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All the facts and figures to help you buy

Editor's Word



The cost of convenience

I was caught a little by surprise when news came through that Maplin had gone into administration and my local store started its sell off. I always considered Maplin a convenience store. The organisation's product range was a strange mixed bag of technologies ranging from RC toys and professional DJ gear to home automation and development tools.

The instore product range and pricing policy never worried me. If a design project stalled at 3.30pm on a Sunday afternoon Maplin was often a life saver. Be it a link wire, obscure battery, resistor, power supply, hand tool or anything else I felt I needed at that point, Maplin offered a solution.

However, for me there was a real problem lurking under the surface: a mismatch between staff knowledge, stock holding, logistics and competitor pricing.

Let me explain. On many occasions I entered the store with a good idea of what I wanted. However, after a chat with the knowledgeable staff I would often start to question my initial decision and move towards their recommendation. If the alternative product was not on the shelf I would be offered the option of making an online order for later collection.

Sadly, other online retailers would typically offer the same branded part with better pricing and faster delivery, so Maplin lost the sale.

I've decided that any business trying to mix a focussed product range in bricks and mortar stores with a wider online offering, while also maintaining convenience pricing is in for a tough ride. It can be done but it needs real care.

If the brand is sold and resurrected let's hope the next management team evolves a new, more sustainable business model. If anyone from Maplin is reading this, I'm happy to help if required.

Jon Barnett

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Blockchain

makes headway in the

Supply Chain



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

New partnerships, research and investment underscore the technology's potential to deliver visibility, transparency to trading partners

Supply Chain • By Victoria Kickham

2018 may be the year that 'blockchain' becomes more than just an industry buzzword. Business investment in the technology is giving rise to new ventures aimed at simplifying complex business transactions, and the supply chain is at the top of the list of industries likely to benefit from it. Investment in blockchain technology is expected to more than double this year – to \$2.1 billion compared to \$945 million in 2017 – and the United States will lead the way, followed by Western Europe, China and Asia-Pacific, according to data from technology researcher IDC.

"There are a multitude of potential new use cases for blockchain, as transactions and records are the lifeblood of just about every organisation," Jessica Goepfert, IDC's program director, customer insights and analysis, said in a statement. "However, we are seeing initial blockchain spending to transform existing highly manual and inefficient processes such as cross-border payments, provenance, and post-transaction settlements. These are areas of existing pain for many firms, and thus blockchain presents an attractive value proposition."

In a nutshell, blockchain "establishes a shared, immutable record of all the transactions that take place within a network and then enables permissioned parties access to trusted data in real time," according to IBM, one of the technology companies at the forefront of the blockchain movement. This makes the technology especially applicable to supply chains, because it can increase visibility across trading networks, streamlining transactions between buyers and suppliers – and everyone in between.

Krishna Ratakonda, IBM fellow and CTO of blockchain solutions, points to manufacturing as a key example. In today's manufacturing environment, time is money – especially in the fast-paced electronics sector, where time to market can make or break the introduction of a new or upgraded product.

"Visibility [becomes] very important," explains Ratakonda, pointing to the often cumbersome process of communicating among all the parties involved in shipping, delivering, and receiving a part. Blockchain proponents say the technology allows all parties in this multi-step process access to one record of information, allowing for better-informed decision making at all

stops along the way. "On the procurement side, we find definite advantages there ... Having one record [of information] gets rid of a lot of headaches."

The theory is already being put to the test in some portions of the supply channel. IBM and global transportation/logistics giant Maersk made headlines in January with the announcement of a joint venture aimed at providing more transparency and simplicity in the global shipping environment. Together, the companies will use blockchain – and other cutting-edge technologies, including artificial intelligence and the Internet of Things – to digitise the ocean shipping process.

"Manufacturers, shipping lines, freight forwarders, port and terminal operators and customs authorities can all benefit from these new technologies – and ultimately consumers," the companies said in joint statement.

IBM also is working with large retailers to develop blockchain-based supply chain solutions, including a collaboration with nine food-industry companies that will use the technology to address food safety issues in the grocery supply chain.

"We can track what's happened from the farm to the time the retailer sells it to you," explains Ratakonda. "You get a much better view of the supply chain ... and can take action against potentially harmful things."

As with the adoption of any new technology, the largest players in the channel are out in front, but proponents such as Ratakonda say smaller companies are wise to keep tabs on how blockchain is being applied and the benefits it can bring to their industry, their company, and their daily responsibilities.

"I see [blockchain] as a very democratic instrument, because it really levels the playing field," he says, using the supplier landscape as a case in point. "Rather than saying, as a smaller supplier, 'Trust me, I have a good reputation,' you can actually now point to an immutable record of your past deliveries. This takes away some of the advantage [that larger organisations have] and kind of levels the playing field – and it could potentially streamline and speed things up."

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British-made mil-spec connectors delivered fast

Lane Electronics boasts short lead times for standard and customer specified MIL-DTL-26482 circular connectors, with many standard products supplied next day. What's more, LMH series MIL-DTL-26482 connectors can be specified and purchased through Lane's online store.

Manufactured in the UK by sister company, Weald Electronics, LMH connectors are designed to meet MIL-DTL-26482 series one and Patt 105 requirements and have also been approved to IECQ-CECC spec BS/CECC 75201-003 and BS 9522 F0017. They are equivalent to 62GB, AB05, KTP, 851 and IPT series from Amphenol, AB Connectors, ITT Cannon, Souriau and Glenair.

Standard LMH series connectors can be supplied by Lane from stock in a variety of shell sizes and styles as well as several contact arrangements, or as free shells with grounding fingers. All versions can be specified in a variety of RoHS compliant finishes and can incorporate a selection of accessories, including J sealing glands and protective caps. www.fclane.com

Distributor invests in extended warehouse facilities

Distributor, Premier Farnell, is investing in a 360,000ft² warehouse at Logic Leeds, capable of stocking over 420,000 products and with the potential for up to one million square feet of distribution capacity.

President of Premier Farnell, Graham McBeth, said: "This is a significant investment in a modern, automated warehouse, made possible by opportunities for growth in the market and the support of our American parent company, Avnet."

In the last 12 months, Premier Farnell has invested more than £60m in additional inventory across the globe, instigating a Europe-wide search for a new warehouse facility to support demand. Having selected the Leeds site, works began in early February, with the site expected to be operational by late 2019 to early 2020.

Chief supply chain officer, Premier Farnell, Nick Wilkins, added: "This new warehouse, with great transport links, will allow us to grow to support market demand." www.premierfarnell.com



You CAN improve response times

Mouser Electronics is now stocking Microchip Technology's PIC18 K83 eight-bit microcontrollers, which combine a controller area network bus with an array of core independent peripherals to improve response time to critical system events. The CIPs handle tasks without code or supervision from the CPU, increasing system capabilities for easier implementation of CAN-based applications.

Each PIC18 K83 microcontroller contains 15 time-saving CIPs in 28-pins with up to 64kB of flash memory. On-chip CIPs can be configured through the MPLAB Code Configurator, a free software plug-in that provides a graphical interface to configure application-specific peripherals and functions. This can save time, since it is easier to configure a hardware-based peripheral than to write and validate a software routine to accomplish a task.

Mouser suggests the PIC18 K83 family is ideal for applications using CAN in the medical, industrial and automotive markets, such as motorised surgical tables, asset tracking, ultrasound machines, automated conveyors and automotive accessories. www.mouser.com

Many distributors make claims

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Pushing control panel options

RS Components has announced more than 150 new lines of flush-mount pushbuttons from Schneider Electric's Harmony XBF5 range. Designed for use in control panels, the new plastic range boasts a modern design without compromising performance.

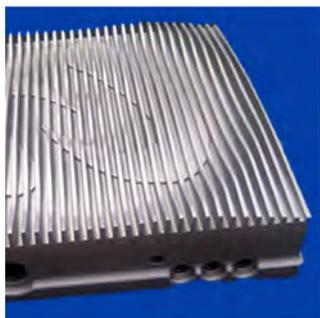
Aimed at industrial applications in the chemical industry, food and beverage production, packaging industry, automotive industry and building automation, the new XBF5 range is designed to be robust. The range meets the performance requirements of machines in harsh environments and is compliant to IEC and UL international standards. Featuring IP ratings of IP66, IP67, IP69 and

IP69K, plus temperature ranges from -40 to 70°C, the range also boasts enhanced mechanical endurance and shock resistance.

This plastic body version comes in a vibrant colour palette, including new blue and green caps for non-illuminated functions.

A series of illuminated buzzers have also been introduced targeting operator alarm systems. Designed for mounting on a control panel in a standard 22mm panel cut out, the IP69-rated XBF5K range of buzzers is available in illuminated and non-illuminated options and in red or amber colours.

www.rs-online.com



PCB provider to centralise manufacturing

SCL PCB Solutions Group is to centralise its UK PCB manufacturing capabilities by relocating its Spirit Circuits business in Waterlooville to sister-company Lyncolec's plant in Poole. This will create a central manufacturing site with the scale and technical capability to better serve customers.

By end of May 2018, manufacture of small batch and quick turn prototype PCBs will be transferred to Lyncolec. Together with the company's mid to high-volume PCB manufacturing facility in Romania, this ensures customers from diverse industries can access short lead-times, competitive pricing and a fully controlled supply chain.

Group sales director, SCL PCB Solutions Group, Lee Lloyd, said: "We have a hugely buoyant order book for our Romania operation and orders for flexible PCBs at Lyncolec are at record levels." www.sclpcbgroup.com

www.gelec.co.uk

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Robust sourcing demands rail-ready solutions

Purchasers in the rail industry have high expectations, and rightly so – our transport safety relies on them sourcing robust products from a reliable supply partner

Thanks to a portfolio of products that meet the rigorous demands of this industry, Telegärtner UK is a trusted supplier partner for rail industry customers. Not only can it manufacture cable assemblies, it also supplies a range of cables and connectors from manufacturers such as Pei tel, Provertha and Hummel.

This combined offering ensures Telegärtner UK is ideally suited to support rail industry customers, offering all products from one source, which results in an opportunity for vendor base optimisation and logistics chain streamlining.

Sealed solutions

Highlights of the wide range of products suitable for the rail industry include Pei tel's IP68 waterproof hand-held microphone with chromed housing. This rugged model is ideal for use by conductors working on trains. Other sealed

solutions include Hummel's IP68/IP69k V0 HSK-K cable glands, which are approved by the global rail sector, by end users such as Alstom.

Provertha's quick and easy field assembly IP67 M12 90deg connector with crimp flange technology is another rail-ready product. It is designed to provide secure 360deg electromagnetic and radio frequency interference shielding, as well as vibration, shock and torsion-proof strain relief.

Finally, Telegärtner's own M12x1 X-coded connection cords meet increased requirements for fire protection systems in rail vehicles. They are ideal for networking passenger information systems in rail cars.

Advanced assembly services

In addition to the many rail suitable products, Telegärtner UK also boasts

extensive experience in cable assembly manufacturing, with production sites in the UK and Slovakia. The company's capabilities on the assembly field include flexible, conformable and semi-rigid coaxial assemblies, various multiwire assemblies, panels and looms and overmoulded cable assemblies.

Furthermore, to complete the picture, Telegärtner is able to offer vendor managed inventory and supplier management, kitting and subcontract services.

www.telegaertner.co.uk



Hummel's IP68/IP69k V0 HSK-K cable glands are approved by the global rail sector



Pei tel's IP68 waterproof hand-held microphone is ideal for use by conductors



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Overtemperature protection needn't be oversized

Schurter's new reflowable thermal switch features mechanical activation for compact protection of integrated power semiconductors

Ideal for demanding power semiconductor applications, the new RTS designed to prevent components such as mosfets, ICs, IGBTs, Triacs and SCRs from overheating. Noted for its compact dimensions, the device can be mounted using conventional reflow soldering carried out prior to mechanical activation.

After reflow, mechanical activation arms the RTS to trip at 210°C. This process, which can be achieved manually or automatically, produces status change that is immediately visible to the installer. This is unlike electrical activation, which also requires a third additional contact.

Thanks to this design, the new RTS boasts dimensions of just 6.6 by 8.8mm and high load capacity, handling operating currents up to 100A at rated voltages up to 60V DC. Customer-specific variants are also available with an integrated shunt or an additional overcurrent fuse.

All switches meet the high reliability requirements of AEC-Q200 and MIL-STD as well as offering reliable protection against thermal runaway.

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Keep sourcing on track

Short lead-times, minimal order volumes and extreme environmental conditions make sourcing electronic components for rail transportation daunting. Here, connectivity specialist, PEI-Genesis, helps buyers in this sector stay on track

Across the world, rail transport has become essential. Not only does it help move a growing population, it also helps reduce automotive pollution. Whether the focus is trains, trams, or the underground, countries are investing more in rail systems to achieve their goals for safe, fast, reliable—and greener—transportation.

As industrial business development manager at PEI-Genesis UK, Joao Rocha, explained, rail projects can encompass everything from infrastructure, such as track, signalling, junction operations and rolling stock, right through to onboard passenger infotainment and station ticketing.

Sourcing must-haves

Whatever the application, whether it's an upgrade or a new system, railway project managers expect the highest quality. It is not uncommon to require 15 or more years' reliability and safety compliance, as well as looking at running costs over that same 15 or even 30-year period.

"Local sourcing is key," added Rocha. "While certain aspects may be performed in another country, project managers want to see local economy growth. That means buyers may be tasked with sourcing components that are manufactured or supplied locally.

"Delivery speed and reliability is also critical. Buyers need to identify partners who can deliver quickly, usually at small volumes, at specific times throughout a project, which may last for years. This speed and flexibility over the long haul is sometimes difficult for major suppliers to meet. It falls to specialized distributors with access to a full line of global products to provide the kind of availability, speed, and technical support needed for a rail project."

Environmental challenges

Furthermore, electronic rail components need to withstand harsh or hazardous environments. Power surges in parts of some trains frequently range from 3,000 to 50,000V, and components may also need to withstand vibration, heat and electromagnetic interference.

This means buyers not only have to source parts to fit these harsh environments, they need a distributor that can provide integrated solutions to allow for design and sourcing changes. For example, if EMI causes problems, either a shielded connector or fibre optic system may need to be sourced quickly.

Environmental safety and compliance specifications are another focus area. Across Europe, heavy metals like cadmium and lead cannot

be present. Components may have to comply with the International Railway Industry Standard, which is based on the ISO 9001 structure. Rail connectivity systems also need to be classified as low smoke zero halogen, to reduce toxic and corrosive gas emitted during high heat or fire.

Future-proof sourcing

There are often space constraints, especially when retrofitting older systems, and because rail systems are now connected, the 'internet of trains' demands that components accommodate a multitude of sensors and data transfer protocols.

With experience and expertise in the rail market, PEI-Genesis collaborates with rail OEMs, such as Bombardier, Siemens, GE, and Alstom, as well as their subcontractor partners in design and fulfilment.

Joao Rocha concluded: "Buyers should look for quality and reliability first, then how fast the distributor can deliver the product. Buyers need not only a company that delivers quality quickly; they need a strategic partner who can help them anticipate challenges and adapt to solve problems as they arise."

www.peigenesis.com



Buyers need to identify partners who can deliver quickly, usually at small volumes, at specific times throughout a project, which may last for years



Buyers commonly require 15 or more years' reliability and safety compliance



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The power of distribution



Distributors are optimistic about 2018 semiconductor sales

Distributors hope that strong chip demand last year continues in 2018



James Carbone

Last year was a good year for distributors that specialise in semiconductors or derive a large percentage of their overall revenue from chip sales as total global semiconductor revenue increased 21.6 per cent in 2017, according to World Semiconductor Trade Statistics (WSTS).

Distributors are confident semiconductor demand will continue to be robust in 2018, although some acknowledge 20+ per cent sales growth in 2017 was an anomaly and driven in part by higher prices for memory ICs, which resulted in 60 per cent sales growth for DRAM, flash and other memory ICs

However, many distributors say that high single-digit growth is possible because of strong end customer demand. They also note that memory ICs weren't the only semiconductors that posted healthy growth. For instance, in 2017 logic revenue increased 11.7 per cent; analog, 10.9 per cent; sensors, 16.2 per cent and discretes, 11.5 per cent, according to WSTS.

Similar growth is possible again in 2018 because of healthy overall global economic growth. Global GDP is expected to rise 3.9 per cent in 2018 while US GDP will be about 2.7 per cent, according to the forecast of the International Monetary Fund (IMF).

As a result, distributors are optimistic that demand for components, including semiconductors, will remain healthy in 2018. Semiconductor distributors will try to grow their chip sales not just by providing customers with the integrated circuits and discretes and the value-added and supply chain services for electronic systems already in production.

They will also assist customers in new product introduction efforts offering design support and expertise to midsize and small OEMs. In fact, many OEMs look to semiconductor distributors for design help, technical expertise and for recommendations concerning which chips and other components should be used in new designs.

"This is the core of what we do and is an exciting benefit of our specialty approach," said David Beck, vice president of marketing for Symmetry Electronics. Symmetry is a specialised semiconductor company focused on wireless, IoT, and video technologies. "Wireless itself is more of a horizontal than a vertical, so we end up supporting a wide variety of applications in many different industries," he said.

Wanted: Early NPI involvement Symmetry gets involved very early in new product development efforts to help customers with their "system architecture



David Beck, vice president of marketing for Symmetry Electronics

"Wireless itself is more of a horizontal than a vertical, so we end up supporting a wide variety of applications in many different industries"

decisions," said Beck. The distributor provides in-depth technical support throughout the design cycle. For instance, OEM customers often ask Symmetry for recommendations of the latest available technologies to meet their requirements, according to Beck.

"It's key for us that customers can receive support early on, and the services we provide in early-stage planning distinguishes us among semiconductor distributors," he said. Chipmakers are progressively recognising Symmetry's technical capabilities and are "increasing their relationship with us to better service an expanding

number of their customers," according to Beck.

Because Symmetry is specialised, it has close relationships with its suppliers that are "at the forefront of technology," he said. Many of its suppliers offer "synergistic products" to each other. "This allows us to develop a deeper technical knowledge of our line card through training provided by our suppliers, and we share that knowledge with our customers," said Beck.

He said the investment in time to solve a technical problem for one customer often benefits multiple customers developing



applications with the same technology. "This specialised advantage enables our application engineers to provide support for our customers at no cost," said Beck.

Symmetry's support team consists of field sales engineers, a technical field sales team, and a centralised applications engineering team for detailed technical assistance. "With this approach to support, we can dig deep into customers' designs through constant phone, email and video chat interactions along with local engineering support for onsite meetings" said Beck.

In some ways, Symmetry competes with larger broadline distributors. Just as large broad line distributors do, Symmetry provides supply chain and value-added services. "Symmetry has a full range of services for business of all sizes," said Beck. Many of Symmetry's customers are "mid-market companies and we scale our services to the needs of each customer," he said.

Symmetry operates its worldwide distribution logistics with a single global system, that enable the distributor to track and support customers throughout their supply chain, according to Beck.

With many customers, Symmetry provides bonded and pipeline inventory, and proximity warehousing for customers in China and Mexico, he said. "We also provide reconfiguration and programming services, material planning for our customers, and development kits and bundles on our website," said Beck.

Field support available

As a specialised semiconductor distributor with extensive technical knowledge, Symmetry can provide "highly technical

field support for our customers, a service that distinguishes us from the broad line distributors."

Symmetry's intention with customers is to focus on the "wireless and/or video part of their system that we can offer the most support for," said Beck. "Rather than trying to capture an entire bill of materials (BOM) list, we help customers design some of the key support-intensive devices into their products and offer a few of the most synergistic technologies around these devices," he said.

Another distributor that focuses on new product development and is seeing an increase in semiconductor sales is Mouser Electronics, based in Mansfield, Texas. Mouser is not a semiconductor specialist distributor, yet about 46 per cent of its business is for semiconductors.

"Semiconductors have gained about 10 per cent internal share of Mouser's business and continues outpacing most of the other product categories," said Mike Scott, vice president, product management for Mouser.

Don't forget legacy parts

He said Mouser's goal is to offer customers every component they need for their new designs, including legacy products. While Mouser focuses on manufacturers' new products, legacy products must also be available for immediate shipment or customers' designs can stall waiting for the full bill of materials to arrive," said Scott. It's also critical to have the development tools and test equipment available for OEM customers, he said.

Mouser's semiconductor business involves the "entire



Mike Scott, vice president, product management for Mouser

"Semiconductors have gained about 10 per cent internal share of Mouser's business and continues outpacing most of the other product categories"

semiconductor ecosystem," including integrated circuits and discretes, development tools, and modules, said Scott. For example, if a customer wants to add wireless capabilities to a design but isn't sure that wireless capability of the product will be successful enough in the marketplace to warrant the hiring of an engineer who understands antenna and transmission line theory. The customer can buy a pre-FCC certified wireless module that Mouser has in stock for the design so the level of interest in the wireless capability of the product can be determined.

If the product is a success, the OEM may want to hire an RF/wireless engineer to take cost out of their system prior to high volume production, said Scott.

A large part of Mouser's mission with semiconductors and other components is to get manufacturers' new products design into systems and to reach new customers for chipmakers. Manufacturers have a limited reach to potential new customers with a new product because there is not yet volume demand for it, so the parts may not be stocked by large volume distributors until a customer base materialises, said Scott.

Some designers will not consider

using a new product unless "they see we have stock on our shelves. That means a manufacturer could miss one or more design cycles simply because the product is not immediately available for purchase from Mouser," said Scott.

Besides having new products, Mouser also provides customers with technical information so that OEMs can evaluate new semiconductors. Such information is conveyed via distributor websites, new product newsletters or manufacturers.

Mouser has a technical support team to provide necessary information about new products for engineers considering using the components in the design. Information is critical because design cycles are shrinking and there is more pressure to develop and get products the market quickly.

"Mouser spends a tremendous amount of effort gathering as much technical information and resources designers may need to design with the newest products as well as millions of legacy products," said Scott. This includes data, development tools, and how-to videos. Mouser also has online tools customers can use to validate that their device selections have positive lifecycles and available stock, said Scott.

Ready to respond

We asked Digi-Key's chief operating officer and president, Dave Doherty, how the company has grown and how it remains responsive in a rapidly evolving market

Q What challenges have you faced in the years since you took over the reins at Digi-Key?

A The main challenge is the dynamic nature of the industry and the impact and opportunity that digital solutions now present to better serve our customers. Fortunately, we have a solid foundation and long-time proven track record on which to continue building. I'm a big believer in this quote from Charles Darwin: "it is not the strongest of the species that survives, nor the most intelligent, but the one most responsive to change."

Q Digi-Key has experienced phenomenal growth since Electronics Sourcing launched in 2005, at which point turnover was around \$300M. To what do you attribute this growth?

A Our growth is the result of multiple factors but stems largely from meeting the three primary needs of our customers: speed, selection and service. Aggregating global demand and servicing from a single fulfillment center allows us to offer the largest selection of components in stock and

available for immediate off the shelf delivery. Our suppliers use us as their primary platform to introduce their new products to our community of engineers and purchasing professionals.

Q How is the build going for your new facility, when is it due to be fully operational, and how will this benefit purchasers?

A The project is currently on schedule. It will be a 2.2 million square foot expansion, almost 3.5 times the size of our existing facility. More visible progress will be seen in around April or May this year, with construction at various phases of development into the end of 2020. Ultimately, the project enables us to sustain our model of offering that broad selection and high in-stock availability, with the benefit of combining orders from one shipping location.

Q There have been a lot of acquisitions in the component distribution sector, yet Digi-Key has not acquired any companies. Why is that?

A I believe you will continue to see

aggressive mergers and acquisitions for both suppliers and distributors, particularly for public companies unable to satisfy the stock market's pressure for growth. We've been fortunate to have a 46-year history of driving above industry growth organically. We never say never, but the challenge with merger and acquisition considerations is always the dilution of core focus on the value proposition to customers. We would be reluctant to do anything that would take away from our culture of passion for delighting the engineer and purchasing professional, who are our core customers.

Q The Digi-Key line card now includes automation, process control and industrial-related components. How are these products performing?

A Sales of newly added industrial automation products have exceeded expectations. Our conclusion is that these products resemble classic board level components in market and supplier fragmentation. This puts a premium on a distributor that can offer choice, availability and high service, all of which



Chief operating officer and president, Digi-Key Electronics, Dave Doherty



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are core competencies that we strive to improve upon every day.

Q What has changed in the electronic component supply chain over the last five years and what has Digi-Key done to combat these shifts?

A One of the most exciting transformations currently taking place is the transition away from the industrial age and its principles of requiring high volume and scale to offer competitive products. Instead we are moving towards micro-manufacturing, which relies on automation and robotics to cost effectively produce small lot, more customised runs. This evolution has placed an even higher premium on speed and responsiveness. It seems we are witnessing what Chris Anderson describes in the title of his book: *The Long Tail: Why the Future of Business is Selling Less of More*.

To this end, Digi-Key is partnered with new product introduction assembly partners that can commit to a 24-hour cycle time from schematics to completed assemblies. Meeting these requirements has demanded an entirely new machine to machine linkage through a suite of application programming interfaces that connect our systems with our customers' systems for increased efficiencies.

Q Finally, what advice would you give readers sourcing components in today's marketplace regarding extended lead times?

A There are no magic formulas. Demand has been higher than supply throughout 2017 and into 2018 in multiple product areas. Look for a distribution partner that you can trust to work with you, recognising the volatility and limits in your ability to forecast your end customer demand. At Digi-Key, our primary metric isn't how fast we turn our inventory but rather stocking sufficient quantity to maintain a high in-stock rate because, in fact, those two metrics aren't compatible; one is about serving shareholders, while the other is about serving customers.

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Managing allocation: a ten-point guide

Component allocation is back. With tightened supply and lengthening lead-times, Anglia Components' chief executive officer, Steve Rawlins provides purchasers with this ten-point protection plan

Before allocation

1 Place scheduled forward orders

Buyers with scheduled forward orders are always in the best position if demand for a component exceeds supply. If you can't commit to a schedule, offer your distributor a letter of intent that can be converted into orders on a rolling basis as things become clearer. It may be possible for the distributor to hold buffer stock against a letter of intent, which provides the best of both worlds. This can offer flexibility, as well as guaranteed availability for a set period.

2 Use a distributor that maintains inventory

Shareholder pressure means many distributors have reduced stock, however privately-owned businesses, like Anglia, can maintain a higher level of inventory, offering a temporary buffer when lead-times lengthen. Anglia made a bigger-than-usual investment in inventory late last year, meaning it has stock in a market where allocation of certain products, including chip resistors and chip capacitors, is under way. Brokers and customers from other parts of the world are beating down our door, but we are committed to supporting regular customers first.

3 Choose a distributor with a transparent culture

A good supply chain is based on transparency and an open culture. Anglia Sigma therefore provides purchasers with a complete overview of their business with Anglia in one convenient dashboard. It includes all transactions, regardless of whether they were placed by phone, email, EDI, fax or through Anglia Live. You can also see how Anglia has performed over the last twelve months, with information like the number of converted lines and their value, billings over the last five years and a breakdown of purchase orders by product type. Critically, the dashboard also shows Anglia's delivery performance, with a breakdown of shipments dispatched on time and delivered on time.

4 Be open with your distributor

The better a distributor understands your business, the more it can help. A forecast is always good, but Anglia likes to understand what that forecast is based on, and what factors influence demand. Does weather affect sales? Are there peaks, perhaps around one or more specific shows or events? Do your sales track the performance of a particular industry, like construction or oil? The more information is available, the better the support.

Purchasers that spot buy from brokers will be exposed when allocation bites

5 Manage stock properly

If you have your own buffer stock, manage it intelligently. Ensure you know what stocks you have. Anglia 80/20 was introduced to allow smaller customers to hold an on-site buffer stock on a pay-per-use basis, tracking component usage in real time on the web. Users can also adjust replenishment online to fit changing demand patterns. Normally, replenishment is automatic, following an agreed formula, but in an allocation situation, Anglia 80/20 tells the customer and the distributor exactly what they need to know to manage the situation.

▶▶
During allocation

► During allocation

6 Keep up to date on demand patterns

There is no excuse for being ill-informed about lead-times from Anglia, since we now publish this information on line. Lead-times on every single part are available on Anglia Live and are updated daily, together with live stock data. For example, if you order ten devices, you will see the stock level reduce in real time. I'm very vocal about challenging all distributors to offer this.

7 Extend order cover as far as possible

It is fair to assume that the growth we've seen will continue, and it will take a while for suppliers to increase capacity, so lead-times will likely continue to extend. Anglia is working hard with customers to mitigate supply problems and protect them from lead time issues. In general, purchasers would be well advised to increase their order cover as far as possible to avoid problems later in the year. Even where this isn't possible, as much visibility as possible on likely demand helps distributors to help you.

8 Be realistic about what you need and when

When allocation hits, customers who are realistic in their expectations are much easier to support. If you really need 800 reels this week and another 1,200 in a month's time, say so, rather than pushing for 2,000 reels now. The stock and forward orders we have will only go so far, and we do our best to keep all our customer's production lines turning if we possibly can.

9 Beware of multi-sourcing

Franchised distributors have to report their point of sale to the supplier, so if you multi-source from several distributors, this will be apparent. When allocation bites, placing multiple orders with several distributors can be dangerous. The supplier may well assume that you're double or treble ordering and put you at the back of the queue.

10 Use brokers only as a last resort

Most purchasers have used brokers on occasion when they really are up against it, but it is definitely a case of buyer beware. There are more and less reputable suppliers, and as a rule of thumb it is worth carefully checking and testing any components that have arrived via this route. The cost of such an exercise is tiny compared to the financial and reputational impact of a series of field failures.



CEO, Anglia Components,
Steve Rawlins

★ The golden rule

To boil these ten points down into one, I'd say relationship is key. Buyers that habitually spot buy from brokers, or other sources, will be exposed when allocation bites. Anglia believes in being transparent with its customers. If customers are equally transparent, we can support them much more effectively when things get difficult. During periods when there isn't enough stock to go around, a strong personal relationship is key to managing the situation and keeping everyone's production running as smoothly as possible.

www.anglia.com

Powering the industrial IoT take-over

Wireless sensors underpin the internet of things, yet consumer and industrial applications require very different battery solutions, as president of Memory Protection Devices, Tom Blaha, explains

A dynamic revolution is currently underway, with billions of wireless devices becoming interconnected through the internet of things. Consumer grade IoT devices commonly access data through wearable devices, smart phones, tablets, and laptops, often connecting to wireless sensors that operate in moderate indoor environments. Conversely, industrial wireless applications typically need to operate for longer periods, often in remote locations and extreme environments.

These fundamental differences mean purchasers sourcing products for consumer-oriented IoT face wildly different constraints to those working on industrial internet of things (IIoT) projects.

For example, IIoT-enabled sensors in inaccessible locations require extended battery life. This necessitates industrial-grade long-life lithium batteries, in combination with low power circuit architecture and low-power communications protocols. It also dictates low power networks, such as LPWAN and NB-IoT, and edge computing to manage copious amounts of data.

Consumer IoT systems, on the other hand, communicate via smart phone or WiFi, where battery access is simplified and where a consumer grade alkaline or rechargeable Lithium-ion battery will suffice.

Focus on reliability

The choice of battery and battery holder may well be cost-driven for consumer electronics, however for an industrial application, decision-making is more complex.

IIoT-enabled applications might have to operate for decades in a fixed location, requiring a 40-year lithium thionyl chloride (LiSOCl₂) battery and a battery holder that offers maximum reliability and corrosion-resistance, often with gold plated contacts. If the device is also exposed to extreme humidity, then a sealed enclosure is necessary.

Alternatively, if the IIoT-enabled device is portable and the battery can be replaced, extended battery life may not be a huge concern, but the battery holder will need to withstand shock, vibration, corrosion and extreme temperatures.

Environmental factors

As a rule, battery-powered solutions should be configured to deliver low mean times between failures. For example, mine safety equipment must be designed to withstand extreme humidity and corrosive gases, surviving ASTM B117 or equivalent salt spray tests. The battery holder must be constructed using superior quality raw materials that can withstand extreme temperatures.

Portable IIoT-enabled medical devices such as glucose meters, thermometers, or

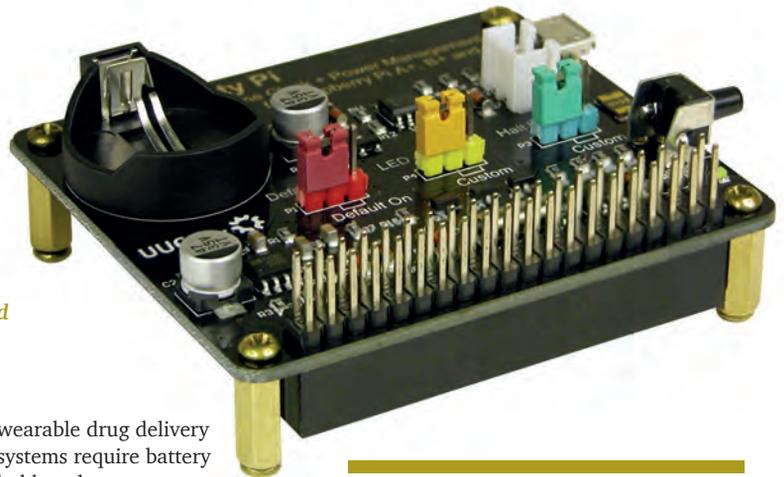
wearable drug delivery systems require battery holders that can meet rigorous FDA-21 standards, including drop testing, salt spray, thermal and contact wear testing.

Certain industrial grade medical devices also need to undergo routine sterilisation, preferably without removing either the battery or the battery holder. Autoclave steam sterilisation dictates high pressure and temperatures, while chemical sterilisation can involve highly corrosive compounds. There are also radioactive sterilisation procedures that use gamma rays or electronic beams. While most primary batteries need to be kept within a temperature range of approximately zero to 55°C during sterilization, certain LiSOCl₂ cells can operate at 125°C.

Cost of failure

As these examples illustrate, careful due diligence is required when specifying battery-operated solutions for IIoT. Design and procurement professionals must work together to ensure that the solution delivers optimal battery life with rugged and reliable performance that exceeds customer expectations. These factors need to be balanced against overall profitability, but invariably, it pays to invest in superior grade materials, rather than risk high rates of product failure.

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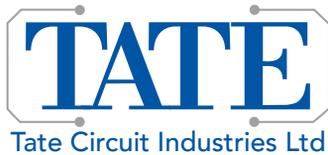


Battery-powered solutions should deliver low mean times between failures



Autoclave steam sterilisation dictates high pressure and temperatures, while chemical sterilisation can involve highly corrosive compounds





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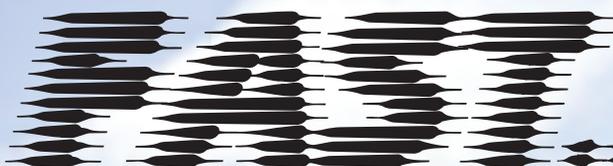
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Escape the roller coaster of fake demand

Developing a direct relationship with your semiconductor manufacturer could break the cycle of demand instability, explains microchipDIRECT global sales manager, Martin Warmington

To understand the phenomenon of fake demand, we need to understand the underlying market conditions that drive this rollercoaster's extreme ups and downs.

Looking at the semiconductor industry as a whole, we can see that, over the years, many manufacturers have sought to increase market share through acquisitions. Buying up competitors, and companies that enable them to penetrate new markets, potentially increases profitability.

With all these acquisitions, which continue a rapid pace, the industry now consists of a far smaller number of global players. From an original equipment manufacturer's perspective, acquisitions make the industry feel less competitive, however, average sale prices continue to fall, ultimately putting pressure on semiconductor distributor profits.

In this economic landscape, distributors tend to reduce their inventory levels, both in terms of the overall number of stock-keeping units and the volume held for each SKU. There is less investment in speculative stocking based on potential customer demand and a greater reliance on placing back-to-back orders to minimise the cost and risk of holding inventory for clients.

Triggering the cycle

The roller coaster of fake demand begins when lengthening lead-times create a manufacturing trigger point. OEMs will often try to mitigate the risk of longer lead-times by placing multiple orders with different distributors to cover the same requirement. This approach is based on widening the chance that the manufacturer, or at least one distributor, may be able to supply them with some stock.

Multiple OEM orders create the illusion of increased demand which, when relayed back to the semiconductor manufacturer, can seriously distort production forecasts. In some cases, fake demand has been known to create a 1.5:1 or higher book-to-bill ratio, leading manufacturers to step-up production to reduce lead-times and meet apparent customer demand.

As this new product begins to come off the lines, lead-times fall, and OEMs begin to cancel their duplicate orders. This causes the demand forecast to fall to its real level, often leaving manufacturers with excess inventory. In the worst-case scenario, this excess stock can trigger the manufacturer to slow production so that, when customers order again in six months' time, the cycle starts again.

Breaking the cycle

One of the most effective



The roller coaster of fake demand begins when lengthening lead-times create a manufacturing trigger point. OEMs will often try to mitigate the risk of longer lead-times by placing multiple orders with different distributors to cover the same requirement

Semiconductors

solutions to the problem of fake demand lies in purchasers developing a closer relationship with semiconductor manufacturers.

Traditionally, customers of different sizes have been channelled into different distribution models: online and catalogue houses support a high number of OEMs with low- to mid-volume orders; design-led distributors focus on a smaller number of mid- to high-volume OEMs. Only the highest-volume, tier one customers are able to develop a direct relationship with their semiconductor manufacturer.

Fortunately, those traditional barriers are now being challenged by the development of e-commerce sites like microchipDIRECT, which are designed to deal direct with customers of all sizes. Customers can range from a design house buying 100 pieces of a memory product, to an OEM spending hundreds of thousands of dollars per year on silicon requirements.

This emerging strategy has benefits for both sides. OEMs gain direct access to the manufacturer, as well as a rich source of timely information. This might mean they are first to find out about product inventories, quoted costs and availability, or have access to information on end-of-life parts, or to excess stock direct from the manufacturer. Larger OEMs also benefit from having a direct influence on the manufacturer's production-planning and gain a louder voice when deadlines lengthen and allocation starts to bite.

For the manufacturer, having a direct relationship with a wide customer base, gives greater visibility of OEM forecasts and build plans. These are the basis for more accurate and effective production planning.

Communication loops

One of the most common issues faced by mid-sized OEMs is erratic purchasing from their end-customers. To help smooth out these demand fluctuations, OEMs can try to arrange flexible 30-day cancellation terms for standard products, or take advantage of buffer stocks, as well as applying for credit terms. Their objective is to establish the



microchipDIRECT global sales manager, Microchip Technology, Martin Warmington

service-level agreements offered that will provide greater stability and certainty against a dynamic market.

Communication is crucial here, with a multi-tiered approach giving OEMs the speed and simplicity of ordering online, combined with the safety net of a team of real people behind the scenes. The microchipDIRECT support team, for example, handles a range of requests, most frequently for help with order statuses or quotes and lead-times. In the virtual world, communication via email or using microchipDIRECT's business dashboard, gives the OEM access to product information and a 360-degree view of their purchasing.

One of the reasons why mid-sized OEMs buy from non-direct channels is because they do not expect to be able to deal directly with their semiconductor manufacturer. But, with more distributors relying on back-to-back orders, there is a compelling case for all OEMs to develop a direct relationship the manufacturer, and with sites like microchipDIRECT that becomes a possibility.

After all, it is only through the transparent sharing of genuine demand forecasts that our industry will break the cycle of instability caused by the fake demand roller coaster.

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Rapid cycle times boost capacity

Higher throughput meets demand for faster cycle times — contract electronics manufacturer, Esprit Electronics, explains how it has invested in increased capacity

Hampshire based CEM, Esprit Electronics, has increased its surface mount capacity by 50 per cent, thanks to the installation of a new surface mount production line, which it believes to be one of the fastest in the UK.

The line, which cost in the region of £350,000, consists of two Yamaha I-pulse S20 machines, together with associated printer, conveyers, reflow and loader equipment.

According to Esprit, the machines will provide higher throughput and address the increasing need for faster cycle

times, ultra-large PCB handling and higher placement rates.

Sales director, Russell Otter, commented: "We know there is a demand for fast, efficient and accurate SMT machines that are capable of high volume. The investment in these new highly flexible S20's, each capable of 32,000cph, means that we can now offer some of the quickest cycle times and placement rates in UK."

Including the new machines, which were delivered last year, Esprit now boasts seven surface mount machines

across four production lines, giving a total surface mount capacity nudging 200,000cph.

This significant capital expenditure is part of Esprit's growth story, driven by an increase in volumes and customer demand.

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Esprit's new high speed SMT line will double its placement capacity

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Illuminating supply chain changes

Lighting products and their supply chain have changed immeasurably in recent years. Keeping up is a challenge: one that increasingly falls to procurement professionals, says director of solid state lighting, Arrow Electronics, Gary Zullo

Globalisation and technology advances are accelerating the pace of innovation in the lighting industry, which is creating some exciting opportunities. Keeping up with change can be challenging, with the burden falling mainly to procurement and supply chain professionals. There are, however, ways to stay ahead of the curve, not least identifying new products on the horizon that will impact the industry in the years to come.

First, let's talk about some of the changes of the past five years. Any experienced supply chain or procurement professional knows that it's important to prepare for anything that could go wrong, because it probably will. Even the most basic supply chain has numerous points of potential failure and inefficiency. Today's lighting supply chain, however, is far from basic.

Increased complexity
LED technology and digital

lighting have accelerated at a rapid pace in recent years and are now highly specialised. This specialisation ultimately enables better product design and performance, but it also increases the sheer scale of products that need to be managed within the supply chain. Generally increased complexity also equates to increased costs, risks and time to market.

Color-tunable LED drivers can change brightness and color temperature in response to natural light conditions



Director of solid state lighting, Arrow Electronics, Gary Zullo

Furthermore, it is impacting lead times. Traditional lighting applications had little-to-no lead time, but that all changed with the transition to smart, connected lighting, which is far more complex. During this transition, lighting original equipment manufacturers are struggling to keep up with hyper-accelerated design cycles, hardware and software integration and increased demand from non-traditional customers.

Globalisation adds another layer of complexity. The electronics industry has become more global in recent years, with sourcing and final assembly increasingly taking place in different parts of the world. For procurement pros, this globalised approach to sourcing and assembly has escalated the importance of staging the right materials at the right locations.

Streamlined supply
Although shifting dynamics like these have certainly proved challenging, we've also seen several trends helping to simplify and streamline supply chain operations.

Standardisation is one such positive trend; manufacturers of lighting components continue to align and evolve their offerings around standard packages and form factors. Flexibility is

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another; thanks to advances in LED technology, it's now easier than ever to design smart, flexible, energy-efficient lighting solutions and that is providing new opportunities for suppliers, OEMs, distributors and others.

An increased focus on sustainability is another positive trend. There is an emphasis on what happens when new technology devices reach the end of their useful lifecycle, which impacts the entire supply chain.

Stay informed

Clearly, all these changes, whether positive or challenging, have complicated the procurement process. So, what should purchasers be doing today to ensure they are sourcing the best lighting products and solutions for their needs?

For starters, keep reading industry news to follow macro-economic and technology trends that could impact the way the materials and end-products move through the supply chain. The more you know, the more successful you'll be at navigating potential pitfalls, finding efficiencies and successfully evolving your supply chain to keep up with changing times.

It's also important that you understand LED binning structure because it has a major impact on the viability of useful inventory, and on utilising products that carry proper performance certifications.

Another key step is to find the right partners. Focus on core competencies and leave complex, time-consuming work to someone who specialises in doing that. There are many partners out there who can help navigate procurement and supply chain challenges. Equipped with the right information and the right partners, new technologies and advances in lighting are actually providing a lot of exciting opportunities.



Intelligent opportunities

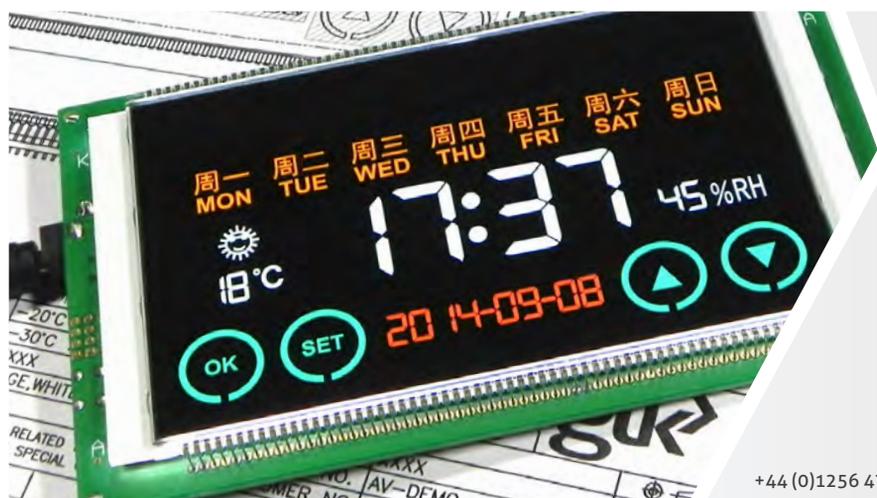
One of the most exciting opportunities is intelligent lighting and the internet of things. Lighting fixtures are already being enabled with sensing and connectivity functionality and this is accelerating the convergence of higher-complexity electronics in a host of new lighting solutions. Think smart city crosswalks that illuminate when pedestrians step into them, alerting oncoming motorists.

Another interesting area is color-tunable LED drivers that can change brightness and color temperature in response to natural light conditions. Not only do these drivers create lighting solutions that are more energy efficient, research shows they can make hospital patients and office workers healthier by maximising their exposure to natural light.

While change has always been a constant in the lighting supply chain, there's no denying it's accelerated in recent years, and will likely continue to do so. So, buckle up, study up and get prepared for this smart, connected ride.

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A degree is not enough for supply chain and purchasing job seekers

When hiring, supply chain managers at electronics companies prefer candidates who have advanced degrees, are bilingual and have a desire to continuously learn

It's not easy for a young person fresh out of college with a four-year degree to land a supply chain management or purchasing position with a major electronics OEM or electronics manufacturing services provider.

Competition is keen for many entry-level supply chain management jobs and many electronics companies want new hires to have multiple job skills and not just a degree. Of course, a degree in business, engineering or supply chain management is mandatory for most positions. Many supply chain management executives at OEMs and EMS providers also prefer candidates to have some experience or have gone through an internship program with an electronics company.

Many electronics companies also look for candidates who are bilingual, technologically savvy, are willing to continuously learn and can easily adapt to changes in business and markets.

Rasheed Mohamad, executive vice president global operations for Alcatel-Lucent Enterprise (ALE), based in Paris, says that his company requires job candidates for all supply chain and purchasing positions to have at least a bachelor's degree in supply chain management, engineering, or business, but a masters in those fields is "very desirable." He said candidates with APICs and CPIM certification are also preferred. He added ALE also likes to see candidates who have lean manufacturing experience and lean Six

Sigma Green or Black belt certification.

EMS provider MC Assembly, based in Melbourne, Fla., also prefers to hire candidates with advanced degrees. "We recently hired two MBA students and we have hired someone with a graduate degree in supply chain management," said Brian Kingston, director of human resources for MC Assembly. Kingston handles recruitment for supply chain positions at the company.

"We would hire someone with a four-year degree in supply chain management, but a graduate degree or MBA definitely sets a candidate apart," he said. It depends on how the candidate "fits with our culture at MC Assembly," said Kingston. He said added MC Assembly has hired supply chain employees without a degree in the past, if they had a "significant amount of direct EMS work experience on their resume."

Recruiting locally

MC Assembly fills one or two SCM positions per year and recruits from colleges near Melbourne. "We don't have a problem filling the entry level positions since Florida Institute of Technology (FIT) and University of Central Florida (UCF) provide us with several strong candidates," said Kingston. MC Assembly participates in career fairs at both FIT and UCF, he said. Kingston notes while it is not hard to fill entry-level positions, it is more challenging to fill positions that require people to have three to five years of SCM experience.

ALE also has little trouble finding talented people for entry-level supply chain and purchasing openings with local talent applying to job board postings. "I look for someone with experience and it's not difficult for me to find such people," said Mohamed. Besides having a four-year degree, Mohamed said all supply chain and purchasing employees at ALE, a global company, must be able to speak, read and write proficiently in English. Bilingual candidates are preferred for operations in China and eastern Europe.

"An ideal candidate would have supply chain or purchasing experience on a global scale and experience with outsourced manufacturing in China and eastern Europe," said Mohamad.

SCM degrees wanted

Some companies prefer to hire young people with supply chain management degrees rather than a business degree. Jeff Rudy, chief supply chain officer at NCR, based in Atlanta, said NCR is "partial to candidates who have specific degrees in supply chain. For example, candidates for supply chain analytical positions typically have graduate degrees in supply chain or industrial engineering," he said.

He added that Georgia Tech has an excellent supply chain engineering graduate program from which NCR recruits heavily. "For more operational roles we look for an undergrad or graduate degree or MBA with a supply chain



NCR is partial to candidates who have specific degrees in supply chain. For example, candidates for supply chain analytics or industrial engineering

- Jeff Rudy, chief supply chain officer at NCR



is much talk about a talent shortage in supply chain, we really don't feel that at the entry level," he said.

Rudy said for non-entry-level SCM positions, NCR looks for candidates with industry experience. "We're a large international company with operations in many countries, so a demonstrated ability to work in an international environment is desirable, as is the ability to speak multiple languages," said Rudy.

He said there is no template for an ideal candidate, but "a person who has demonstrated some operational or process leadership and has serious skills with the various analytical tools has a large advantage over other candidates. We also look for a diversity of experiences."

Many electronics companies are proactive in their recruitment efforts. They may work with colleges on business and supply chain management curriculum and offer internship programs to promising students in an effort to identify future job candidates. Internships give students some work experience and an insight in how a supply chain organisation operates.

Internships are often coveted by students looking for careers in supply chain

►► *continued on page 30*



An ideal candidate would have supply chain or purchasing experience on a global scale and experience with outsourced manufacturing in China and eastern Europe

- Rasheed Mohamad, executive vice president global operations for Alcatel-Lucent Enterprise

concentration," said Rudy.

NCR is very proactive about recruiting for supply chain management positions and works with schools in southeastern United States. "Our new global headquarters is adjacent to the Georgia Tech campus, so we obviously have close ties to the University," said Rudy. Tennessee, Clayton State, Georgia Southern all have "solid undergraduate supply chain programs from which we've recruited from as well," he said. NCR also has an active intern gateway program for supply chains. Rudy added there are several schools outside the southeast

that have prestigious supply chain graduate programs in NCR recruits at those schools as well. "Our head of global inventory is an alum of Texas A&M's program. I graduated from the University of Southern California's program. Michigan and Michigan State both have well known and regarded programs," he said.

The best and brightest

He said young people graduating from schools with supply chain programs "are more talented and capable than ever. Supply chain as a field is attracting some of the best and brightest students in the world. Although there



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► management and purchasing because they provide bona fide business world experience that students can't get in a classroom.

While internships are valuable to students, they also are beneficial to companies. Internships help companies identify up and coming talent, said Kingston. "This is very important for MC Assembly's future and sustained growth. The job market and technology are always changing, so making sure we have the top talent is important," he said.

The internship programs also help MC Assembly to further its ongoing partnership with local colleges. "These partnerships not only help cultivate talent, but also allow us to be part of the ongoing education" of students, some of whom will work with MC Assembly after graduation.

He said that about 10 per cent of students who take part in the six-week internship program are eventually hired by the EMS provider.

"This may seem low, but we partner with FIT and UCF for senior projects and can have upwards of 20 interns at one time," he said.

Rasheed said ALE has an internship program "where college students can come in learn and contribute." ALE's does not partner with any specific colleges with internships but takes "applications from college students based on expertise needed. In supply chain we have interns currently in data analytics and reporting," he said.

EMS provider Celestica also offers internships, which are part of its effort to recruit aggressively from universities. "Most of our sites in North America, Europe and Asia have internship programs and we are actively working with universities," said Kristie Syndikus, vice president,

supply chain, advanced technology solutions. "We not only recruit but we are all involved in curriculum development at universities to make sure that the business' needs for supply chain engineering get incorporated into the curriculum of universities that work with Celestica," she said.

The universities are very cooperative because they want to make sure they have a "funnel for their student" into companies that may hire them after graduation, she said.

Celestica offers supply chain management internships that last four, six or 16 months. Interns are rotated into different roles within the supply chain organisation or in different projects, so they get a lot of exposure within the organisation.

Celestica's internships center around the EMS provider's manufacturing locations. The company works with three to five schools per manufacturing site and the company has about 15 manufacturing locations.

The internship program has changed over the years. It has more of a technology focus as students are "asking to be much more involved in technology," she said. "It's not just tactical on how to key punch purchase orders. It is about getting involved in technology and how you use technology."

The number of internships has been steady over the years and is not dependent on how the company is doing.

Supply chain management internships are worthwhile for students. "I have noticed that people who do an internship program with Celestica or another company tend to have a very grounded perspective when they go into the workforce. They are very desirable for employers," she said.

Celestica looks favorably on candidates that have participated in internship programs either at Celestica or other electronics companies. However, to be hired by Celestica for an SCM position, it is not enough for a candidate to have a four-year degree or to have been an intern.

How's your Mandarin?

Language skills are important. Most of Celestica's business transactions are in local language and in English, so recruits hired outside often speak more than one language and often speak two or three different languages, said Syndikus. Besides being bilingual, candidates should also have a desire to learn and to continue to learn and the ability to adapt to change.

"What we look for is aptitude," said Syndikus. "We are looking for an aptitude rather than a professional designation. A degree gives you certain level of aptitude. A professional designation often means a person has aptitude, but not always."

Aptitude means the candidate has thought leadership that is required in supply chain management. "They have business leadership skills. They understand how to impact results, how to successfully navigate with a supplier or customer. They understand the market and have a strategic orientation," she said.

"If candidates show that, they are going to be highly sought after and highly regarded within our company."



Internships are often coveted by students looking for careers in supply chain management and purchasing because they provide bona fide business world experience that students can't get in a classroom



We would hire someone with a four-year degree in supply chain management, but a graduate degree or MBA definitely sets a candidate apart

- Brian Kingston, director of human resources for MC Assembly, who handles supply chain recruitment for the EMS provider



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Sensor market to grow despite price declines

Double-digit increases in sensor unit shipments will result in continued robust sales growth in worldwide sensor revenue



James Carbone

Semiconductor buyers can expect prices for sensors to decline an average of 2.5 per cent per year through 2022, despite annual double-digit increases in demand driven by automotive, industrial and smart phone applications.

The average price of a sensor will decline from \$0.39 in 2017 to \$0.34. Despite falling prices, the overall global sensors market will increase from \$8.5 billion in 2017 to \$12.7 billion in 2022, according to researcher IC Insights. Unit shipments will also rise by about 10 per cent per year.

The bad news for buyers – and the good news for sensor manufacturers – is that price erosion through 2022 will be less than the previous five years. From 2012 to 2017, the average sensor price declined by about 6.3 per cent per year.

“There’s been tremendous reduction in prices of sensors in recent years, but downward pricing pressure now has eased,”

said Rob Lineback, senior market research analyst for IC Insights.

One reason is that sensor demand is rising because of growing use of sensors in a wide range of customer segments, including automotive, industrial and communications among others. As a result, unit shipments are expected to rise 11.2 per cent per year through 2022, said IC Insights.

The sensors market includes accelerometers and gyroscopes, and field, temperature, humidity, gas, and fingerprint sensors and others.

Automotive continues to grow as an important driver of sensors because more of the devices are being used in conventional gas-powered cars, electric vehicles and hybrids and will be used even more in autonomous vehicles.

The automotive industry is the leading application for pressure sensors, said Lineback. Pressure sensors are for fuel injection in

engines and in exhaust systems. Accelerometers are also needed in exhaust systems, and stability control systems.

Automotive was the biggest driver of sensors from the mid-1990s until 2010 or so, said Lineback. “All of a sudden smart phones became the place to be for sensors.” Smart phones and other consumer products impacted the cost structure for sensors and manufacturers had to cut prices, he said.

Automotive dominates sensor market

But smart phone sales in recent years have been sluggish and the automotive market “right now is again the biggest driver for sensors,” said Lineback. In fact, automotive represents 38 per cent of the global sensors market, while communications, including smart phones accounts for 15 per cent of global sensors revenue. Industrial, which includes medical, commercial systems and factory automation accounts for 19 per cent, said IC Insights.

Consumer segment, including wearable electronics such as FitBits and smart watches, make up 14 per cent of the sensors market.

Automotive will likely dominate the sensors market due in part to the development of the autonomous, or self-driving vehicle. Automakers and other companies have announced plans to develop autonomous vehicles. Researcher Gartner said there should be multiple launches of autonomous vehicles around 2020. However, the full impact of autonomous vehicle technology will not begin to emerge until approximately 2025.

Autonomous vehicles will further drive sensor demand because they are expected to have 50 per cent more sensors than a standard, human driven car, said IC Insights. “It’s pretty clear that if we are really going to have these cars fully autonomous, we will see a lot of growth for sensors,” said Lineback.

By the Numbers



2.5%

The rate of annual decline of sensor prices through 2022



\$12.7 billion

The forecasted size of the worldwide sensors market in 2022



38%

The percentage of the total sensors sales that come from automotive market



24.1 billion

The expected number of sensors that will ship in 2018



The number of autonomous vehicles is expected to grow significantly from 2020 to 2030 and Gartner estimates that autonomous capable vehicles will represent approximately 25 per cent of passenger vehicles in 2030.

While many sensors will be used in autonomous vehicles, sensor content in standard cars and trucks will also increase because of advanced driver assistance systems (ADAS) such as lane centering, automatic braking, self-parking and other safety features. Sensors are needed for those system to operate.

"Automotive will be a big user of sensors regardless of whether vehicles are fully autonomous or not," said Lineback.

Sensors help phones be smart

While automotive will drive sensors sales, smart phones will also remain a "a big platform for sensors" because they are critical to the functions of iPhones, Androids and other smart phones. For instance, Apple's iPhone X contains five sensors from four different manufacturers including Bosch, ALPS, AMS and

STMicroelectronics. The phone uses accelerometer/gyroscope, compass, pressure, light and proximity sensors, according to researcher IHS Markit.

Sensor sales will likely increase when 5G cellular networks go into operation. More smart phone users will upgrade their phones to take advantage of 5G network capability which will of course further drive sensor demand as well as other semiconductors.

Besides smart phones and automotive, a lot of factory automation industrial equipment contribute to sensors demand growth. "A lot of robotics will be using a lot of sensors," said Lineback.

Focusing on sensors

Because sensor demand is rising, buyers can expect more chipmakers to focus on sensors. "The sensors business is a good one and there are some companies that are trying to expand their presence," said Lineback. For instance, Japanese electronics company TDK last year acquired InvenSense, a supplier of motion, ultrasonic environmental and other sensors.

Although unit demand for sensors will increase, the average selling price for sensors will fall
Source: IC Insights

Sensor prices to decline



Despite strong growth in demand, there should not be any serious supply issues with sensors. Lead times are mostly stable for most types of sensors. In the first quarter, NXP's sensor lead times were in the 8 to 16-week range, while Infineon's were 18 to 26 weeks; Bosch, 12 to 14 weeks; Vishay, 14 to 18 weeks in STMicroelectronics 14 to 20 weeks.

"Prices are stable, but there are increasing lead times for pressure sensors, but still well within the lead time of the other components," said a purchasing manager at an electronics manufacturing services provider.

Some sensor companies are integrated device manufacturers (IDM) and make their own sensors, while others outsource production to foundries. More sensors are being produced by foundries rather than in-house. Both IDMs and foundries are adding capacity.

"There has not been a problem with capacity," said Lineback. A lot of capacity has transitioned to 200 mm wafers. The move to larger size wafers is good news for buyers because manufacturers can get more usable die from 200mm wafers than 150mm or other smaller wafers.

"There's also a lot of older IC fab equipment that is not being used for ICs and is being turned over to sensors and discretes," said Lineback.

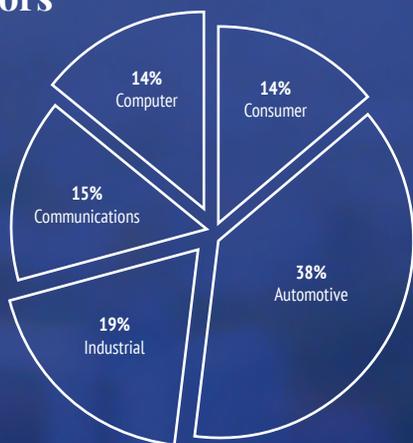
He added that many sensors are combined with an integrated circuit in a package. "The tricky part for sensors is on the packaging side. They (sensor companies) do a lot of subcontracting on that," said Lineback.

Because of strong demand, the sensor industry is healthy. However, to reduce risk buyers should make sure their sensor suppliers don't rely on one or two customers bulk of their business.

Lineback said some sensor companies have "gotten themselves in trouble by hitching their business too much to one company." For instance, InvenSense, before it was acquired by TDK, had strong sales and supplier sensors in the iPhone. A large percentage of the company's business came from Apple and Samsung.

When there was a slowdown with Apple products InvenSense had some difficulty and was later acquired by TDK.

Automotive demands the most sensors



Automotive and industrial are the two biggest customer segments for sensor manufacturers
Source: IC Insights

Cost and customisation are king

Even though the global economy is improving, exchange rate fluctuations and Brexit concerns mean buyers are still under pressure to control costs and add value

With cost at the top of any buyer checklist, CamdenBoss has increasingly seen requests to offer its high standard terminal blocks at more competitive prices. Driven by this demand, CamdenBoss has developed the CamBlock Plus range, a family of terminal blocks from 2.54 to 10.16mm pitch, designed to address competitive markets where cost savings are mandatory, without the disadvantage of sacrificing quality or approvals.

The new CamBlock Plus 2.54mm pitch rising clamp terminal block, for example, offers two to 12 poles and is UL approved. It is designed

for use in applications with limited space or low power products and is ideal for research and development, lighting, or fire and security products where space is at a premium. Development of this range is continuous, so expect more products to be released, complete with UL and VDE approvals where required.

Handling harsh environments

Meeting the demands of environmentally challenging applications is another factor that prompts buyers to demand product certification and approval. Accordingly, CamdenBoss has introduced a

new range of water and dust proof products with an IP68 ingress protection rating. This means they are protected from total dust ingress and from long term immersion in water, up to a specified pressure.

CPWP3 connectors meet this standard and offer further benefits, including a one-piece construction designed to reduce the possibility of incorrect assembly. All models in this robust range feature an integrated terminal block design so there are no small parts that might be dropped. This makes them ideal for use in field wiring applications where losing



CPWP3 water and dust proof connectors feature IP68 ingress protection and a one-piece construction to eliminate incorrect assembly

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parts would create difficulties. The one-piece construction also ensures ease of installation, with colour-coded screws/terminals making wiring up easy and Braille points for correct identification of connections in low light conditions.

One size no longer fits all
Another increasingly important trend is customisation, whether in terms of functionality, dimensions, appearance or construction. According to design manager at CamdenBoss, Dan Smalley, the company is experiencing increased demand for both customising 'off-the-shelf' products and for completely bespoke designs.

Dan commented: "On our standard products, this can range from something as simple as different colour end caps or corners to match a customer's corporate colours to adding printing using cost effective digital printing or LED light pipes to make the product look less generic."

To meet demand for completely bespoke designs, CamdenBoss' flat sheet plastic technology allows custom cases to be made quickly and cost effectively. The service relies on an in-house team of experienced engineers, with one engineer assigned to the project from sample to production for a smooth customer experience.

Thanks to a new joining technique, these custom enclosures can also be made



CamBlock Plus terminal blocks address cost-competitive markets without sacrificing quality or approvals



suitable for use in harsh environments. When sealed to IP68, the enclosures can be specified in a variety of previously impossible applications, including outdoors. Other benefits that can be incorporated include anti-microbial, UL rated self-extinguishing, or translucent materials.

According to CamdenBoss, the ability to offer a one

stop service including design and customisation, as well as a range of standard products, allows it to service a multitude of applications, from automotive and agriculture to rail, robotics and security. Not only this, it provides purchasers with the service level they require in today's competitive market.

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How to cut the cost of custom enclosures

Specifying custom electronics enclosures is time-consuming and impractical in low volumes. OKW reveals how to cut the costs involved by customising a standard enclosure instead

Excessive costs, endless design meetings and months of delays mean specifying custom electronics enclosures can be demanding, as well as impractical if you want low volumes. Times have changed, however, thanks to the introduction of innovative technologies.

Now it's possible to realise a cost-effective solution by ordering customised plastic or metal electronics enclosures, which can even be supplied in small batches. But what's the difference between a bespoke enclosure and a customised enclosure?

OKW Enclosures marketing director, Robert Cox, said: "Opting for 'bespoke' means designing a completely new enclosure from scratch. It takes time, which inevitably translates into cost.

"It's far quicker and much more cost effective to go for a customised enclosure instead.

Simply specify a standard enclosure then decide how you would like it to be customised to your exact requirements."

Unrestricted choice
There are now so many standard enclosures available, even for specialised applications, that it doesn't take much customisation to create the perfect housing; one that differentiates your product from your competitors, thereby providing more bang for your buck.

There is a vast array of customisation options, including: CNC machining, plastic and aluminium panels, display windows, custom colours and finishes and printed logos and legends. Buyers can also specify flame retardant materials, EMC shielding, membrane keyboards and touchscreens, power supplies, battery compartments and charging stations. Installation of



Customised OKW enclosures and front panels

components and assembly of accessories is also an option, which means you can outsource the entire manufacturing process from beginning to end.

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Cutting costs

According to OKW, there are some cunning ways to get the cases you want more cost effectively.

For buyers that require a custom colour, the minimum order for moulding plastic in non-standard colours



is usually 200 to 250 enclosures. Opt for lacquering instead and that drops to just 25 units. Purchasers have a choice of colours, including metallic, marble, wood effect

or animal print and textures such as matt, silk gloss or velvet-feel. Antibacterial paint can be specified for medical applications or ESD lacquer to prevent electrostatic discharges.

Further savings can be made by specifying digitally printed legends and logos instead of traditional screen printing. Set-up costs are lower, making it significantly more cost effective and viable for low volumes.

When it comes to ordering special sizes, think about extruded metal enclosures such as OKW's Synergy or Smart-Terminal products, or Rolec's mobilCASE. They're easy to customise because they can be cut to any length, with minimum order numbers as low as 10 units.

Focussing on 19in rack cases or instrument enclosures, consider specifying one that can be customised in three dimensions such as Metcase's new Technomet or Combimet 19in enclosures. Again, the minimum order is 10 units.

Single-source savings

As a final thought, OKW suggests buyers partner with a standard enclosures manufacturer capable of offering single-source supply.

This avoids spreading the various customisation processes across a series of providers, which takes time and creates more paperwork and potential delay.

Choosing a supplier that provides 3D modelling also helps speed up the customisation process. The OKW and Metcase websites both offer downloadable files so you can see how components will look in the finished housing.

Other manufactures such, as Rolec, have made the process even easier by offering 3D product configurators for various models: aluDISPLAY and mobilCASE extruded aluminium enclosures; multiPANEL display and control enclosures; and profiPLUS 50 and 70 suspension arm systems.

Delivery times for customised enclosures will vary depending on the amount of extra work required, typically ranging from two to six weeks — in many cases providing purchasers with significant potential time savings.

www.okw.co.uk



Extruded metal enclosures such as OKW's Smart-Terminal can be cut to any length



Choosing a supplier that provides 3D modelling also helps speed up the customisation process



Paving the way for Industry 4.0

Real-time machine-to-machine communication relies on low-latency data transfer. Edge computing can provide a smart solution, as Rittal explains

Companies that employ machine-to-machine communication to streamline manufacturing require real-time capabilities.

The sensors and actuators deployed in smart production systems continuously relay information on the status of processes and infrastructure. This forms the basis for innovative services, such as alerts, predictive maintenance, and machine self-optimisation in real-time. To make this possible, and to rapidly respond to events and anomalies, low latency between production and IT infrastructure is critical.

Ready-to-go edge computing

A remote cloud data centre is unable to support these scenarios. Edge computing at the perimeter of a given network provides a solution. IT resources deployed in close geographical proximity ensure that latency is low, and data readily available. With this in mind, Rittal has introduced a new edge data centre: an end-to-end product with standardised, preconfigured IT infrastructure. This turn-key solution can be implemented rapidly and cost-efficiently, thereby paving the way for Industry 4.0.

The Rittal Edge Data Centre comprises two Rittal TS IT racks, plus corresponding modules for climate control, power distribution, UPS, fire suppression, monitoring and secure access. Units are available in various output classes, and can be combined for rapid deployment. Moreover, to safeguard critical components from heat, dust and dirt in industrial environments, the Rittal Edge Data Center can be implemented in a self-contained high-availability room.

As Rittal's technical manager for IT infrastructure, Clive Partridge, observes: "The Edge Data Center allows organisations to quickly and simply establish IT environments equipped for the challenges of what's been termed 'the fourth industrial revolution.' Combined with the 'as-a-service' offering that we jointly provide with iNNOVO Cloud, the Rittal Edge Data Center is a complete, one-stop solution for enterprises of all sizes."

To streamline edge data centre planning, Rittal offers a web-based configurator, which means compact and small enclosures can be quickly and easily configured online. Customers can choose the right accessories, without reference



Rittal's Edge Data Center offers effective edge computing for smart production systems

to a catalogue, then position and prepare the enclosure for mechanical processing.

Select service options

Customers who would prefer not to operate the edge data centre themselves can opt for Rittal's data-centre-as-a-service (DCaaS) offering. They are then free to focus on their core tasks while harnessing the benefits of the internet of things for their business. Hand-in-hand with its IT-as-a-service (ITaaS) platform provider iNNOVO Cloud, Rittal also offers private-cloud data centres in shipping containers, plus ITaaS. The containers are fully equipped with all key active components, such as servers, network connectivity and storage for immediate use.

Finally, for a flexible solution, the Rittal Edge Data Center can be extended two racks at a time. This modular approach provides customers with diverse options, allowing it to accommodate a variety of scenarios, including installation in an IT security room, or in a container, to be located wherever it is required.

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Calling all budding football players and spectators

Thursday 14 June is the date for the *Electronics Sourcing's Annual Industry Five-a-Side Football Tournament*, to be held at the Sussex FA Headquarters Stadium in Lancing, West Sussex.

Sponsored by Gelec and ecsn the tournament is a great opportunity for individual players or teams of five or six. The tournament is played in a respectful yet competitive manner.

Entry is free and food/refreshments are provided by *Electronics Sourcing* for players and spectators alike. The tournament is also a great opportunity to network with readers of *Electronics Sourcing magazine* and companies providing components or services.

Ex-professional players will be available to make up numbers for teams needing extra players, plus Under-18 Albion in the Community Scholars (volunteering for the day) will also fill in where required.

Companies such as GB Electronics, Avnet Abacus, Camden Boss, GELEC, Photronix, Esprit, Harwin,

Farnell, MMG Publishing, AVX, Napier and Publitek have already registered. To enter yourself or your team please e-mail sales@electronics-sourcing.com or call 01892-613400.

To coincide with the tournament, ecsn is hosting its *UK Electronic Components Annual Dinner* in Brighton in the evening. Sponsored by *Electronic Sourcing Magazine* and Gelec, the evening begins at 6pm when Aubrey Dunford presents: *'What's Happening in the Global Electronic Components Markets'*. Dunford's presentation usually sparks lively debate on subjects such as components availability, lead-times, new applications and market growth during his presentation, at the bar and over dinner.

The guest speaker for the evening is Dr Dave Richards, a globally recognised innovation thought-and-practice leader, author, entrepreneur and most notably, co-founder of the MIT Innovation Lab.

During the evening, *Electronics Sourcing's* publisher Mark Leary and ex

Spurs, Portsmouth & Brighton player Guy Butters will auction football memorabilia with all monies donated to the Albion in the Community charity.

For this year's auction we have (subject to change)

- 1) Framed Geoff Hurst 1966 World Cup signed replica shirt
- 2) Manchester United Home signed shirt
- 3) Liverpool Home signed shirt
- 4) Sheffield Wednesday football signed by the entire squad 2018
- 5) Arsenal Home signed shirt
- 6) Portsmouth plaque signed by entire squad 2018
- 7) Chelsea Home signed shirt
- 8) Crystal Palace Home signed shirt.

To make a pre-auction bid e-mail sales@mmgpublishing.co.uk.

Gelec and *Electronics Sourcing* are subsidising the cost of attending. Readers who mail Jill Waite at enquiries@ecsn-uk.org and insert 'ecsn Industry Event - *Electronics Sourcing Reader*' in the subject line can purchase tickets for just £49 per seat.



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4D Systems
Aavid Thermalloy
ABLIC U.S.A. Inc.
Abracon LLC.
Accoreer AB
ACKme (Zentri)
ACL Staticide, Inc.
Active-Semi
Adafruit
Adapteva
Adesto Technologies
ADI (Analog Devices, Inc.)
Advanced Linear Devices, Inc.
Advanced Photonix (Luna Optoelectronics)
Advanced Sensors / Amphenol
Advanced Thermal Solutions, Inc.
Advantech
Aearo Technologies, LLC – a 3M company
Aeroflex (MACOM Technology Solutions)
Aerospace Defense and Marine / TE Connectivity
Affinity Medical Technologies - a Molex company
Agastat Relays / TE Connectivity
AIM-Cambridge / Cinch Connectivity Solutions
AKM Semiconductor, Inc.
AK-NORD GmbH
ALCOSWITCH Switches / TE Connectivity
AlfaMag Electronics (AMGIS)
All Sensors Corporation
Allegro MicroSystems, LLC.
Alliance Memory, Inc.
Alliance Sensors Group a div of HG Schaevitz LLC
Alpha and Omega Semiconductor, Inc.
Alpha Wire
Altera (Intel® Programmable Solutions Group)
AMBER wireless GmbH
Ambiq Micro, Inc.
American Electrical, Inc.
American Technical Ceramics
Ametherm
Amgis
AMI Semiconductor / ON Semiconductor
AMP Connectors / TE Connectivity
Amphenol
Amphenol Advanced Sensors
Amphenol Aerospace Operations
Amphenol Anytek
Amphenol Audio
Amphenol Commercial (Amphenol ICC)
Amphenol Connex (Amphenol RF)
Amphenol Entertainment
Amphenol FCI (Amphenol ICC)
Amphenol Industrial
Amphenol Information Communication & Commercial
Amphenol LTW
Amphenol Pcd
Amphenol RF
Amphenol Sine Systems
Amphenol Spectra-Strip
Amphenol SV Microwave
Amphenol Tuchel Electronics
Ampleon
ams
Amulet Technologies, LLC.
Analog Devices, Inc.
Anaren
AnDAPT
Angstrom / Vishay
Antenova
Anytek (Amphenol Anytek)
Apacer
APEM Inc.
Apex Microtechnology
Apex Tool Group
API Delevan
API Technologies Corp.
APM Hexseal
Aptina / ON Semiconductor
ARCOL (Ohmite)
Arcoelectric (Bulgin)
Arcotronics (KEMET)
Arduino
Aries Electronics, Inc.
ARM
Artaflex Inc.
Artesyn Embedded Technologies

Asahi Kasei Microdevices / AKM Semiconductor
ASSMANN WSW Components
Astec America (Artesyn Embedded Technologies)
Astro Tool Corp.
Atmel (Microchip Technology)
Atop Technologies
ATP Electronics, Inc.
Ault / SL Power
Avago Technologies (Broadcom Limited)
Aven
Avery Dennison
AVX Corporation
Axicom Relays / TE Connectivity
Azoteq
Aztronic / Vishay
B B Battery
B&F Fastener Supply
B&K Precision
B+B SmartWorx, Inc.
BeagleBoard.org
Beau Interconnect - a Molex company
BEI Sensors
Bel
Bel Fuse, Inc.
Bel Power Solutions
Belden
Belden's Hirschmann
Bergquist
BI Technologies / TT Electronics
Birtcher / Pentair
Bivar, Inc.
BlueCreation
BlueRadios, Inc.
Bluetech GmbH
BNS Solutions
Bomar (Winchester Electronics)
Bopla Enclosures
Bosch Connected Devices and Solutions
Bosch Sensortec
Bourns, Inc.
Brad Harrison - a Molex company
Breadware, Inc.
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
Carlo Gavazzi
Catalyst Semiconductor / ON Semiconductor
CEL (California Eastern Laboratories)
Central Semiconductor
Cera-Mite / Vishay
CGS Resistors / TE Connectivity
CH Products
Chemi-Con
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
Coiltronics (Eaton)
Comair Rotron
Comchip Technology
Comus International

Concept Technologie (Power Integrations)
Condor / SL Power
CONEC
Connex (Amphenol RF)
Connor-Winfield
Conxall / Switchcraft
Cooper Bussmann (Eaton)
Copal Electronics (Nidec Copal Electronics)
Corcom Filters / TE Connectivity
Cornell Dubilier Electronics
Cortina Systems (Inphi)
Cosec
Coto Technology
CR Magnetics, Inc.
Cree
Cree WolfSpeed
Crescent
Critical Link
Crouzet
Crowd Supply
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
Datawave Wireless
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
Dielectric Laboratories (Knowles)
Digi International
Digent, Inc.
Digital View Inc.
Diodes Incorporated
Displaytech
DLI
DLP Design, Inc.
Draloric / Vishay
dresden elektronik
Dynastream Innovations Inc.
E Ink
EasyBraid Co.
Eaton
ebm-papst Inc.
Echelon
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
ERP Power
Espressif Systems

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.
Extech
E-Z-Hook
Fairchild (ON Semiconductor)
Fan-S Division / Qualtek Electronics Corp.
Fanstel Corp.
FCI (Amphenol ICC)
FCT Electronics - a Molex company
FDK America
Fedco Batteries
FERROXCUBE
Finisar Corporation
FIT (Foxconn Interconnect Technology)
Flamar - a Molex company
Flambeau, Inc.
FLIR
Formerica Optoelectronics Inc.
Fox Electronics
Foxconn Optical Interconnect Technologies
Free2move
Freescale Semiconductor, Inc. (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)
GenSiC Semiconductor
Genuino (Arduino)
GHI Electronics, LLC
Global Power Technologies Group
Global Specialties
Grayhill, Inc.
Greenlee Communications
GWConnect - a Molex company
H&D Wireless
H.G. Schaevitz, LLC / Alliance Sensors Group
Hamlin / Littelfuse
Hammond Manufacturing
HARTING
Harwin
Heatron
HellermannTyton
Henkel/Loctite
Heraeus Sensor Technology USA
Hillcrest Labs
HiRel Systems / Vishay
Hirose
Hirschmann
Hittite (Analog Devices)
Hoffman Enclosures, Inc.
Hologram
Holsworthy Resistors / TE Connectivity
Holt Integrated Circuits, Inc.
Honeywell Microelectronics & Precision Sensors
Honeywell Sensing and Productivity Solutions
I/O Interconnect
IAR Systems Software Inc
ICCNexergy (Inventus Power)
IDT (Integrated Device Technology)
II-VI Marlow
Illinois Capacitor
ILLUMRA
Industrial Fiber Optics, Inc.
Infineon Technologies
Initial State Technologies, Inc.
Innovasic Semiconductor / Analog Devices, Inc.
Inolux
Inphi
Insight SiP
Inspired LED
Integrated Device Technology (IDT)

Integrated Silicon Solution, Inc. (ISSI)
Intel® Programmable Solutions Group
Intermatic
Interconnect Systems - a Molex company
Interlink Electronics
International Rectifier (Infineon Technologies)
Intersil (Renesas Electronics America)
InvenSense / TDK
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
IXYS RF
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.
Kavlico Pressure Sensors
Keil (ARM)
KEMET
Kennedy Labs
Kester
Keystone Electronics Corp.
Khatod
Kilo International
Kilovac Relays / TE Connectivity
Kingbright
Kings (Winchester Electronics)
Kiniox
Klein Tools
Knowles
Knowles DLI
Knowles NOVACAP
Knowles Syfer
Knowles Voltronics
Kyocera
Kyocera Display
Laird
Laird - Antennas
Laird - EMI
Laird - Signal Integrity Products
Laird Connectivity
Laird Connectivity (LSR)
Laird Thermal Materials
Lantronix
LAPIS Semiconductor
Lattice Semiconductor
Leader Tech Inc.
LeCroy (Teledyne LeCroy)
LED Engin
LEDynamics, 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
LTW (Amphenol LTW)
Lumberg Automation
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.
 Makeblock
 Mallory Sonalert Products
 Marktech Optoelectronics
 Marlow Industries, Inc.
 Martel Electronics
 Marutsuelec
 Master Appliance Corp.
 Matrix Orbital
 MaxBotix Inc.
 Maxim Integrated
 MaxStream (Digi International)
 Maxwell Technologies, Inc.
 MCB Industrie / Vishay
 McGraw-Hill Education
 MEAN WELL
 Measurement Specialties /
 TE Connectivity
 MEC switches
 Mechatronics
 MegaChips
 Melexis
 Memory Protection Devices
 MEMSIC
 Menda
 Mentor Graphics
 Metelics (MACOM Technology
 Solutions)
 METZ CONNECT
 MG Chemicals
 Micrel / Microchip Technology
 Micrium
 Micro Commercial Components (MCC)
 Microchip Technology
 microEngineering Labs Inc.
 Micro-Measurements /
 Vishay Precision Group
 Micron Technology
 Micronas / TDK
 Microsemi
 Microwave Technology
 Midcom / Wurth Electronics
 Mide Technology
 Midwest Microwave / Cinch
 Connectivity Solutions
 MikroElektronika
 Mill-Max
 Mills / Vishay
 Milwaukee / Vishay
 MMB Networks
 Molex
 Molex Affinity Medical Technologies
 Molex Beau Interconnect
 Molex Brad Harrison
 Molex FCT Electronics
 Molex Flamarc
 Molex GWConnect
 Molex Interconnect Systems
 Molex NuCurrent
 Molex Oplink Communications, LLC.
 Molex Phillips-Medisize
 Molex PolyMicro Technologies
 Molex Temp-Flex
 Molex Woodhead
 Monnit
 Monolithic Power Systems
 MPD (Memory Protection Devices)
 MPS (Monolithic Power Systems)
 Mueller Electric Co.
 Multicore / Henkel
 Multi-Tech Systems, Inc.
 Murata Electronics
 Murata Power Solutions
 Nakagawa Manufacturing USA, Inc.
 National Semiconductor /
 Texas Instruments
 Navman Wireless (Telit)
 NDK
 Nearson
 Neohm Resistors / TE Connectivity
 Neonode
 Nesscap Co., Ltd
 NetBurner, Inc.
 Newava Technology
 Newhaven Display, Intl.
 Nexperia
 Nichicon
 Nidec Copal Electronics
 NimbeLink
 Nippon Chemi-Con
 NJR Corporation / NJRC
 NKK Switches
 NMB Technologies Corp.
 NorComp
 Nordic Semiconductor
 NOVACAP
 NovaSensor / GE Measurement &
 Control

NuCurrent - a Molex company
 Nuvoton Technology Corporation
 America
 NVE Corporation
 NXP Semiconductors / Freescale
 O.C. White Co.
 Octavo Systems
 ODU
 OEG Relays / TE Connectivity
 Ohmite
 OK Industries (Jonard Tools)
 Olimex
 Omron Automation & Safety
 Omron Electronic Components
 ON Semiconductor
 On-Shore Technology, Inc.
 Oplink, a Molex company
 Optek Technology / TT Electronics
 Option NV
 Opto Diode Corporation
 Opulent Americas
 O'Reilly Media, Inc.
 Orion Fans
 OSRAM Opto Semiconductors, Inc.
 Packet Digital LLC
 Paladin Tools (Greenlee
 Communications)
 Panasonic
 PanaVise
 Panduit
 Parallax, Inc.
 Parlex Corp.
 Particle
 Patco Electronics
 Patco Services
 PCD / Amphenol
 Peerless by Tympany
 Pentair
 Peregrine Semiconductor
 Pericom Semiconductor Corp.
 (Diodes Incorporated)
 Pervasive Displays
 PHIHONG USA
 Phillips-Medisize - a Molex company
 Phoenix Contact
 Phoenix Mecano
 Phoenix Passive Components /
 Vishay
 Phytion, Inc.
 PI Supply
 Pimoroni
 PolyMicro Technologies -
 a Molex company
 Polytech / Vishay
 Pomona Electronics
 Pontiac Coil, Inc.
 Portescap
 Potter & Brumfield Relays /
 TE Connectivity
 Power Integrations
 Powerex, Inc.
 Power-One (Bel Power Solutions)
 PowerStor (Eaton)
 PRD Plastics
 Preci-Dip
 Precision Design Associates, Inc.
 Precision Electronic Components Ltd.
 Precision Technology, Inc.
 ProAnt
 Products Unlimited Transformers &
 Relays / TE Connectivity
 Protektive Pak
 PUI Audio, Inc.
 PULS
 Pulse Electronics Corporation
 PulseCore Semiconductor /
 ON Semiconductor
 PulseLarsen Antennas
 Pycrom
 Q-Cee's / TE Connectivity
 Qoitech
 QT Brighttek
 Quadcept
 Qualcomm
 Qualcomm (RF360 - A Qualcomm &
 TDK Joint Venture)
 Qualtek Electronics Corp.
 Quatech / B+B SmartWorx
 Rabbit Semiconductor
 (Digi International)
 Radial Magnet, Inc.
 Radiocrafts
 RAF
 RAFI
 Ramtron (Cypress Semiconductor)
 Raspberry Pi
 Raychem Cable Protection /
 TE Connectivity

RayVio
 RECOM Power
 Red Lion Controls
 REDEL / LEMO
 Renesas Electronics America
 RF Digital
 RF Solutions
 RF360 - A Qualcomm-
 TDK joint venture
 Richco, Inc. (Essentra Components)
 Richtek
 Riedon
 Rigado
 Roederstein / Vishay
 ROHM Semiconductor
 Rose Bopla
 Rose Enclosures
 Rose+Krieger
 Rosenberger
 Roving Networks / Microchip
 Technology
 RPM Systems
 Rubycon
 RushUp
 Sagrad
 Samsung Electro-Mechanics
 Samsung Semiconductor
 Samtec, Inc.
 Sanken Electric Co., Ltd.
 Sanyo Denki
 Sanyo Semiconductor /
 ON Semiconductor
 Schaffner EMC, Inc.
 Schrack Relays / TE Connectivity
 Schroff / Pentair
 Schurter
 SCS
 Seeed
 Segger Microcontroller Systems
 Seiko Instruments, Inc.
 Semflex / Cinch Connectivity
 Solutions
 Semtech
 Sensata Technologies, Airpax
 Sensirion
 Sensirion Semiconductor /
 SMC Diode Solutions
 Seoul Semiconductor
 Serious Integrated
 Serpac Electronic Enclosures
 SGX Sensortech
 Sharp Microelectronics
 Sierra Wireless
 Sigfox
 Sigma Designs
 Sigma Inductors / TE Connectivity
 Signal Transformer
 Silego Technology
 Silicon Labs
 SINE Systems / Amphenol
 Siretta
 SiTime
 SkyTek
 Skyworks Solutions, Inc.
 SL Power Electronics - Manufacturer
 of Condor / Ault Brands
 SMC Diode Solutions
 Soberton, Inc.
 Socle Technology Corporation
 SolidRun
 Souriau Connection Technology
 Spansion (Cypress Semiconductor)
 SparkFun
 Spec Sensors
 Spectra Symbol
 Spectra-Strip (Amphenol
 Spectra-Strip)
 Sprague Goodman
 SSI Technologies, Inc.
 Stackpole Electronics, Inc.
 Staco Energy Products Co.
 Standex-Meder Electronics
 Stanley Electric
 Steinel
 steute Wireless
 Stewart Connector
 STMicroelectronics
 Storm Interface
 Sullins Connector Solutions
 Sumida Corporation
 SunLED
 Sunon
 Susumu
 SV Microwave (Amphenol SV
 Microwave)
 Swanstrom Tools
 Swissbit
 Switchcraft / Conxall

Syfer
 Synapse Wireless
 Tag-Connect
 Tahtien
 Taiwan Semiconductor
 Taiyo Yuden
 Talema
 Tallysman Wireless
 Talon Communications, Inc.
 Tamura
 Taoglas
 TAOS / ams
 TDK Corporation
 TDK InvenSense
 TDK Micronas
 TDK RF360
 TDK-Lambda Americas, Inc.
 TE Connectivity
 TE Connectivity Aerospace Defense
 and Marine
 TE Connectivity ALCOSWITCH
 Switches
 TE Connectivity AMP Connectors
 TE Connectivity Corcom Filters
 TE Connectivity DEUTSCH Connectors
 TE Connectivity DEUTSCH
 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
 Texas Instruments's Schrack Relays
 TE Connectivity's Sigma Inductors
 Teccor / Littelfuse
 Techflex
 TechNexion
 Techno / Vishay
 Techspray
 TechTools
 Telcodium
 Teledyne LeCroy
 Telit
 Temp-Flex - a Molex company
 Tensility International Corporation
 Terasic Technologies
 Test Products International (TPI)
 Texas Instruments
 t-Global Technology
 Thales Visionix, Inc.
 Thermometrics / GE Measurement
 & Control
 ThingMagic
 Thinxtra Solutions Limited
 Thomas Research Products
 TinyCircuits
 TOKO / Murata
 Torex Semiconductor Ltd.
 Toshiba Memory America, Inc.
 Toshiba Semiconductor and Storage
 Touchstone Semiconductor
 TPI (Test Products International)
 TPK America LLC
 Transphorm
 Trenz Electronic
 Triad Magnetics
 TRINAMIC Motion Control GmbH
 Tripp Lite
 Trompeter / Cinch Connectivity
 Solutions
 Tronics
 TRP Connector

TSC (Taiwan Semiconductor)
 TT Electronics
 TT Electronics / BI Technologies
 TT Electronics / IRC
 TT Electronics / Optek Technology
 TT Electronics / Welwyn
 Tuchel / Amphenol
 Twin Industries
 TXC Corporation
 Tyco Electronics
 Tympany (Peerless by Tympany)
 U.S. Sensor/Littelfuse
 UD00
 Ultra Librarian®
 Ungar / Weller
 United Chemi-Con
 US-Lasers, Inc.
 Varitronix International Ltd.
 VCC (Visual Communications
 Company)
 VEAM
 Vector Electronics & Technology, Inc.
 Verivolt
 VersaLogic Corporation
 VersaSense
 Vicor
 Vicotree
 Vifa (Peerless by Tympany)
 Viking Technology
 Virtium Technology Inc.
 Vishay
 Vishay / BCComponents
 Vishay / Beyschlag
 Vishay / Cera-Mite
 Vishay / Dale
 Vishay / Huntington Electric, Inc.
 Vishay / Semiconductor -
 Diodes Division
 Vishay / Semiconductor -
 Opto Division
 Vishay / Sfernice
 Vishay / Siliconix
 Vishay / Spectrol
 Vishay / Sprague
 Vishay / Thin Film
 Vishay / Vitramon
 Vishay Foil Resistors
 Vishay Precision Group
 Vishay Precision Group /
 Micro-Measurements
 Visual Communications Company, LLC
 Vitelec / Cinch Connectivity
 Solutions
 Volgen / Division of Kaga
 Electronics USA
 Voltronics (Knowles)
 VPG / Micro-Measurements
 Wakefield-Vette
 Walsin Technology
 Wandboard
 WeEn Semiconductors Co., Ltd
 Weidmuller
 Weller
 Welwyn / TT Electronics
 Wickmann / Littelfuse
 Wiha
 Winbond Electronics Corporation
 Winchester Electronics
 Wintec Industries
 Wiss
 WIZnet
 Wolfspeed - a Cree company
 Woodhead - a Molex company
 Wurth Electronics
 Wurth Electronics iBE
 Wurth Electronics Midcom
 Xcelite
 Xeltek
 Xilinx
 XMOS
 XP Power
 Xsens
 Yageo
 Zentri (Silicon Labs)
 Zetex Semiconductors (Diodes
 Incorporated)
 ZF Electronics
 Zilog



DIGIKEY.CO.UK LINECARD

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
CABLE ASSEMBLY & HARNESSING											
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	97%	50	1,500+	Y
CIRCUIT PROTECTION											
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35000	N/A	£0	67%	50	1,500+	Y
DISPLAYS & LEDs											
Lascar Electronics		+44 (0)1794 884567	www.lascarelectronics.com/				£1		10	90	
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ELECTROMECHANICAL											
ALPHA WIRE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	26,919	N/A	£0	97.04%	150	3500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
CUI INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	17,410	N/A	£0	92.21%	150	3500+	Y
DELTA PRODUCT GROUPS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	3,215	N/A	£0	99.95%	150	3500+	Y
KEYSTONE ELECTRONICS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	6,315	N/A	£0	95.17%	150	3500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Murata	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	66,179	N/A	£0	99.79%	150	3500+	Y
OMRON ELECTRONICS INC-EMC DIV	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	74,369	N/A	£0	95.47%	150	3500+	Y
Panasonic	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	154,777	N/A	£0	94.42%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	91%	50	1,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ECS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	99%	50	1,500+	Y
Epson	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	59%	50	1,500+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz		01276 605900	www.jauch.co.uk			£3M		100%	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	67%	50	1,500+	Y
ICs & SEMICONDUCTORS											
ALLEGRO MICROSYSTEMS, LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	3,090	N/A	£0	87.22%	150	3500+	Y
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y
ALTERA	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	10,901	N/A	£0	84.86%	150	3500+	Y
ANALOG DEVICES INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	52,308	N/A	£0	73.79%	150	3500+	Y
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



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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
ICs & SEMICONDUCTORS (continued)											
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
AVAGO TECHNOLOGIES US INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	16,512	N/A	£0	91.38%	150	3500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
CYPRESS SEMICONDUCTOR CORP	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	27,423	N/A	£0	92.54%	150	3500+	Y
DIGI INTERNATIONAL	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	4,355	N/A	£0	95.30%	150	3500+	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
DIODES INCORPORATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	38,292	N/A	£0	90.02%	150	3500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
FTDI	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	569	N/A	£0	100.00%	150	3500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	97%	50	1,500+	Y
Infineon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
INFINEON TECHNOLOGIES	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,850	N/A	£0	93.70%	150	3500+	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,479	N/A	£0	77.62%	150	3500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,200	N/A	£0	67.00%	50	1,500+	Y
MAXIM INTEGRATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	68,021	N/A	£0	78.22%	150	3500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
MICROCHIP TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	86,517	N/A	£0	86.12%	150	3500+	Y
Microsemi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	40%	50	1,500+	Y
NEXPERIA USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,513	N/A	£0	99.29%	150	3500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	36,258	N/A	£0	93.55%	150	3500+	Y
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	Y
ON SEMICONDUCTOR	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	87,298	N/A	£0	85.61%	150	3500+	Y
Power Integrations	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	Y
Rohm	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	Y
ROHM Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	55.00%	50	1,500+	Y
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	Y
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
SILICON LABORATORIES INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	19,667	N/A	£0	96.54%	150	3500+	Y
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	99%	50	1,500+	Y
STMICROELECTRONICS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,201	N/A	£0	97.79%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
TEXAS INSTRUMENTS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	180,012	N/A	£0	91.94%	150	3500+	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
Vishay	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.71%	150	3500+	Y
XILINX INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	8,213	N/A	£0	51.46%	150	3500+	Y



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Buyers' Guide

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INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
3M	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	62,421	N/A	£0	93.42%	150	3500+	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
AMPHENOL RF DIVISION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	443,368	N/A	£0	75.92%	150	3500+	Y
Anderson Power Products	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	82%	50	1,500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
HIROSE ELECTRIC CO LTD	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,215	N/A	£0	90.98%	150	3500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100.00%	6	38	Y
JAE Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,200	N/A	£0	32%	50	1,500+	Y
JST SALES AMERICA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	5,109	N/A	£0	84.32%	150	3500+	Y
Kycon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	99%	50	1,500+	Y
LEMO	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	65%	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	16,900	N/A	£0	75%	50	1,500+	Y
MOLEX, LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	120,034	N/A	£0	97.98%	150	3500+	Y
Neutrik	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,000	N/A	£0	99.00%	50	1,500+	Y
PHOENIX CONTACT	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	54,845	N/A	£0	99.99%	150	3500+	Y
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
SAMTEC INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	427,448	N/A	£0	99.99%	150	3500+	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y
OBSOLESCENCE / HARD TO FIND											
	America II Europe	01462 707070	www.americaieurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y
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



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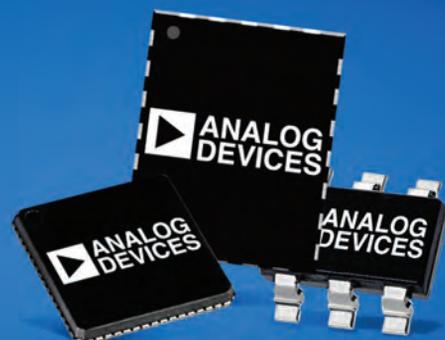
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Buyers' Guide

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
PASSIVES											
ABRACON LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	41,991	N/A	£0	100.00%	150	3500+	Y
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
AVX CORPORATION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	70,131	N/A	£0	89.28%	150	3500+	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
BOURNS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,314	N/A	£0	82.47%	150	3500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Coolcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
HONEYWELL MICROELECTRONICS & PRECISION SENSORS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,560	N/A	£0	89.87%	150	3500+	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	101,257	N/A	£0	91.57%	150	3500+	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
LITTELFUSE INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,517	N/A	£0	91.54%	150	3500+	Y
Murata	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	66,179	N/A	£0	99.79%	150	3500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
NICHICON	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,747	N/A	£0	96.70%	150	3500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y
Panasonic	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	154,777	N/A	£0	94.42%	150	3500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
Rohm	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	Y
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TAIYO YUDEN	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	21,540	N/A	£0	99.97%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
TT Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	32,800	N/A	£0	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	13,900	N/A	£0	99.00%	50	1,500+	Y
Vishay	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.1%	150	3500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
Würth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
WURTH ELECTRONICS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,733	N/A	£0	100.00%	150	3500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	147,833	N/A	£0	84.31%	150	3500+	Y
POWER & BATTERIES											
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y

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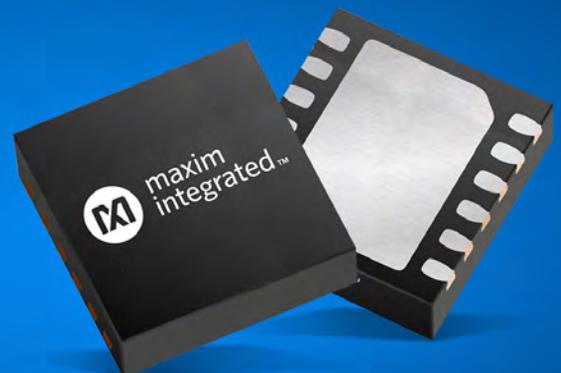
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Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
POWER & BATTERIES (continued)											
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y
Sensirion	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	N/A	50	1,500+	Y
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	70.00%	50	1,500+	Y
Apem	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	84%	50	1,500+	Y
Carlisle 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
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
3m / Laird / Henkel / Brightview / Luminix / Universal Science	Materials direct 247	01908 222211	www.materialsdirect247.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
ADDA	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	59.00%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	99%	50	1,500+	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	N/A	50	1,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	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



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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
WIRELESS SOLUTIONS (continued)											
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
AWS Electronics Group	01782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	430	11	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	Y	Y	Y	Y	Y	Y
Axiom Manuf. Services	01495 242130	www.axiom-ms.com	£40m	SW	300	3	ISO9001, AS9100, ISO13485, ISO14001, SC21, IPC610E, BSI Kitemark, NADCAP, ISO27001	Y	Y	Y	Y	Y	Y
Briton EMS Ltd (OSI Electronics)	01234 266300	www.britonems.co.uk	£12m	Bedford & Singapore	100	3	ISO: 9001, 13485, 14001, AS9100, BSI Kitemark IPC610	Y	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£5m	Essex/SE	55	7	ISO 9001, 14001, UL IPC-610, SC21	Y	Y	Y	Y	Y	Y
CML Innovative Technologies (uk) Ltd	01284 714700	WWW.CML-IT.com	£12M	UK/EU/China	65		ISO9001 TS16949 UL	N	Y	Y	Y	Y	Y
Contract Production Limited	01751 475950	www.contract-production.co.uk	£1.9m	North Yorkshire	20	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£7.5m	UK	72	3	AS9100, ISO9001, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
CSI EMS Ltd	01376 500050	www.csiems.co.uk	£5m	Essex	50	3	ISO 9001, UL, IPC610	Y	Y	Y	Y	Y	Y
CT Production Ltd	01202 687633	www.ctproduction.co.uk	£4.5m	Poole, Dorset	55	3	ISO9001:2015, AS9100, SC21 Bronze Award	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£14m	Andover (Hampshire)	130	6	ISO 9000, IPC610, ISO 13485	Y	Y	Y	Y	Y	Y
DJ Assembly	01904 436 456	www.djassembly.com	£1.25m	North Yorkshire	15	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y



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Contract Manufacturers Buyers' Guide (continued)

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BCA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610-F class 3, ISO14001, ISO 13485, UL	Y	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electricalimited.com	£1.75m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etuloc.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Elite Electronic Systems Ltd	028 6632 7172	www.elitees.com	£20m	UK	200	5	ISO9001, ISO13485, UL, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Fabrinet UK	01249 814081	www.fabrinetuk.co.uk	£21m	UK/Thailand/US	210	5/31/2	AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001, ISO14001, IPC-A-610	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC-J-STD-001, IPC7711/7721, 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
Jaltek	01582578170	jaltek.com	£8m	UK	80	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
JJS Manufacturing	01455 555500	www.jjsmanufacturing.com	£23m	M/CZ Republic	270	3	ISO9001:2008 and IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Lacon Electronic	+44 (0) 7836 338122	www.lacon.de/en	50m	Germany/Romania	500	13	ISO9001, ISO14001, ISO13485, TS16949, OHSAS18001, VG96927, UL	Y	Y	Y	Y	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£11.25m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
NOTE	01453 797580	www.note.eu	£100m	UK/EU/China	1,000	14	ISO9001, 13485, 14001, 18001, IPC-610 Class 3	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001:2008/IPC-A-610 Class 3/WHMA-620/ISO14001-2004/IPC-7711/7721	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	UKAS ISO9001:2008, IPC-A-610	Y	Y	Y	Y	Y	Y
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£95m	Havant/Global	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	Y	Y	Y	Y	Y	Y
Sedgewall	01582 475555	sedgewall.com	£1.2m	Bedfordshire	25	2		Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£6m	SE	60	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
Speedboard Assembly Services	01753 746700	www.speedboard.co.uk	£12.5m	Windsor, SE	99	4	IPC610 to Class 3, ISO9001:2015	Y	Y	Y	N	Y	Y
Tenkay Electronics Ltd	01903 855455	www.tenkay.co.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£14.5m	SE	126	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£15m	Derby	110	6	ISO 9001:2015, ISO 13485:2016, IPC 610, IPC 7711/7721	Y	Y	Y	Y	Y	Y
Trojan Electronics Limited	01792 469020	www.trojanelectronics.co.uk	£2m	South Wales	20	2	BS EN ISO 9001 2008, ISO 14001 2007	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	4	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

PCB Buyers' Guide

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

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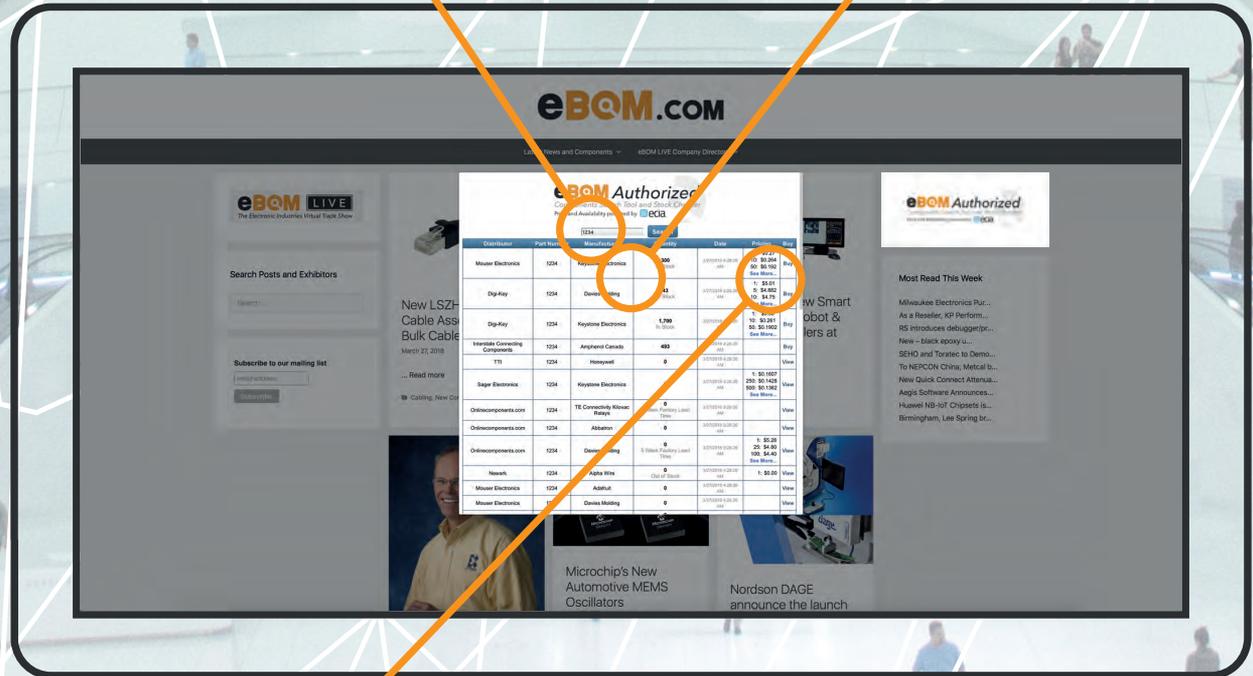


Part Number	Manufacturer	Quantity
1234	Keystone Electronics	300 In Stock
1234	Davies Molding	43 In Stock
1234	Keystone Electronics	1,700 In Stock
1234	Amphenol Canada	493
1234	Honeywell	0
	Keystone Electronics	

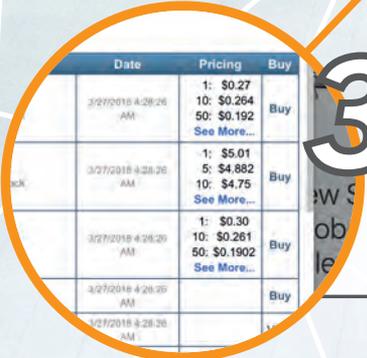
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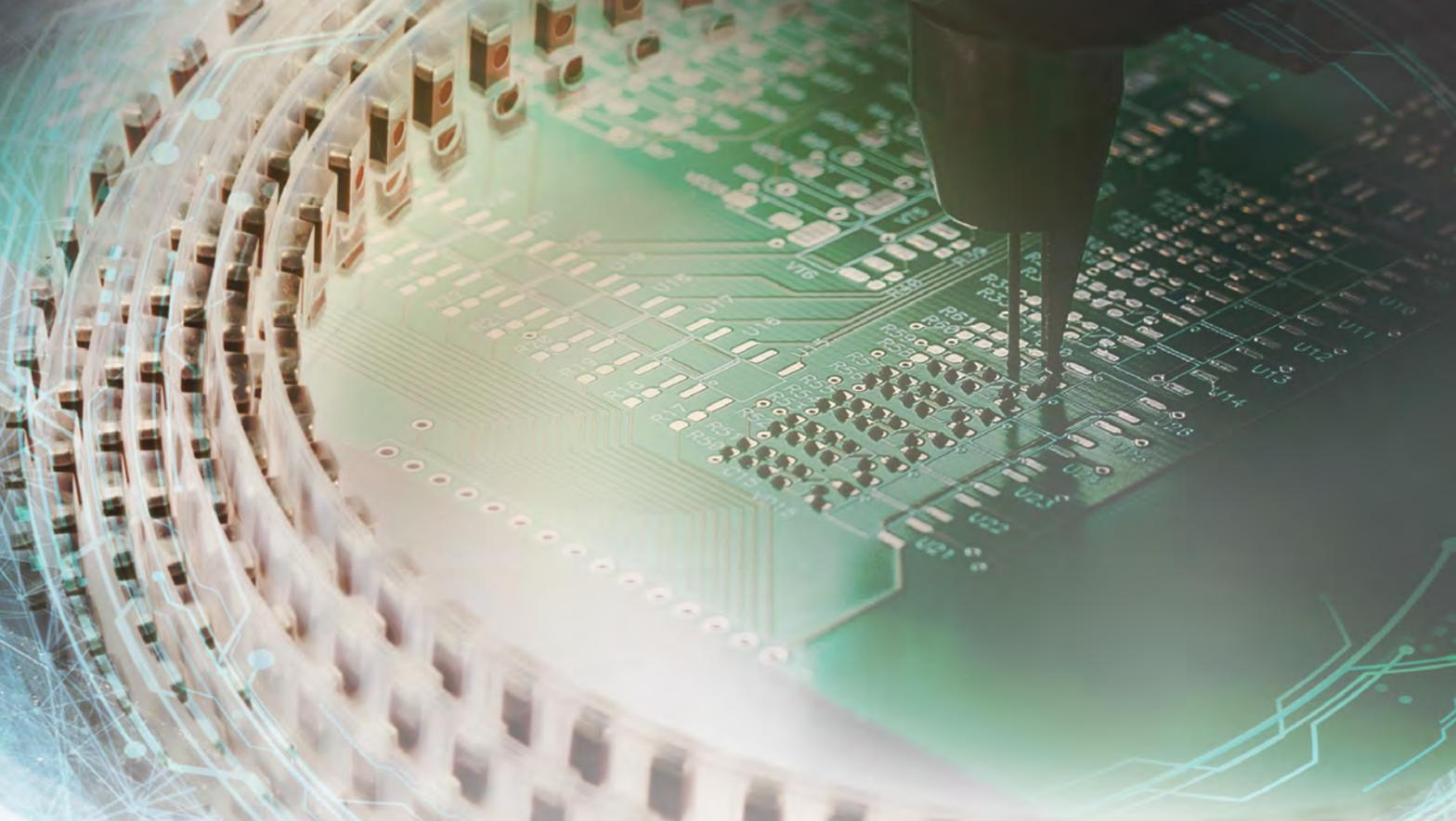


3 Purchase



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