientation of the terminal block if necessary**



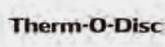
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# When does mil-spec matter?

**Connector specialist, ECCO, offers advice on determining whether to specify military standard parts or commercial equivalents**

Authorised distributor, ECCO, is often asked when is it appropriate to specify MIL-STD or mil-spec products over commercial counterparts? There are various factors to consider in situations where both types are an option, as well as assessing the worst-case situations that can occur.

Military standard connectors are those approved for use by the US Department of Defense, following rigorous standards regarding factors such as interoperability and reliability. Nowadays, MIL-STD, or MS connectors, are also used in aerospace, industrial, marine and even commercial automotive applications.

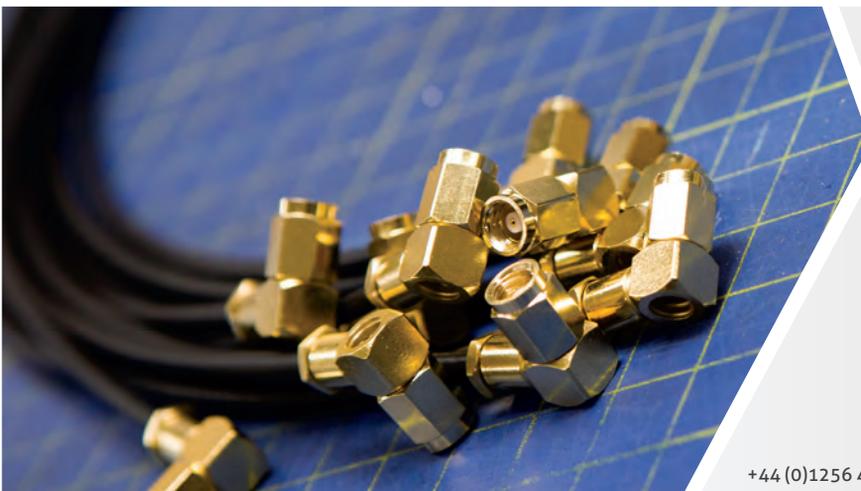
Commercial counterparts are often made of the same materials, sometimes they even come off the same production line at the same factory. If this is the case, pricing should be similar, however, supply

and demand may dictate variances in the pricing of either part. Where supply is limited, for example, the market price for a commercial part could be higher than its MS cousin.

Often, however, commercial equivalent connectors are justifiably cheaper, due to material changes, such as contacts with less gold content. Lower material costs mean a lower price for the end customer and if the commercial part is produced at a separate factory with lower labour costs, this could also result in a lower final price.

Bearing this in mind, there may be good reasons for specifying a commercial part, particularly where cost is an issue and there is no MS requirement from the end customer. But, when it comes to deciding on MS versus commercial equivalents, what criteria should be used to inform that decision? ►►

**Commercial counterparts are often made of the same materials, sometimes they even come off the same production line at the same factory. If this is the case, pricing should be similar, however, supply and demand may dictate variances in the pricing of either part**



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## Connectors

**Establish whether availability is a prime consideration. There is often a plethora of military style products on a distributor's shelves and sometimes not as much of the commercial equivalents**

► **Informed decisions**

Primarily, it depends on whether the end customer demands MS approved connectors. If they do, buyers need only determine which brands to evaluate and place on print, bearing in mind it's always wise to put two options down.

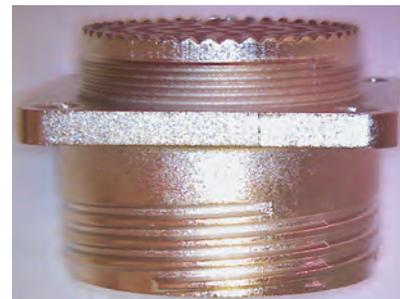
If the customer can use either product, determine if the application can withstand the relaxed technical specifications of a commercial equivalent. Find out whether the specs listed are a result of material, process, or labour aspects of the commercial equivalent connector.

Pricing must also be considered, so get quotes on both the commercial and MS approved parts and determine if the market for supply and demand is driving commercial pricing higher than MS style.

Some buyers may be faced with an existing supplier approvals strategy that dictates their vendor choices. Find out who has demonstrated supply success in that connector category and consult with other stakeholders such as production, engineering and product management to verify there is support for a given supplier.

Finally, establish whether availability is a prime consideration. There is often a plethora of military style products on a distributor's shelves and sometimes not as much of the commercial equivalents. As a note, many authorised value-added connector assemblers can dual mark a part as commercial or mil spec, which offers greater sourcing flexibility. Speaking to a connector assembler that is on the qualified product list can help with advice and expertise throughout the process.

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## Waterproof coaxial range extended

GradConn has extended its Nautilus range with a new IP rated coaxial connector. The new Nautilus N connector promises greater flexibility for those requiring sealed coaxial connections in demanding and harsh environments.

The N variant is available in rear mount configuration and shares all the Nautilus features including an internal seal and O-ring, which prevents ingress through the inner contact and through the panel, rated to IP67 and IP68. Although larger than SMA, TNC and BNC variants, it is also stronger and more suitable for designs where durability is an important consideration.

Sales manager, Andy Hamlin, said: "We saw increasing demand to enhance the already tough Nautilus range which prompted us to engineer one of our strongest coaxial connectors to date. Adding the N connector not only gives customers more options, it also opens up a bigger market segment we can serve with reliable, waterproof coaxial connector and cable assemblies."

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



## Eliminate accidental disconnection

Mega Electronics has introduced a new locking rewirable C13 IEC connector. The Lock Rewireable connector is designed to guard against accidental disconnection of computers, power distribution units, servers and most network devices. Benefits are said to include ease of use, as well as low smoke zero halogen compatibility.

Connectors in the range combine a high-visibility locking mechanism and a simple release mechanism for disconnection from all sides. Ideal as a retrofit solution, it requires no other equipment or special inlets. The red cage release mechanism also marks the connector out from standard IEC leads to allow maintenance and other data centre staff to identify critical power sources.

A slim design means it can be implemented in areas where access is limited, while its LSZH attribute is crucial for applications in military, broadcast, transportation and data centres.

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# Wise up to smart factory changes

**Driven by the growth in smart factories, where modular machinery is the norm, Harting's Brian Coyle suggests that the industrial connector is undergoing a fundamental transformation**

The classic industrial connector is in the process of evolving into an Industry 4.0 component. Driven by the growth of the smart factory, dramatic changes are underway, resulting in the modularisation of machines and plants. Connector manufacturers are responding with new features and consequently modular connectors are becoming the backbone of the smart factory.

Most of these changes have been brought about by the increasing demand for modularisation. Unlike installation technology, which is driven by machinery manufacturers, modularisation is a user-initiated change brought about by the need for flexibility. Specifically, plant operators want to configure their plant in the simplest way. Instead of relying on an automation expert or a maintenance engineer, the operator wants a simple 'plug and produce' system. This in turn has a fundamental impact on the connector, since it becomes an integral part of a smart infrastructure.

### Industrial evolution

Between 1950 and 1980, centralisation was a key driver. The introduction of electric drives in machinery made it necessary to supply equipment with power as well as control. These control and power supply functions were combined in a central switch cabinet, which was later used for the programmable logic controller. Industrial connectors made it possible

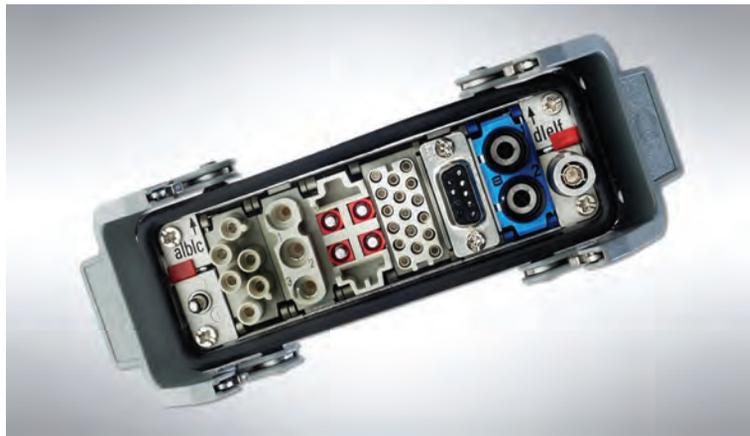
to separate the switch cabinet and the mechanical areas of the machine, which offered significant benefits including rapid installation and reduced errors compared to hard wiring.

From around 1980 to 2010 factories moved through a process of decentralisation. The introduction of fieldbus systems meant it was no longer necessary to connect all signals directly to the switch cabinet. Sensor data could be collected remotely and actuators could also be switched on remotely. This resulted in a decentralised configuration which was characterised not only by IP67 devices on one side, but also by decentralised, smaller switch cabinets on the other. The Han-Modular connector family, which was invented to transfer data, power and signals to these distributed switch cabinets, does so in a pluggable manner, leading to some key benefits: simple installation and extended machine lifecycles.

### Smart transformation

Looking to the future, it's clear that smart factories will be much more capable of transformation than today's factories thanks to modularisation. Modular connectivity with standardised interfaces is essential and modules require full data, power and signal capabilities.

Naturally, when a connector is no longer part of the installation, but becomes the standardised infrastructure interface, the demands



on that connector are magnified. In a smart factory there is no traditional commissioning process that ends with a standard system configuration. In principle, a smart factory is either continuously commissioned over and over, or reconfigured, even during operation. The new configuration should be produced easily and securely and must be supported by integrated management.

Since the addition and replacement of a module always implies the insertion of a connector, connectors are taking on a new central position. The Han-Modular connector system, for example, is endowed with features for docking and undocking, functionality for high-uptime, active locking, visualisation and communication. These features support the inevitable development of the connector from a passive installation device into a smart infrastructure component.

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The Han-Modular connector system is supplied with full data, power and signal capabilities

Modular connectors are the backbone of the smart factory





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# Get connected with industrial expertise

**Distributor, Rhopoint Components, has enhanced its industrial offering and expanded its expertise by becoming an authorised supplier of Weidmüller products in the UK**

As a global supplier of precision electronic components and sensors with more than 40 years' experience, Rhopoint Components boasts a very high level of field and internal technical support for all its product ranges, backed by an efficient stocking and distribution operation. The company takes pride in the fact that its level of product knowledge is the same as that of its manufacturing partners, enabling customers to get

quick answers to technical and design-in questions.

Supported by this expertise, Rhopoint is delighted to announce that it has been appointed as authorised distributor for Weidmüller in the UK. Weidmüller provides its customers and partners around the world with products, solutions and services in the industrial environment of power, signal and data. Naturally, it is committed to always providing the best

connections possible and developing these in close cooperation with customers, to meet all the requirements of their specific environment.

Application-based products in the Weidmüller range include PCB terminals and connectors, through-panel terminals and electronics housings for industrial applications, with emphasis on signal processing and power electronics. As a pioneering provider of device connectivity and housings,

Weidmüller, in partnership with Rhopoint Components, supports the entire design-in process with deep-rooted application expertise and a proven know-how in finding solutions. Its global design-in support provides the perfect connection between products and services.

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# Fast track programming brings flexibility within reach

**Authorised distributor, SE Spezial-Electronic, has introduced a 24-hour programming service for SiTime's MEMS oscillators, ensuring more buyers have access to this flexible, high precision technology**

Micro electromechanical system-based oscillators are no longer a niche product. Due to their technical and economic advantages, they continue to conquer many markets previously dominated by quartz-based components. Products from SiTime are already popular as high-precision timers for telecom and network applications, or as AEC-Q-100 qualified oscillators in automotive safety integrity level applications. The demand for MEMS-based oscillators has been increasing for some time.

Now, authorised distributor, SE Spezial-Electronic, offers an in-house 24-hour programming service for all standard SiTime MEMS oscillator families. Buyers can select component specifications online in a new e-shop and the programmed components will be delivered 24-hours after receipt of order.

Vice president marketing and sales at SE Spezial-Electronic, Rolf Aschhoff, commented: "One reason for the increasing acceptance is that MEMS oscillators offer, apart from their technical values, an additional advantage of individual programming. The use of standard semiconductor processes and packaging guarantee an almost unlimited availability and extremely short lead times, especially if components are programmed close to the customer."

At present, up to 3,000 components per hour can be programmed and taped, with a choice of eight component series and four frame sizes.

Rolf concluded: "Our supply reliability and drastically reduced delivery times will soon induce even more potential users in favour of MEMS oscillators."

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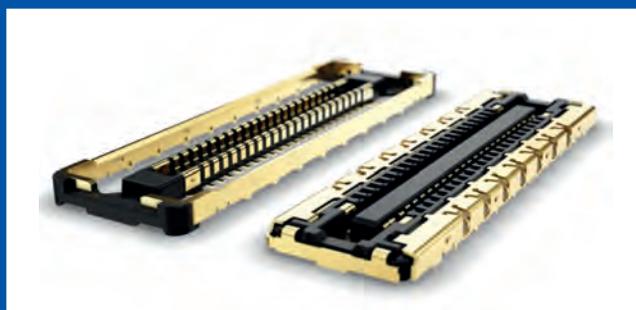
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## Stackable connectors underpin high data rates

Astute Electronics is now stocking Novastack board-to-board and board-to-flexible printed circuit connectors from its franchise, I-PEX. This Dai-ichi Seiko company designs and manufactures small form factor precision connectors for high speed and high frequency applications.

The Novastack 35-HDP, for example, is a fully shielded, board-to-FPC connector with a mated height of 0.75mm on a 0.35mm pitch which includes four 2.2A power contacts. Available with 42 or 56-signal pins, the connector supports data rates of 20Gbps. It is designed to facilitate data transfer in accordance with international standards such as USB3.1, PCIE Gen three and four, USB Thunderbolt 3 and EDP HBR 3. It also features 360deg shielding with multiple grounding, enabling connectors to be placed closer to noise sources such as antennas.

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



## Enhanced connector selection

Anglia has substantially expanded its offering from Taicom with 700 new connector products from this manufacturer including new board to board, wire to board, USB and RJ connectors with built in magnetics for Ethernet and wide area network applications. The full portfolio is featured online and the distributor is also publishing a new 136-page connector selection guide giving details of both new and established parts.

Within the selection guide there are several new connector ranges, many of which are direct alternatives to popular industry standard connectors. In total, the Taicom range stocked by Anglia includes over 500 series of connectors covering more than 7,000 line items.

The new guide includes a website reference code for each product range. When typed into the search bar on Anglia Live, this allows quick access to live inventory, pricing and datasheet information. [www.anglia-live.com](http://www.anglia-live.com)



## Distribution blocks simplify panel building

Switchtec has introduced Arnocanali's range of distribution blocks, designed to distribute incoming power to smaller or numerous cables within a panel. They are said to reduce installation time and keep cable usage to a minimum, providing time and cost savings over traditional methods.

Aimed at OEMs, CEMs, panel builders, equipment manufacturers and machine builders, these DIN rail mountable distribution blocks can also be used in building management control panels.

The range comprises a variety of products, from the single pole BKB series to the multi-pole BD series.

Arnocanali can be used to establish an electromechanical connection between large cross-section, high current carrying cables with one or more smaller cross-section wires. This makes it possible to manage multiple load connections and a range of cable and wire sizes. They also provide the facility to interlock multiple blocks side by side, forming a compact design layout that saves space in control panels.

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



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### Ensure robust data connections

Phoenix Contact is extending its range of robust data connections with new device panel mounting frames. The one-piece panel mounting frames from the push-pull Advance series are made from die-cast zinc for the connection of RJ45 or SC-RJ connectors of the same series. Thanks to IP65/67 protection and continuous shield connection, the panel mounting frames are ideal for industrial use. An extensive range of mounting accessories enables adjustment to various conditions, such as deep housing sections or angled cable outlets

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



### New home for PV connectors

MC4 solar power connectors are now part of the Stäubli Electrical Connectors brand. These photovoltaic units were branded as Multi-Contact before the company's change of name earlier this year and in fact, more than one billion MC4 family connectors have been installed worldwide over the past 20 years, often operating in the harshest of environments.

Snap-fit MC4 units are suitable for cable cross-sections from 1.5 to 10mm<sup>2</sup> and are rated for currents up to 45A. Resistance to UV, ammonia and salt spray enables the IP68 rated devices to operate in harsh environments.

The latest addition to the MC4 range is the MC4-Evo2, which boasts a high voltage rating of up to 1,500V DC, such that solar power operators can benefit from longer cable strings when linking solar fields. It also has a current carrying capacity of up to 69A and a streamlined design said to improve heat dissipation.

[www.staubli.com/electrical](http://www.staubli.com/electrical)



### Delivering end-to-end automation connectivity

Bulgin has launched a new range of industrial automation components designed to offer flexible connectivity for a variety of rugged automation applications. The M-series includes a range of sizes and pin configurations, from three to 19-pins, and is designed for use in industries requiring exceptionally reliable and robust connections, from automotive production and machine building to food and beverage processing.

A variety of connector types and keying options are available, including A-, B- and D-coded configurations. In addition to straight and right-angled field installable versions, Bulgin's M5, M8 and M12 variants also offer PVC/PUR overmoulded cable options to provide end-to-end automation connectivity for almost any situation.

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



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[ip67.schurter.com](http://ip67.schurter.com)



## Aerospace

### Connector supplies power in harsh environments

Schurter has introduced a new waterproof IEC connector consisting of an appliance inlet type 4761 and a rewirable cord connector type 4762. With a protection rating of IP67, or IP69K connected or unconnected with cover, this appliance coupler can be used to supply power to appliances in harsh environments such as industrial, marine, laboratories or in outdoor appliances.

The push/pull locking system is designed to provide a reliable connection, yet at the same time ensures a break-away cable in the event of overdue stress. For ease of use, the shape and color of the pull-out mechanism indicate the pull-out direction and a clear catch sound is heard upon the seated connection. Although similar to IEC and UL/CSA 60320

standard connectors, Schurter's new offering is distinguished by a special contact arrangement that won't interchange with conventional power cords.

Both components are said to be easy to terminate. The inlet 4761 is available with solder or quick connect terminals, while the connector is equipped with conventional screw terminals, so no special tools are necessary for wire assembly.

Connectors can be temporarily submerged in water and can be cleaned with high-pressure hot water. Accessory covers are available for both plug parts, providing waterproofing and protection against pollutants.

[schurter.co.uk](http://schurter.co.uk)

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Commercial director of Texcel, Peter Shawyer

# Supplying peace of mind to the aerospace industry

**Safety and performance are critical in the aerospace industry. Contract electronics manufacturers must therefore meet exceptionally demanding criteria, as commercial director of Texcel, Peter Shawyer, explains**

Electronic products manufactured for the aerospace, defence and security industries need to be resilient and robust since they must perform in extremely harsh environments and withstand extreme mechanical and environmental stresses. In the aerospace industry specifically, safety and performance are critical. As a result, the requirements for contract electronics manufacturers supplying into this industry are often more demanding than other vertical markets.

**Focus on components**  
The aerospace industry requires the use of high performance components and where military specification components are available, these are often mandated. Component traceability is invariably required for products supplied into this vertical market. The CEM should therefore keep a complete audit trail of components used in any

given sub-assembly or finished product and there should be processes in place to manage this.

Counterfeit component prevention is also vital. A CEM will need to show that it has the relevant processes in place to prevent the procurement or use of counterfeit components. To manage this well, it needs to have company-wide procedures that involve supply chain management, purchasing and test and inspection.

Aerospace OEMs will need to be satisfied that the CEM can demonstrate its business operates sufficiently rigorous quality and inspection processes for the products it manufactures. This will often involve a factory visit and audit by the original equipment manufacturer.

**Ensure technical ability**  
The range of products supplied into the aerospace industry are wide and varied.

Consequently, OEMs will look for a CEM that has sufficient in-house technical expertise to contribute to product design and propose alternatives where applicable. Design for manufacture will also come into play here and OEMs will evaluate the depth of technical expertise available.

In addition to the standard approvals, such as ISO9001 and ISO 14001, there are a series of additional approvals that apply to the aerospace industry. These include J-STD-001, Class III IPC, ITAR and AS9100C. The AS9100 standard is a globally recognised standard that was designed specifically for the aerospace and defence industry. It covers component quality and traceability, manufacturing processes and systems in place in the manufacturing organisation.

For a CEM to make and supply products into the aerospace industry, there is significant upfront investment



It's nearly 90 years since the Wright brothers made their first flight

required to ensure it has all the requisite approvals and processes in place. There is also considerable additional overhead involved in ensuring ongoing compliance. This is really a strategic decision for CEMs and sometimes it takes a project opportunity to act as the tipping point to jump through all the necessary hoops to qualify as an approved vendor. Once approved, there also needs to be well-planned business development in this sector to ensure a good return on the investment.

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# Quality keeps marine projects afloat

**Price isn't always a deal breaker, says Esprit Electronics' sales director, Russell Otter. Sometimes quality and reliability are the top priority, especially in the marine industry**

In a world of disposable items, the importance of reliable, high-quality electronics manufacturing can get side-lined, but there are many industries where well-built, robust technology is essential, and the marine industry is one of them.

As a provider of turnkey manufacture and test solutions to the marine sector, Esprit Electronics appreciates that potential customers in this area also care about service levels,

quality and reliability. It's a market that requires robust technology that can withstand the most challenging environments.

That's why manufacturer of ultrasonic thickness gauges, Cygnus Instruments, chose Esprit to provide PCB manufacture and in-circuit test solutions for its Cygnus Dive product.

The robust Cygnus Dive is a wrist-mountable underwater ultrasonic thickness gauge,

designed to give users a free hand during challenging underwater operation.

Featuring a large, bright colour display, it can perform metal thickness measurements at depths of up to 300m, even in poor visibility. The gauge employs multiple measuring modes for variety of applications including metal thickness and corrosion checks on offshore structures and pipelines, safety inspections on bridges and ship classification surveys.



Cygnus Dive is a wrist-mountable underwater ultrasonic thickness gauge

Purchasing manager of Cygnus Instruments, Wayne Brown, said: "From customer support and response times, through to testing and product quality, it's reassuring to partner with a contract electronics manufacturer that you can rely on to deliver a first class service."

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# Reversal of fortune for chip buyers: average prices for microcontrollers will rise

After declining for years, prices for MCUs will increase despite robust demand

By James Carbone

The days of declining average selling prices for microcontrollers (MCU) is over as tags for MCUs will increase over the next four years despite growing demand.

The average price for MCUs, including 4- 8- 16- and 32-bit devices, will increase 2 per cent in 2017 after rising 8 per cent in 2016, according to researcher IC Insights. The average MCU price will rise 3 per cent in 2018, 4 per cent in 2019, and 1 per cent in 2020, the researcher said.

The increase in microcontroller tags is a big change for the MCU market, especially the 32-bit segment. From 2006 to 2015 the average 32-bit MCU price declined 17 per cent per year from \$5 in 2006 to \$0.92 in 2015, said IC Insights.

"Prices had been coming down hard and heavy," said Rob Lineback, senior market analyst with IC Insights. "Thirty-two-bit MCU average selling prices had been falling so much that they took down average prices for all microcontrollers. It has been so dramatic," said Lineback. However, 32-bit prices are now rising. In 2016, the average price for a 32-bit MCU increased 18 per cent to \$1.09 and the price will continue to rise over the next several years, he said.

Lineback noted that the 32-bit segment is the largest microcontroller segment and will account for 60 per cent of total MCU revenue and 43 per cent of units in 2017.

Price increases coupled with increased MCU unit shipments mean healthy revenue growth for the microcontroller market through 2021. Global MCU revenue will increase from \$17.5 billion in 2016 to \$18.8 billion in 2017, a 7 per cent increase. The MCU market will continue to grow through 2021 when revenue will total \$25.1 billion, said IC Insights.

#### Exponential growth

"Business has been great," said Punya Prakash, product line manager of the SimpleLink MSP432 MCU business for Texas Instruments. "It's very strong. We've seen almost exponential growth in the 32-bit side of the business and continue to gain share with 16-bit microcontrollers, but the growth of 32-bit is much larger," she said.

Much of the growth is coming from the automotive and industrial markets and with the Internet of Things. "We don't view Internet of Things as a market. We see it as an enabler," said Prakash. She noted that there are expected to be 30 billion connected devices by 2020 and most of the devices will need MCUs to connect to the Internet.

She noted that automotive is driving MCU business because electronics content in vehicles continues to rise and more vehicles are being connected to the Internet. Automotive is a "very sustained market" with long lifecycles, said Prakash. It uses 8-, 16- and 32-bit MCUs, although 32-bit is the fastest growing segment, she said.

In fact, much of the growth in MCUs is due to increased demand for 32-bit microcontrollers, which have been "going like gangbusters," said Lineback. One reason for robust demand for 32-bit MCUs is that the average price for the device fell to below \$1.00 two years ago, Lineback said the drop of the average price to \$1.00 was "kind of a psychological point" when a lot of companies decided to use 32-bit parts rather than 8-bit.

"Suppliers had been trying hard to get the price down for 32-bit to basically the level of 8-bit," said Lineback. Because the price fell to below \$1.00, 32-bit MCUs started to be designed into applications that had used 8-bit microcontrollers.

"There are 16-bit microcontrollers, but they are different animals," said Lineback. "They have a lot of the signal processing. Sixteen is more specialized and 8- and 32-bit are more general purpose," said Lineback.

Thirty-bit prices increased because of growing demand and because 32-bit MCUs offer more value and function in a smaller package.

#### Strong growth in automotive

While MCU demand is growing across virtually all customer segments, it is especially strong in automotive. Automakers have long used MCUs for engine control, antilock brakes, power steering and seating and airbags among others functions.

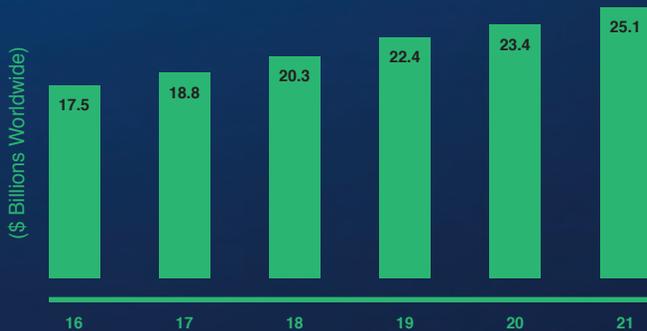
## By The Numbers

Source: IC Insights



## MCU market to reach it \$25.1 billion by 2021

Rising prices and healthy demand will result in steady revenue growth for microcontrollers through 2021 Source: IC Insights



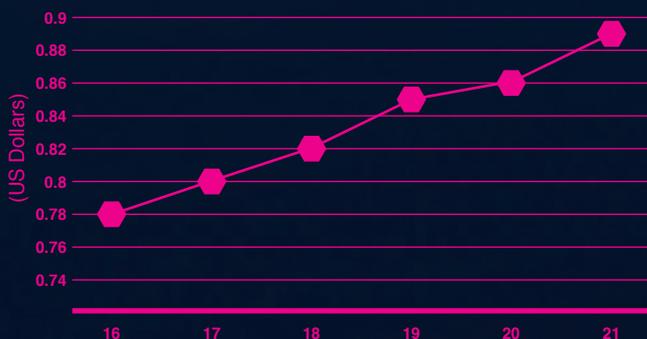
## Unit shipments growth steadily

Microcontroller unit shipments will post single-digit growth through 2021 Source: IC Insights



## Microcontroller average prices to rise

The average price of microcontrollers will increase as more higher functioning 32-bit MCUs ship Source: IC Insights



But now they are also needed in sophisticated safety features including advanced driver assistance systems (ADAS). ADAS improve safety by warning drivers if there is a vehicle that has crossed the center line or if there is a stalled vehicle down the road. Other features include blind spot detection, surround view cameras, lane change warning, automated braking and lighting and lane change warning, all which require microcontrollers. MCUs are used in infotainment systems and in many cases, provide connectivity to the vehicle network. MCUs are also used in vehicle features such as touch-screen controls, advance environmental controls and keyless entry. Electric cars and hybrids are also helping drive microcontroller use.

The industrial segment, including factory automation, is also using more microcontrollers as more equipment is being connected to the Internet. "Many systems already have a microcontroller doing embedded control or measurement," said Lineback. But now more MCUs are being used for Internet connectivity.

In some applications MCUs are competing with processors, system-on-a-chip devices which are more specialized and "sometimes more powerful," said Lineback.

However, he said MCUs have an advantage because they are better suited for a lot of embedded functions and are more code efficient. "The program code is on chip whereas in a lot of the system-on-chip processors don't have the program. That is one of the distinctions between the two," said Lineback.

He noted that Intel has started to use the x86 microprocessor architecture in microcontrollers. The x86 architecture has traditionally been used for PC processors.

"They have been introducing some microcontrollers or at least they have been calling them that," said Lineback.

However, with 32-bit MCUs, ARM-based microcontrollers dominate the market. About 77 per cent of 32-bit MCUs are based on the ARM architecture, he said.

### Enough competition and capacity?

With MCU demand growing and prices increasing, some in the supply chain are concerned that there may not be enough capacity and competition in the MCU market.

In fact, there has been consolidation in the microcontroller manufacturer ranks. In recent years, NXP acquired Freescale and now QUALCOMM is buying NXP. Renesas acquired Intersil and Microchip Technologies bought Atmel.

Despite consolidation, the MCU market remains competitive, according to Lineback. He noted that Intel, the leading provider of microprocessors and the biggest semiconductor manufacturer in the world, has invested in microcontrollers. In fact, Intel had been the biggest manufacturer of microcontrollers years ago, but decided to focus more on microprocessors for computers, said Lineback.

Computer sales have slowed so "they are trying to get back into microcontrollers. Their interest is really in embedded processing or connected system with MCUs and system-on-a-chip processors as well," he said. "Intel wants to be an Internet of Things company connecting systems," said Lineback.

"The question is how successful will they be," said Lineback. "They will be competing against ARM and Intel has not been able to compete very well with ARM on anything else" including smartphones. "Intel gained market share with tablets just as tablets were dying," said Lineback.

# Fan choice helps products last longer

**Heat is a killer for electronic systems; selecting the right fan helps ensure reliable operation and avoid premature failure, explains Aerco's product director of fans, Jason Slaughter**

The demand for more performance in a smaller space is inexorable. Yet higher operating speeds and higher equipment

density lead to increased heat, which can be damaging unless dispersed effectively. Selecting the correct fan to keep rack-mounted

equipment at a regulated temperature is therefore vital as it ensures reliable operation and avoids premature failures.

Within the enclosures market, there is a trend for customers seeking energy efficient solutions to move away from AC fans in favour of electronically commutated products. Essentially, these products comprise a fan with a brushless DC motor and speed control. In combination with better aerodynamics and improved bearing design, they can achieve enhanced performance, using less power and with less noise.

To select the correct fan, it is important to consider: air flow requirement and efficiency, available aperture size, acoustic noise, system power consumption and required service life. With answers to these questions it should be possible to prevent overheating while still selecting a fan that does not significantly add to the overall system cost.

To help buyers achieve this balance in industries such as aerospace, defence, medical and industrial, Aerco partners with various manufacturers of fans and blowers including ADDA, Comair Rotron, Delta, NMB, Etri, Jamicon, Sofasco and Torin-Sifan. A technical service is available to advise on the best products for application and budget and Aerco can also modify fans and filters in-house to suit customers' needs.



ADDA's GP series fans boast high airflow against high system pressure

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**Selecting the correct fan to keep rack-mounted equipment at a regulated temperature is vital as it ensures reliable operation and avoids premature failures**

**Optimise airflow**

Recent additions include several innovative products, including one designed to provide high airflow at a competitive price. Measuring 172 by 51mm, and with a maximum airflow capability of 103l/s, the Sofasco D17051V12-HBL axial fan is suitable for cooling many types of enclosures. This rugged fan features a die-cast aluminium frame, a plastic impeller and a high performance dual ball-bearing system. Applications include UPS systems, commercial refrigeration units and other demanding applications in the military aviation, aerospace, medical, telecommunication and commercial sectors.

Also offering airflow up to 103l/s, ADDA's GP series fans claim to offer high airflow against high

system pressure, thanks to an efficient venturi design combined with a 12,000rpm motor. Seven frame sizes and three supply voltages give 30 different combinations for design flexibility. This series also boasts a quality ball bearing system, said to result in minimum power consumption and low operating noise levels.

Finally, for energy savings, low vibration and low noise, Delta offers a range of products based on DC brushless fan technology for enclosed equipment. Its AFB axial fans offer airflows from six up to 290CFM and in sizes from 40 by 40mm to 172 by 172mm. Delta also offers a new line of EC fans which are eco-friendly and use DC technology in AC format for AC applications.

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# Circuit specialists invest in tomorrow's high flyers

***In a bid to jet propel the engineers of the future, Cambridge Circuit Company is collaborating on a variety of student projects, including a spaceflight program at Cambridge University***

Centred on the Cambridge Science Park, the UK's Silicon Fen is home to more than 1,500 tech firms, making it Europe's largest technology cluster. Since Cambridge University established the science park in 1970, the cluster has mushroomed, generating annual revenues of more than £13 billion. To ensure it continues to thrive, UK companies are encouraged to invest in student projects. One company following this example is Cambridge Circuit

Company, located adjacent to Cambridge Science Park.

Cambridge Circuit Company director, Guy Sanford, said: "We support projects including Cambridge University Spaceflight and Cambridge University Eco Racing. We help hone their prototype designs, offer tours to see their PCBs in production and provide top quality products quickly. By investing in students, they see what we offer and take that knowledge into the

workplace, often returning as customers once they've secured employment after graduating."

CUSF avionics lead, Adam Greig, said: "We're constantly trying to push the edge of what a student group can accomplish and that's impossible without support from corporate sponsors. Our latest rocket avionics project involves twelve stacked PCBs. Cambridge Circuit Company's support in producing high quality PCBs at short lead

times has been essential in hitting our deadlines, especially when we make last minute changes or spin new revisions."

CUER electrical team leader, Zi Koon Pong, added: "We benefit from reliable PCBs with quick turnaround times, which is key considering the amount of rapid prototyping we do. We're extremely grateful to have Cambridge Circuit Company on board."

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



CUSF's latest rocket avionics project involves twelve stacked PCBs

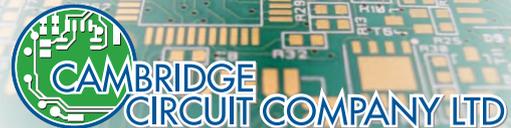
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## More subrack choices offer greater protection

Verotec's KM6 subrack family is designed to offer versatility, with three different systems available. Front panels, compatible with all KM6 versions, are a critical building block. They include: unshielded to IEC 60297, shielded to IEEE 1101.10 and one dedicated to the VXI architecture. Two and four rail modules, which can be fitted with top, bottom and side covers are available in 3U and 6U heights, 160 and 220mm depths and a range of widths from 10 to 42HP.

Iridite NCP conductive finish extruded shielded panels are fitted with a double swipe stainless steel EMC gasket. They are available as blank filler panels, with a fixed pull handle or with an improved injector/ejector latching handle said to generate greater insertion and extraction force for high pin count backplane connectors. Shielded panels are available in 3U, 6U and 9U heights and 4, 5, 6, 8, 10 and 12HP widths as standard.

Unshielded versions are available as blank panels or with pull handles in 3U and 6U heights and widths from 2HP to 84HP. Both types are available either with both faces anodised and plastic screw mounting bushes or, where electrical conductivity with the subrack frame is required, with an anodised front face, an iridite NCP rear face and metal fixing bushes.

For VXI systems, single and double width C and D size modules are available. Shielded panels in a heavy-duty extrusion that accepts beryllium copper shielding fingers are also available in 6U and 9U heights and 6HP and 12HP widths.

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



## Low light camera optimizes face detection

Specialist distributor, L2Tek, is now offering the SeeCam\_30, an ultra-low light camera solution optimised for evening and daylight use in surveillance, face detection, in-car security and near-infrared imaging applications. The SeeCam\_30 was developed by e-con Systems using an AR0330 CMOS image sensor from ON Semiconductor and USB 3.1 type C Gen 1 interface connector.

Also available from L2Tek, the See3Cam\_30 is a colour camera with S-mount lens holder featuring a 3.4MP autofocus USB video class compliant camera and a Varioptic liquid lens. It can run using a generic camera software driver rather than utilising a driver installed in the host PC. According to L2Tek, The See3CAM\_30 colour liquid lens consumes less power than traditional VCM based auto focus solutions, which can reduce the need to manage extra heat during operation. With no mechanical movement for autofocus the life of the lens is also increased.

[www.l2tek.co.uk](http://www.l2tek.co.uk)

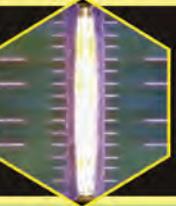
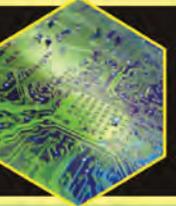


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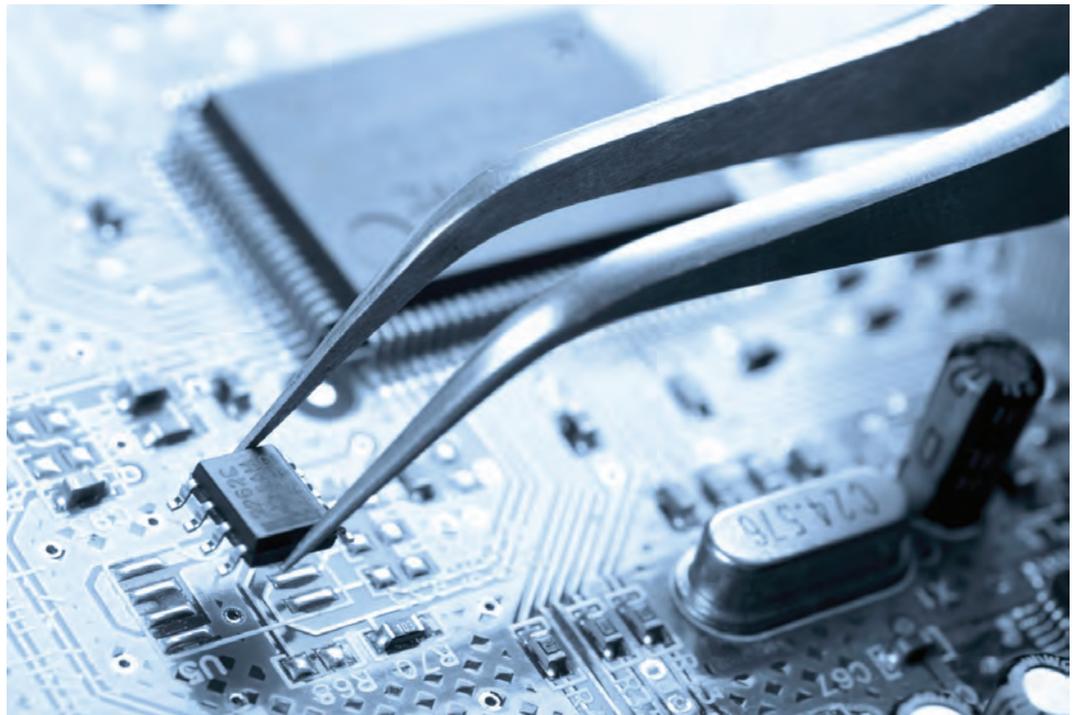
# Getting the most out of outsourcing

***For those considering outsourcing, printed circuit board assembly is the logical first step, but does this go far enough? JJS Manufacturing explains how extended outsourcing can pay dividends***

Outsourcing printed circuit board assembly frees up time to focus on designing, marketing and selling products. Instead of handling this process in-house, an electronics manufacturing services provider can take care of this manufacturing operation for you.

PCBA is generally accepted as the safest entry point when outsourcing electronics manufacturing. Broadly speaking, the process is well-defined and there are numerous suppliers that focus specifically on this service. Original equipment manufacturers stand to enjoy far greater benefits, however, by handing over more responsibility to an assembly partner. While this can be a daunting prospect for first timers, there are advantages to going that bit further.

**Outsourcing PCB assembly**  
The first stage of outsourcing PCBA is to pass responsibility to an EMS supplier for obtaining the materials specified on your bill of materials. As part of this you will need to verify the quality of the EMS provider's supply chain and check what measures are in place to safeguard against faulty and counterfeit materials. Your partner will then work to ensure that the relevant components can be consistently sourced and will liaise with their suppliers to put stocking agreements in place. Once these supply chain elements are complete, your partner will assemble your PCBA.



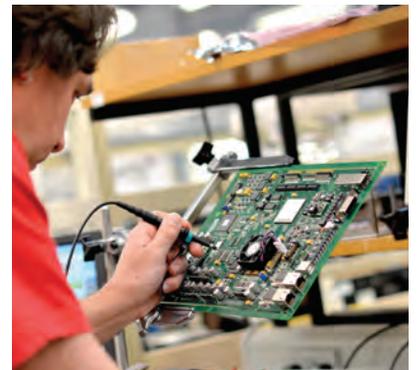
So far, so good: by outsourcing PCB assembly, OEMs can free up time and resources, however, PCBA is just one component within a final product. There is still a lot of work to do once your EMS partner has delivered the completed boards.

Firstly, you still need to source and purchase any custom or drawn items, plus a range of other materials, taking steps to verify the supply chain and inspect purchases. Secondly, you will need to retain several operators to complete the final assembly, along with the associated equipment, tools and documentation. While the PCBA may have been tested by the EMS supplier

using in-circuit test or flying probe, the final assembly will still need to undergo thorough testing. Finally, you remain responsible for shipment involving storage, picking, packing, processing and arranging couriers, all of which require a lot of resources and time. Which raises the question: how much time has your company really gained?

In many ways, outsourcing just the PCBA is no less laborious than outsourcing the entire product. In both cases, a lengthy process is required to choose the right partner that can produce quality products, on time and to exacting specifications. It therefore often makes sense

PCBA is generally accepted as the safest entry point when outsourcing electronics manufacturing



Consider the bigger picture when researching potential partners

## The extent to which you intend to outsource can significantly impact your choice of EMS provider

to outsource your manufacturing in its entirety, rather than just one element. Clearly this requires greater trust, but the resulting benefits should not be underestimated.

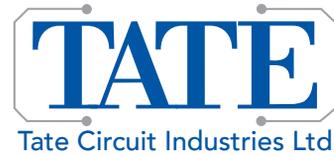
### Choosing an EMS partner

The extent to which you intend to outsource can significantly impact your choice of EMS provider. As many suppliers focus solely on PCB assembly, this could unintentionally narrow your potential list of partners by focusing your search purely around this service. This can be problematic further down the line if you decide, for example, that you want to outsource more of your manufacturing, test and outbound logistics. At this point,

there are two options: work with two EMS suppliers simultaneously, or change supplier. Neither is ideal. The first means cultivating two relationships and the second means effectively starting your outsourcing journey from the beginning.

So, if you do decide to dip your toe into the outsourcing waters by starting with just PCBA, it may be wise to consider the bigger picture when researching potential partners. You need to be confident that they will be able to support your immediate requirements as well as those that might arise in the future.

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# Automakers turn to EMS providers to build high-tech electronics systems

**Strategic buyers need to qualify contract manufacturers skilled in computer production that can build products to stringent automotive standards** By James Carbone

Over the past 20 years outsourcing to electronics manufacturing services (EMS) providers has been an integral strategy for electronics OEMs in the computer, telecommunications, industrial equipment and consumer electronics industries.

Purchasers involved in outsourcing decisions at electronics OEMs often help choose which EMS providers their company should use and how many contract manufacturers their companies should have. Now strategic buyers in the auto industry are being entrusted with similar responsibilities as more carmakers and their key tier 1 suppliers are outsourcing production to EMS providers.

Dan Panzica, chief analyst, outsourced manufacturing intelligence service for IHS Markit Technology, said that while the percentage of EMS business from the auto industry is relatively small, it is growing as more high-tech, computer-like systems such as infotainment systems are being installed in vehicles. Panzica said about 6 per cent of EMS revenue is derived from the automotive industry. Ten years ago, automotive accounted for about 1-2 per cent of EMS sales, said Panzica.

In addition, automotive EMS revenue will rise at a compound annual growth rate of 7 per cent through 2021, while total EMS revenue will increase about 2 per cent through the period, he said. "Automotive is the fastest-growing EMS segment," said Panzica.

Of course, some EMS providers such as Foxconn, Flextronics, and Jabil Circuit have been involved in the auto industry for years. For instance, Jabil's first customers were automotive OEMs when the EMS provider was founded in 1966. Jabil manufactured for Johnson Controls, Webasto and General Motors Co. and automotive has grown into a major focus for the St. Petersburg, Fla., -based company.

"Jabil's automotive group is a strategic growth area for the company," said Lisa Bahash, senior vice president automotive and transportation audio systems. "Jabil builds 'automotive certified high-quality printed circuit board assemblies, electronic modules and end-items to OEMs and tier 1 suppliers around the world," she said. The boards and modules are used in a variety of systems, including engine control, battery management systems, in-car entertainment systems, multimedia in-dash

systems and hands-free cellular communication among others.

**Transitioning to automotive** Now, some EMS providers that have serviced the computer industry are also building products for automakers. One recent example is Pegatron, based in Taiwan.

Pegatron was recently tapped by automaker Tesla to make control computers for Tesla's Model 3 electric vehicle which is expected to go into production and ship to customers later this year. "And the reason Pegatron was chosen is the EMS provider cut its teeth in notebooks, tablets and all-in-one computer production," said Panzica. "If you look at the in-dash infotainment system the same manufacturing technology involved in the computer industry is applied to the automotive infotainment system so it is a natural," he said.

With shipments of notebooks and tablets decreasing, Pegatron can "fill the factories with the assembly of the infotainment systems" to help make up for sluggish computer manufacturing demand, said Panzica.

Switching from manufacturing desktops and notebooks to making control computers and infotainment systems for

Some EMS providers that have serviced the computer industry are also building products for automakers

vehicles “is not very disruptive to the factory. It’s more of what they are already doing with tablets and PCs,” said Panzica.

He said many EMS providers build camera modules for other industries and now such modules are also being built for the auto industry as more cars are equipped with cameras.

Panzica said EMS providers build subsystems for the auto industry and some are vertically integrated which is useful in servicing the auto industry. “For example, with infotainment systems there’s printed circuit boards, stamped sheet metal, displays, touch-screen technology, connectors and wires” that are assembled and shipped by the EMS provider.

### The perfect manufacturer

EMS business in the auto industry is growing because automakers and their tier 1 suppliers are discovering EMS manufacturing capabilities. They realize that EMS companies are “very good at assembling the type of electronics” that carmakers need, said Panzica. EMS companies have perfected the manufacturing of computers and cell phones and now that technology is being used in vehicles, he said.

In addition, EMS providers “can do it at better cost than tier ones,” said Panzica. At the same time, the computer manufacturing capacity of EMS providers is underutilised because of sluggish growth in the computer industry so “you have EMS companies that are hungry to build things and are very capable of doing so. It’s a combination of all that” which is driving automotive EMS growth, said Panzica.

While automotive is an opportunity for the EMS industry, it is also a challenge because automotive requirements are more rigorous than most other industries in terms of quality, reliability and traceability of parts, said Panzica.

“The requirements are more stringent than computer. They are more comparable to medical,” said Panzica. He said manufacturers must meet the TS16949 specification, an ISO standard aimed at the development of a quality management system that

provides for continuous quality improvement, defect prevention and reduction of variation and waste in the supply chain.

Automotive has “unique requirements in terms of supplier quality management and production part approval process (PPAP) and logistics vs. other segments,” said Lisa Bahash, senior vice president, automotive and transportation audio systems.

PPAP is used in the auto industry to show that a component supplier has developed a design and production process that meet a customer’s requirements to minimize the risk of failure. Requests for part approval must be supported in official PPAP format and with documented results when needed.

The idea of PPAP is to ensure that a supplier can meet the manufacturability and quality requirements of the parts supplied to the customer and to provide proof that the customer’s engineering design record and specification requirements are understood by the supplier. In addition, the supplier must demonstrate that its manufacturing process has the potential to produce the part that consistently meets all requirements during actual production.

Besides PPAP, delivery in the auto industry is “really different, as a customer line down has to be absolutely avoided,” said Bahash.

She said the qualification of a new supplier is focused on meeting quality requirements, while being competitive and having the “appropriate logistics organisation to support the automotive business.”

“One thing about automotive customers, once you qualify then you’re considered to be a supplier,” said Panzica. “You are in although you have to prove yourself every shipment.”

### Monitoring roadmaps

Another supply chain industry challenge in the automotive industry is changes in semiconductor technology. “Technology roadmaps change roughly every four years with each of the semiconductor suppliers, so it’s crucial to understand what the different companies will be doing in

the future,” said Amanda Willis, General Motors global purchasing and supply chain director, electrical systems. It’s important for automotive purchasers at automakers, tier 1 suppliers and EMS providers to monitor technology roadmaps of key chip suppliers to keep abreast of technology developments that could impact automotive systems in the future.

“Miniaturisation is also a trend in this space as it closely follows the consumer industry” and needs to be monitored, she said.

Panzica added that supporting long product lifecycles in the auto industry is also challenging. He noted that many electronic products have nine-month to two-year product lifecycles. “Automotive lifecycle requirements could be 10 years,” said Panzica. Long product lifecycles mean that suppliers, including EMS providers, need to continue to build components and subsystems for vehicles for as long as it is in production.

Quality and reliability of components and systems in the auto industry are more challenging than many other

▶▶ continued on page 47



“Automotive has unique requirements in terms of supplier quality management and production part approval process (PPAP) and logistics vs. other segments,” said Lisa Bahash, senior vice president, automotive and transportation audio systems for Jabil Circuit

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# Automotive integrated circuits to post 10.3% annual growth

Automotive systems such as infotainment, collision avoidance, adaptive braking and backup cameras are driving integrated circuit sales in the automotive industry.

Automotive will post the highest growth rate for integrated circuit sales over the next five years, according to market researcher IC Insights. Integrated circuit sales to the automotive sector will grow at a compound annual

growth rate (CAGR) of 10.3 per cent eclipsing all other customer segments. For instance, the CAGR for the industrial and medical segment will be 7.8 per cent per year, while government/military IC growth will total 4.8 per cent; communications, 3.9 per cent; computer, 3.4 per cent and consumer 1.7 per cent, according to the researcher.

Integrated circuit sales to the automotive segment totaled \$22.9

billion in 2016 and will increase to \$33.5 billion in 2020, said IC Insights.

Despite that robust growth, automotive in 2016 represented only 7.9 per cent of total global IC revenue, said Brian Matas, vice president of market research for IC Insights. While IC demand for the automotive segment is growing, the market for automotive ICs is relatively small compared to other segments such as computer,

telecommunications and consumer electronics.

While semiconductors have been used in vehicles for years for such features as power seats, antilock brakes and engine control, the amount of semiconductors in vehicles had been relatively small compared to computers and other electronics equipment.

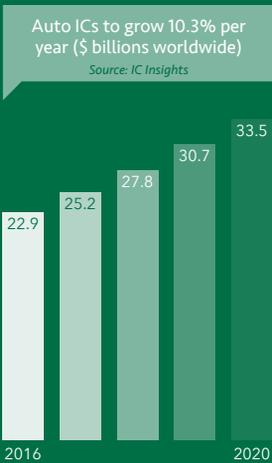
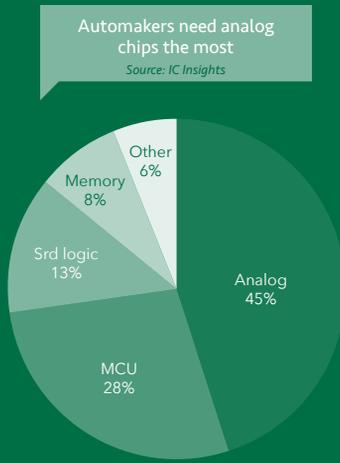
Automotive IC growth has been "steady, incremental growth," said



The Tesla Model 3 electric vehicle will soon go into production and will be equipped with a control computer built by an electronics manufacturing services provider

Matas. "We see that changing a little bit more in the five years as more electronics systems are being incorporated into cars," he said. By 2020, automotive will represent 9.4 per cent of the global IC market, he said.

Some of the growth in automotive ICs will be due to the electric vehicle. While EV sales are small compared to conventional gasoline powered cars, they are expected to grow over the next five years as the



range of EVs per charge increases in the price of electric cars declines.

Electric vehicles require about twice as many semiconductors as gasoline powered vehicles, including microcontrollers, power management ICs and other analog chips and sensors among others. He said there were about \$400 worth of integrated circuits and average gasoline powered car and about \$900 of ICs in electric vehicles.

customer segments. Panzica noted that quality requirements for products built for automotive applications are high and are now measured at the parts per billion level.

While initial quality of automotive products is important, reliability may be more important because parts and systems need to function at a high-quality level in a variety of conditions over a lengthy period of time.

"For instance, you may drive a car to Colorado in winter when it's 20 below zero and then drive it to Death Valley in the summer when it's hundred 115°," said Panzica. "It also has to survive in high and low humidity and withstand the shock of bumpy roads and vibration," said Panzica.

Because of the need for parts and systems to perform in those conditions, testing requirements need to be more stringent for an automotive component than a component used in a smart phone or computer.

While the automotive purchasers face challenges concerning quality, reliability and delivery, they are also exposed to the supply chain risks of the electronics industry. For instance, in electronics critical components are sometimes single-source parts. If the supplier of a single-source component has a manufacturing problem, there is a risk of a production line shutdown. Bahash said the risks in electronics are "not specific risks to the auto industry, but centre around general capacity as the world continues to consume more electronics," she said. In the electronics industry lead times can stretch and some part may go on allocation at times and buyers need to scramble to find parts to keep production lines running.



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# See what's new for real

**With over one hundred companies and brands exhibiting, plus two days of technical content, What's New in Electronics Live gives delegates a chance to network, engage, learn and connect face-to-face**

Delegates visiting *What's New in Electronics Live* will have the opportunity to see all aspects and processes of the electronics manufacturing industry, according to event organisers. Set to run 9 and 10 May at the NEC, the event offers plenty of food for thought for those in the electronics sector.

Alongside an international exhibitor list, showcasing a host of products and services from all corners of the electronic process, the event will include two full days of technical content.

Conference highlights include an innovations forum, which aims to bring electronics industry professionals together from up and down the supply chain to discuss 'open innovation as a new idea, device or method.' As we move towards 2020, this session will ask what innovation means to your business.

#### Round table debate

Round table debates will also run, covering topics

including: emerging opportunities and challenges in UK manufacturing, the smart factory, Brexit, manufacturing trends, automation and robotics and innovation as a competitive advantage. Debates will be filmed by WNIE TV for those who want to catch up, on or review, the discussion.

Networking events include the Female Leaders in Tech Europe lunch, while technical demonstrations will encompass the EMC UK Expo and technical workshops and the IPC hand soldering competition. The *Embedded and Developer Expo* will also run as part of WNIE.

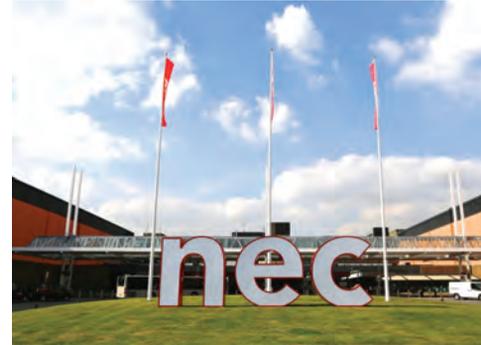
As these highlights indicate, *What's New In Electronics Live* provides an opportunity to network with industry contacts, see the latest products and services in the electronics industry, join live debates, forums and competitions and improve your facility's productivity and output. With hundreds of topics represented, from components to design,

production and contract manufacturing it's a cost-effective way to get up to speed with the industry and in an online world, it's an opportunity to see, hear and touch what's new in electronics.

This free to attend event runs in Hall 8 of the NEC, where visitors can take advantage of free parking and free wifi throughout the venue. Register for speedy entry by visiting [www.wnie.co.uk/live/register](http://www.wnie.co.uk/live/register).

[wnie.co.uk](http://wnie.co.uk)

The event runs in Hall 8 of The NEC



Network, engage, learn and connect at *What's New in Electronics Live*



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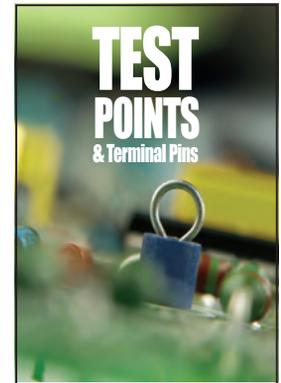
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Beau Interconnect - a Molex company  
BEI Sensors  
Bel  
Bel Fuse, Inc.  
Bel Power Solutions  
Bergquist  
BI Technologies / TT Electronics  
Birtcher / Pentair  
Bivar, Inc.  
BlueCreation  
BlueRadios, Inc.  
Bluetech Gmbh  
BNS Solutions  
Bomar (Winchester Electronics)  
Bopla Enclosures  
Bosch Sensortec  
Bourns, Inc.  
Brad - a Molex company  
Bridgelux, Inc.  
Broadcom Limited  
Buchanan Terminal Blocks /  
TE Connectivity  
Bud Industries, Inc.  
Bulgin  
Burr-Brown (Texas Instruments)  
Bussmann (Eaton)  
C&D Technologies (Murata Power  
Solutions)  
C&K  
Caddock Electronics, Inc.  
Cal Test Electronics  
Califia Lighting (Bivar)  
Calmark / Pentair  
Cannon  
Cantherm  
Capital Advanced Technologies, Inc.  
Carclo Technical Plastics  
Cardinal Components  
Carling Technologies  
Catalyst Semiconductor /  
ON Semiconductor  
CEL (California Eastern Laboratories)  
Central Semiconductor  
Cera-Mite / Vishay  
CGS Resistors / TE Connectivity  
CH Products  
Chemtronics  
Cherry Americas  
Cherry Switches (ZF Electronics)  
Chip Quik, Inc.  
Cicoil  
CII / TE Connectivity  
Cinch Connectivity Solutions  
Cirronet / RFM (Murata Power  
Solutions)  
Cirrus Logic  
Citizen Electronics Co., Ltd.  
Citizen Finedevice Co., LTD.  
Clarostat (Honeywell Sensing and  
Productivity Solutions)  
CMD (ON Semiconductor)  
CNC Tech  
Cogent Computer Systems  
Cognimem  
Coiltronics (Eaton)  
Comair Rotron  
Comchip Technology

Concept Technologie  
(Power Integrations)  
Condor / SL Power  
Conec  
Connex (Amphenol RF)  
Connor-Winfield  
Conxall / Switchcraft  
Cooper Bussmann (Eaton)  
Copal Electronics  
Corcom Filters / TE Connectivity  
Cornell Dubilier Electronics  
Cortina Systems (Inphi)  
Coto Technology  
CR Magnetics, Inc.  
Cree  
Crescent  
Critical Link  
Crouzet  
Crydom  
Crystek Corporation  
CSR PLC (Qualcomm)  
C-Ton Industries  
CTS Electronic Components  
CUI, Inc.  
Curtis Industries  
Curtis Instruments  
Custom Computer Services  
CW Industries  
Cynergy3  
Cypress Semiconductor  
Daburn  
Dale / Vishay  
DAVE Embedded Systems  
Davies Molding, LLC.  
DecaWave  
Delta Electronics  
Delta Electronics / EMI  
Delta Electronics / Fans  
Delta Electronics / Power  
Desco  
DEUTSCH Connectors /  
TE Connectivity  
DEUTSCH ICT / TE Connectivity  
DFRobot  
Dialight  
Dialog Semiconductor  
Dielectric Laboratories (Knowles)  
Digi International  
Digilent, Inc.  
Digital View Inc.  
Diodes Incorporated  
Displaytech  
DLP Design, Inc.  
Draloric / Vishay  
dresden elektronik  
Dynastream Innovations Inc.  
E Ink  
EasyBraid Co.  
Eaton  
ebm-papst Inc.  
Echelon  
Econais  
ECS Inc. International  
EDAC Inc.  
Elco (AVX)  
Elcon Connectors / TE Connectivity  
Electric Imp  
Electro Corp (Honeywell Sensing  
and Productivity Solutions)  
Electro-Films (EFI) / Vishay  
Electronic Assembly GmbH  
Electroswitch  
Elna America  
Embedded Artists  
Emerson Connectivity Solutions  
Emerson Embedded Power (Artesyn  
Embedded Technologies)  
EMIT  
Energizer Battery Company  
Energy Micro (Silicon Labs)  
EnerSys  
enmo Technologies  
EnOcean  
EPC  
EPCOS

Epcos / RF360  
Epson  
Equinox Technologies  
EREM  
Essentra Components  
ESTA / Vishay  
E-Switch  
E-T-A  
Ethertronics  
Eupec (Infineon)  
Eveready (Energizer Battery Company)  
Everlight Electronics  
EverSpin Technologies, Inc.  
Exar Corporation  
Excelitas Technologies  
Excelsys Technologies Ltd.  
E-Z-Hook  
Fairchild/ON Semiconductor  
Fan-S Division / Quatek  
Electronics Corp.  
FCI (Amphenol FCI)  
FCT Electronics - a Molex company  
FDK America  
Finisar Corporation  
FIT (Foxconn Interconnect Technology)  
Flamar - a Molex company  
Flambeau, Inc.  
FLIR  
Fox Electronics  
Foxconn Optical Interconnect  
Technologies  
Free2move  
Freescale / NXP Semiconductors  
Fremont Micro Devices  
FTDI (Future Technology Devices  
International, Ltd.)  
Fujitsu Electronics America, Inc.  
Future Designs, Inc.  
Future Technology Devices  
International, Ltd.  
GainSpan Corporation  
GC Electronics  
GE Critical Power  
General Cable  
General Semiconductor (Vishay)  
GeneSIC Semiconductor  
Global Power Technologies Group  
Global Specialties  
Grayhill, Inc.  
Greenlee Communications  
GWConnect - a Molex company  
H&D Wireless  
Hamlin / Littelfuse  
Hammond Manufacturing  
HARTING  
Harwin  
Heatron  
HellermannTyton  
Henkel/Loctite  
Heraeus Sensor Technology USA  
HiRel Systems / Vishay  
Hirose  
Hittite (Analog Devices)  
Holsworthy Resistors /  
TE Connectivity  
Holt Integrated Circuits, Inc.  
Honeywell Microelectronics &  
Precision Sensors  
Honeywell Sensing and Productivity  
Solutions  
I/O Interconnect  
IAR Systems Software Inc  
ICCNextery (Inventus Power)  
IDT (Integrated Device Technology)  
Illinois Capacitor  
ILLUMRA  
Industrial Fiber Optics, Inc.  
Infineon Technologies  
Initial State Technologies, Inc.  
Innovasic Semiconductor  
Inphi  
Inspired LED  
Integrated Device Technology (IDT)  
Integrated Silicon Solution, Inc. (ISSI)  
Intel® Programmable Solutions Group

Intematix  
Interconnect Systems -  
a Molex company  
Interlink Electronics  
International Rectifier (Infineon  
Technologies)  
Intersil  
InvenSense  
Inventek Systems  
Inventus Power  
IR (Infineon Technologies)  
IRC / TT Electronics  
IRTOUCH Systems Co., Ltd.  
Isocom Components  
ISSI (Integrated Silicon Solution, Inc.)  
ITT Cannon, LLC  
ITT Interconnect Solutions  
ITW Chemtronics (Chemtronics)  
IXYS Corporation  
IXYS Integrated Circuits Division  
J.W. Miller / Bourns  
JAE Electronics, Inc.  
Jinlong Machinery &  
Electronics Co. Ltd.  
JKL Components Corporation  
Johanson Dielectrics, Inc.  
Johanson Technology  
Johnson / Cinch Connectivity  
Solutions  
Jonard Tools  
JRC Corporation / NJRC  
JST  
Judco Manufacturing, Inc.  
Keil (ARM)  
KEMET  
Kester  
Keystone Electronics Corp.  
Khatod  
Kilo International  
Kilovac Relays / TE Connectivity  
Kingbright  
Kings (Winchester Electronics)  
Klein Tools  
Knowles  
Knowles / Syfer  
Knowles Voltronics  
Kyocera  
Kyocera Display  
Laird - Embedded Wireless Solutions  
Laird Technologies  
Laird Technologies - Antennas  
Laird Technologies - EMI  
Laird Technologies - Signal Integrity  
Products  
Laird Technologies - Thermal  
Products  
LAPIS Semiconductor  
Lattice Semiconductor  
LeCroy (Teledyne LeCroy)  
LED Engin  
LEDdynamics, Inc.  
LEDiL  
LEM USA, Inc.  
LEMO  
Lighting Science  
Lime Microsystems  
Linear Technology / Analog Devices  
Link Labs  
Linx Technologies  
Lite-On, Inc.  
Littelfuse  
LMB Heeger, Inc.  
LOCTITE / Henkel  
Logic PD, Inc.  
Logical Systems  
LSR  
Lumex, Inc.  
LUMILEDS  
Luminary Micro / Texas Instruments  
Luminus Devices  
Luna Optoelectronics  
Luxe  
MACOM Technology Solutions  
Macraigor Systems LLC  
Macronix

Maestro Wireless Solutions  
Mag-LED Solutions  
Magnasphere Corp.  
Mallory Sonalert Products  
Marktech Optoelectronics  
Martel Electronics  
Master Appliance Corp.  
Matrix Orbital  
Maxim Integrated  
Maxwell Technologies, Inc.  
MCB Industrie / Vishay  
Measurement Specialties /  
TE Connectivity  
MEC switches  
Mechatronics  
MegaChips  
Melexis  
Memory Protection Devices  
MEMSIC  
Menda  
Mentor Graphics  
Metelics (MACOM Technology  
Solutions)  
MG Chemicals  
Micrel / Microchip  
Micrium  
Micro Commercial Components (MCC)  
Microchip Technology  
microEngineering Labs Inc.  
Micro-Measurements /  
Vishay Precision Group  
Micron Technology  
Micronas  
Microsemi  
Microwave Technology  
Midcom / Würth Electronics  
Mide Technology  
Midwest Microwave / Cinch  
Connectivity Solutions  
MikroElektronika  
Mill-Max  
Mills / Vishay  
Milwaukee / Vishay  
MMB Networks  
Molex  
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 Wireless  
Solutions)  
NDK  
Nearson  
Neohm Resistors / TE Connectivity  
Nesscap Co., Ltd  
NetBurner, Inc.  
Newava Technology  
Newhaven Display, Intl.  
Nexperia  
Nichicon  
NimbeLink  
Nippon Chemi-Con  
NJR Corporation / NJRC  
NKK Switches  
NMB Technologies Corp.  
NorComp  
Nordic Semiconductor  
NovaSensor / GE Measurement &  
Control  
NuCurrent - a Molex company  
Nuvoton Technology Corporation  
America  
NVE Corporation  
NXP Semiconductors / Freescale  
Octavo Systems  
OEG Relays / TE Connectivity  
Ohmite  
OK Industries (Jonard Tools)  
Olimex

Omron  
Omron Automation & Safety  
ON Semiconductor  
ON Semiconductor/Fairchild  
On-Shore Technology, Inc.  
Oplink Communications -  
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.  
Patco Electronics  
Patco Services  
PCD / Amphenol  
Peerless by Tymphany  
Pentair  
Peregrine Semiconductor  
Pericom Semiconductor Corp.  
Pervasive Displays  
PHIHONG USA  
Phillips-Medizise - a Molex  
company  
Phoenix Contact  
Phoenix Mecano  
Phoenix Passive Components /  
Vishay  
Phyton, Inc.  
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.  
ProAnt  
Products Unlimited Transformers &  
Relays / TE Connectivity  
Protektive Pak  
PUI Audio, Inc.  
PULS  
Pulse Electronics Corporation  
PulseCore Semiconductor /  
ON Semiconductor  
Q-Cee's / TE Connectivity  
QT Brighttek  
Quadcept  
Qualcomm  
Qualcomm (RF360 - A Qualcomm &  
TDK Joint Venture)  
Qualtek Electronics Corp.  
Quatech / B+B SmartWorx  
Radial Magnet, Inc.  
RAFI  
Ramtron (Cypress Semiconductor)  
Raspberry Pi  
Raychem Cable Protection /  
TE Connectivity  
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  
Roving Networks / Microchip  
RPM Systems  
Rubycon  
Sagrad  
Samsung Electro-Mechanics  
America, Inc.  
Samsung Semiconductor  
Samtec, Inc.  
Sanken Electronic Co., Ltd.  
Sanyo Denki  
Sanyo Semiconductor /  
ON Semiconductor  
Schaffner EMC, Inc.  
Schrack Relays / TE Connectivity  
Schroff / Pentair  
Schurter  
SCS  
Seed  
Segger Microcontroller Systems  
Seiko Instruments, Inc.  
Semflex / Cinch Connectivity  
Solutions  
Semtech  
Sensata Technologies, Airpac  
Sensirion  
Sensitron Semiconductor /  
SMC Diode Solutions  
Seoul Semiconductor  
Serious Integrated  
Serpac Electronic Enclosures  
Sharp Microelectronics  
Sierra Wireless  
Sigma Designs  
Sigma Inductors / TE Connectivity  
Signal Transformer  
SII Semiconductor Corporation  
Silicon Labs  
SINE Systems / Amphenol  
Siretta  
SiTime  
SkyeTek  
Skyworks Solutions, Inc.  
SL Power Electronics - Manufacturer  
of Condor / Ault Brands  
SMC Diode Solutions  
Soberton, Inc.  
SolidRun  
Souriau Connection Technology  
Spanion (Cypress Semiconductor)  
SparkFun  
Spec Sensors  
Spectra Symbol  
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  
Tadiran Batteries  
Tag-Connect  
Taitien

Taiyo Yuden  
Talema  
Tallysman Wireless  
Tamura  
Taoglas  
TAOS / ams  
TDK Corporation  
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  
TechTools  
Telcodium  
Teledyne LeCroy  
Telit Wireless Solutions, Inc.  
Temp-Flex - a Molex company  
Tensility International Corporation  
Terasic Technologies  
Test Products International (TPI)  
Texas Instruments  
t-Global Technology  
Thermometrics / GE Measurement  
& Control  
ThingMagic  
Thomas Research Products  
TOKO / Murata  
Torex Semiconductor Ltd.  
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

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  
UDOO  
Ultra Librarian  
Ungar / Weller  
United Chemi-Con  
US-Lasers, Inc.  
Varitronix International Ltd.  
VCC (Visual Communications  
Company)  
VEAM  
Vector Electronics & Technology, Inc.  
VersaLogic Corporation  
Vicor  
Vifa (Peerless by Tymphany)  
Virtium Technology Inc.  
Vishay  
Vishay / BCcomponents  
Vishay / Beyschlag  
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  
Woodhead - a Molex company  
Würth Electronics  
Würth Electronics Midcom  
Xcelite  
Xeltek  
Xilinx  
XMOS  
XP Power  
Xsens  
Yageo  
Zentri  
Zetex Semiconductors (Diodes Inc.)  
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
<b>CABLE ASSEMBLY &amp; HARNESSING</b>											
FDI	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
<b>CIRCUIT PROTECTION</b>											
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
<b>DISPLAYS &amp; LEDs</b>											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
<b>ELECTROMECHANICAL</b>											
CUJ CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	15,168	N/A	£0	91.34%	150	3,400	Y
MURATA CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	61,903	N/A	£0	99.72%	150	3,400	Y
OMRON CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	70,119	N/A	£0	95.28%	150	3,400	Y
PANASONIC CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	156,533	N/A	£0	93.83%	150	3,400	Y
TDK CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	64,978	N/A	£0	99.30%	150	3,400	Y
TE CONNECTIVITY CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	437,107	N/A	£0	75.47%	150	3,400	Y
<b>ENCLOSURES</b>											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Evatron Plastic Enclosures Ltd	Evatron Plastic Enclosures Ltd	01908 675121	www.evatron.com	N	2,000	N/A	£0	100%	3	9	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
<b>FREQUENCY MANAGEMENT</b>											
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
<b>HEATSINKS</b>											
Aavid	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	67%	50	1,500+	Y
ABL Components	ABL Components	0121 789 8686	www.abl-heatsinks.co.uk	Y	3,000+	N/A	£150	100%	50	500+	Y
<b>ICs &amp; SEMICONDUCTORS (continued on next page)</b>											
ALLEGRO MICROSYSTEMS, LLC	Digi-Key	0800 587 0991	digikey.co.uk	Y	2,867	N/A	£0	86.22%	150	3,400	Y
ALTERA	Digi-Key	0800 587 0991	digikey.co.uk	Y	10,502	N/A	£0	80.39%	150	3,400	Y
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y



# widest Selection

## 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
ANALOG DEVICES	Digi-Key	0800 587 0991	digkey.co.uk	Y	50,633	N/A	£0	73.33%	150	3,400	Y
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
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
BROADCOM LIMITED (AVAGO)	Digi-Key	0800 587 0991	digkey.co.uk	Y	2,237	N/A	£0	99.96%	150	3,400	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
CREE INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,398	N/A	£0	100.00%	150	3,400	Y
CYPRESS SEMICONDUCTOR	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,030	N/A	£0	89.02%	150	3,400	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
DIODES INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	32,186	N/A	£0	89.01%	150	3,400	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	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	Digi-Key	0800 587 0991	digkey.co.uk	Y	39,380	N/A	£0	97.62%	150	3,400	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	Digi-Key	0800 587 0991	digkey.co.uk	Y	486	N/A	£0	100.00%	150	3,400	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	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
Infiniteon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
INFINEON TECHNOLOGIES CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,610	N/A	£0	85.64%	150	3,400	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
INTERSIL CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,063	N/A	£0	74.18%	150	3,400	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
IXYS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	7,268	N/A	£0	99.55%	150	3,400	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	36,207	N/A	£0	76.91%	150	3,400	Y
MAXIM CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	65,795	N/A	£0	77.63%	150	3,400	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
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
MICROCHIP CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	58,558	N/A	£0	90.13%	150	3,400	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
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	38,701	N/A	£0	99.27%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	57,566	N/A	£0	79.85%	150	3,400	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.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	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
SEMTECH CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	3,694	N/A	£0	87.63%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	17,747	N/A	£0	96.09%	150	3,400	Y



# inStock

## 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
<b>ICs &amp; SEMICONDUCTORS</b> (continued on from previous page)											
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	4,300	N/A	£0	99%	50	1,500+	Y
STMICROELECTRONICS CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	43,448	N/A	£0	97.47%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	210,905	N/A	£0	89.60%	150	3,400	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
XILINX INC	Digi-Key	0800 587 0991	digikey.co.uk	Y	7,354	N/A	£0	51.78%	150	3,400	Y
<b>INDUSTRIAL GRADE MEMORY MODULES</b>											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
<b>INTERCONNECTION</b> (continued on next page)											
3M	Digi-Key	0800 587 0991	digikey.co.uk	Y	54,086	N/A	£0	93.83%	150	3,400	Y
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
AMPHENOL	Digi-Key	0800 587 0991	digikey.co.uk	Y	426,945	N/A	£0	82.42%	150	3,400	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	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
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
EDAC	EDAC	01933 427300	www.edac.net	N/A	N/A	N/A	£100	100%	34	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	0800 587 0991	digikey.co.uk	Y	39,499	N/A	£0	91.53%	150	3,400	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	0800 587 0991	digikey.co.uk	Y	4,320	N/A	£0	81.46%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	123,772	N/A	£0	95.41%	150	3,400	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	Premier Farnell	08447 111111	www.uk.farnell.com	Y	2,000	£250,000	£0	100%	20	3,000	N/A
Phoenix Contact	Rapid Electronics	01206 751166	www.rapidonline.com	Y	16,000	N/A	£0	100%	11	200	N/A
Phoenix Contact	RS Components	08457 201201	www.uk.rs-online.com	Y	7,000	£250,000	£0	100.00%	30	4,000	N/A
Phoenix Contact	Anglia Components	01945 474747	www.anglia.com	Y	500	£25,000	£0	100%	12	200	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



# fast Shipping

## 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
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 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	+44 01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y
Force Technologies Ltd		+44 01264 731200	www.forcetechnologies.co.uk	N/A	N/A	N/A	£0	5%	6	26	Y

### OPTO ELECTRONICS

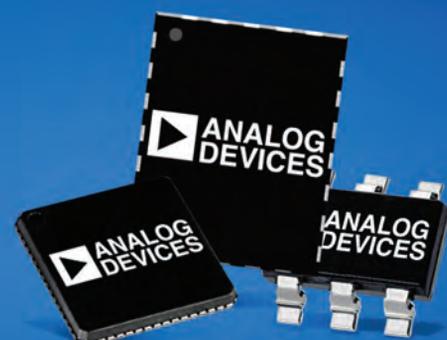
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
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 (continued on next page)

ABRACON CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	28,548	N/A	£0	98.89%	150	3,400	Y
ARCOL	ARCOL Resistors	01872 277431	www.arcolresistors.com	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
BEL FUSE	Digi-Key	0800 587 0991	digikey.co.uk	Y	4,207	N/A	£0	83.53%	150	3,400	Y
BOURNS	Digi-Key	0800 587 0991	digikey.co.uk	Y	59,314	N/A	£0	82.47%	150	3,400	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	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
EATON CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	28,434	N/A	£0	86.49%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	26,319	N/A	£0	86.01%	150	3,400	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	48,025	N/A	£0	90.12%	150	3,400	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
KYOCERA ELECTRONICS CORPORATION (AVX)	Digi-Key	0800 587 0991	digikey.co.uk	Y	65,718	N/A	£0	83.48%	150	3,400	Y
LAIRD CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	14,568	N/A	£0	97.21%	150	3,400	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 CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	86,652	N/A	£0	82.87%	150	3,400	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
NICHICON	Digi-Key	0800 587 0991	digikey.co.uk	Y	35,421	N/A	£0	96.30%	150	3,400	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y

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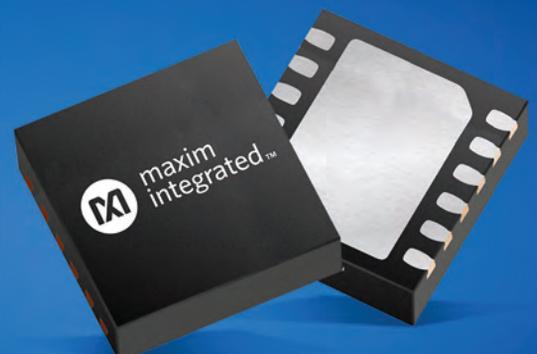
Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
PULSE CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	11,098	N/A	£0	93.56%	150	3,400	Y
ROHM SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	63,003	N/A	£0	99.85%	150	3,400	Y
Samsung Electro-Mechanics	Digi-Key	0800 587 0991	digikey.co.uk	Y	21,522	N/A	£0	100.00%	150	3,400	Y
TAIYO YUDEN	Digi-Key	0800 587 0991	digikey.co.uk	Y	16,677	N/A	£0	99.96%	150	3,400	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TOKO	BEC Distribution Ltd	0845 4900 405	www.bec.co.uk	Y	6,000	£300,000	£20	70%	2	8	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	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
VISHAY CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	275,942	N/A	£0	88.52%	150	3,400	Y
WURTH CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	22,245	N/A	£0	100.00%	150	3,400	Y
Würth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	141,986	N/A	£0	83.67%	150	3,400	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



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## Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
<b>SWITCHES &amp; KEYBOARDS</b>											
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
Carlting 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
<b>TERMINAL BLOCKS</b>											
Marathon Special Products	Global Supply Services	+44 01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
<b>THERMAL MANAGEMENT</b>											
ADDA	Mouser Electronics	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	Y	2,900	N/A	£0	N/A	50	1,500+	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
<b>TRANSFORMERS &amp; INDUCTORS</b>											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
<b>WIRELESS SOLUTIONS</b>											
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

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## PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie. Board Manufacture &/or Repair)	Location	Approvals	Volume Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	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	ISO9001:2008, UL	SML	Y	4-16	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	M	NE	ISO9001:2008 UL	SML	Y	4-30	Y	N	Y	Y	Y
CS Electronics (UK) Ltd	0116 242 4058	www.cs-electronics-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
European Circuits Limited	0141 941388	www.european-circuits.co.uk	M	Scotland	BS EN ISO9001: 2008 CERTIFIED	SM	Y	8	Y	Y	N	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
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

## 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	£15m	Essex/SE	55	7	ISO 9001, 14001, UL, IPC-610, SC21	Y	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	£3.7m	NE	60	2	ISO9001:2008 UL	Y	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
CRS Electronics Ltd	01920 871061	www.crs-electronics.co.uk	£3m	SE	44	2	ISO9001:2008	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, AS9100, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610 F class 3, ISO14001, UL	Y	Y	Y	Y	Y	Y
Electronic Technician Ltd	01202 897722	www.etuk.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	£17m	UK	160	5	ISO9001, ISO13485, UL, IPC610/620	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
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4m	S	50	3	ISO9001, ISO13485, IPC-A-610, IPC-1-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 Electronic Wiring Ltd.	+44(0)1793 694033	www.iiew.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	Y	Y
JIS Manufacturing	01455 555500	www.jismanufacturing.com	£23m	M/CZ Republic	270	3	ISO9001:2008 and IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£10m	SE	120	5	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001:2004, SC21	Y	Y	Y	Y	Y	Y
Northern Hi-Tec Ltd (NHT)	01524 67833	www.nht.co.uk	£4.5M	Lancashire (NW)	66	4	ISO9001:2008, IPC-A-610/D	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 PLC	01332 832424	www.pektron.com	£40m	E-Midlands	350	7	ISO9001, ISO14001, TS16949, BEAB, VCA, TÜV, UL, TickIT	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	1m	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
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£4m	SE	50	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	£11.1m	Windsor, SE	92	5	ISO9001:2008, IPC610 to Class 3	Y	Y	N	Y	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	£12.5m	Derby / Corby	110	7	ISO 9001:2008, ISO 13485, UL, IPC 610F Class 3	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

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ELECTRONICS

# Sourcing's

## 5-A-SIDE FOOTBALL TOURNAMENT

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4 more teams to  
enter!

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to enter your team! No cost to  
spectate or play and we can also  
include individual players to  
make up a team.



SAVE THE DATE:  
**Thursday 25<sup>th</sup> May 2017**



The Annual Electronics Sourcing Football Match continues to be a popular event with friendly competitive matches for readers & advertisers at the MK Dons, Madejski and the AMEX Stadium in Brighton.

With a record number of players requesting to join in the fun for 2017, *Electronics Sourcing* has organised an industry 5-a-side football tournament on Thursday 25 May, 2017.

The tournament will be played in Lancing, West Sussex the home of the Sussex FA. This stadium has the latest artificial pitch and is an ideal venue for both players & supporters to enjoy the matches, to meet, and make friends across the industry.

Refreshments will be available all day at the stadium as well as free onsite car parking. With coffee and bacon rolls on arrival, the first games will kick-off at 11:00am with the aim to play the final match between the two best teams at around 3:30pm.

You are then invited to attend the ecsn UK / Ireland Electronic Components Industry Dinner at Brighton. Sponsored by Gelec, it kicks off at 5:30pm for an informative and enjoyable evening of entertainment.

We would like to encourage as many readers as possible to participate in the tournament and have a great day playing against their fellow industry colleagues.

To help some of the teams to play competitively, we have enlisted a number of ex-professional players from Brighton, Spurs, Portsmouth and Gillingham to provide some additional encouragement and tips...

We have also sourced team kits with your organisation or team names to purchase at a very competitive price and will be publishing full details of the tournament in future editions of *Electronics Sourcing*.

To register as an individual, organisation or team please send an Email to: [sales@electronics-sourcing.com](mailto:sales@electronics-sourcing.com) and we will then contact you to confirm your team entry and keep you updated directly with further details.

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