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On the cover – July 2017

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Buyers' Guide

All the facts and figures to help you buy

Editor's Word



Bunfight: not

Last month I was invited to chair a panel debate at the 2017 ECSN gathering in Brighton. With a 45-minute slot and three subjects to cover it was always going to be a fast-paced event. The topics chosen for discussion were: mergers and acquisitions; the maker market; and Brexit.

Before things began I had pre-programmed my mind that mergers and acquisitions would comprise logical fact-based statements; the maker market would be a fun discussion; and Brexit would turn into a massive bunfight.

How wrong I was. The subject that generated the greatest range of opinion was the impact of the maker community on the electronics sector, while the least contentious was Brexit.

Re the maker market, some on the panel and in the audience, myself included, see the maker market as a sign that the way electronic products will be designed and manufactured in the future is changing. In essence, there is a move away from traditional OEM design departments to dispersed networks of individuals. The goal is the same: to design, develop and make electronic products people want to buy. It's the path to that goal that is changing.

Others in the room saw it very differently. In essence, their argument was that it is difficult, if not impossible, to compete with the skills and resources of established design authorities. In fact, it is worse than that. A lack of skills is forcing designers to increasingly rely on distributors' design support services, which diverts effort away from other projects.

Finally, Brexit. Nothing to report really. Pound down, exports up, head down, crack on.

Jon Barrett

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Procurement

gets

smart



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

Cognitive procurement solutions aim to improve supplier management, contracts and sourcing

Cognitive procurement • By Victoria Kickham

Technology has done much to improve the efficiency of the procurement process, but even more change is ahead as the supply chain becomes increasingly digital. Cognitive procurement — namely artificial intelligence platforms such as IBM Watson — may just be the next big thing.

“What can be automated is going to be automated — that is the reality,” says Paul Devlin, general manager, Europe, Middle East and Africa and Middle and Eastern Europe, for SAP Ariba, which announced a new partnership with IBM to develop cognitive procurement solutions for business buyers and sellers. Such technologies will not only enhance and streamline daily processes and procedures, but, more importantly, shift employees’ focus from the mundane to the value-added.

Devlin explained: “In the context of procurement and supply chain, that means better, more meaningful relationships.”

SAP Ariba and IBM’s global strategic alliance will develop cognitive procurement tools bringing together intelligence from procurement data, such as transactions and pricing, with predictive insights from unstructured data, such as weather and other supply disrupters. This will help companies make better decisions about supplier management, contracting and sourcing. The companies will also develop a ‘cognitive procurement hub’ to research emerging technologies, such as blockchain, to see how they can best be applied to procurement.

Better buying decisions

So, what does all this mean for electronic component buyers? The crux of the issue is information, with cognitive technology applications promising better access to better information.

Devlin added: “Cognitive technology is about presenting new opportunities that allow you to

predict and respond. That’s what we believe starts to fundamentally change how buying and selling is being done.”

Applications that help buyers choose the right type of request for proposal, the best time to buy a particular part, or that alert buyers to supply disrupters in real time, will enable better decisions. And that can go a long way toward levelling the playing field for small and mid-sized companies, says vice president of engineering at 3M, Deb Fronczak, who notes that large companies often have easier access to such information today.

Fronczak commented: “All of a sudden, Watson is telling you live, and giving you information in terms of your data, your sourcing, your procurement. Those types of data points are going to potentially level the playing field on sourcing.”

Streamline processes

Devlin points to contracts as an area where procurement professionals can expect to see some initial applications of cognitive technologies. For example, when you find a new supplier in China or Russia or India, how do you bring the unstructured data of the two companies together to create a contract?

The IBM/SAP partnership aims to create applications that can automatically identify relevant terms and conditions matched to a legal library and taxonomy, uncover similar contract terms for a specific commodity by industry or region based on benchmarking data and suggest optimal prices, based on anticipated volume and contractual discounts.

Devlin concludes: “Everything is geared around the user experience and how you simplify it — how you shrink things that today are very complicated. We are enabling companies to understand and deal with the outliers in their industry so they can focus on where value is driven.”



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Agreement boosts fan support

Hi-rel distributor, Aerco, has signed a UK distribution agreement with Japanese component manufacturer, MinebeaMitsumi, covering the company's entire portfolio of fans and blowers, brushless DC motors and stepper motors.

Business development manager, rotary components, NMB-Minebea, Graham Anderson, said: "Aerco will be an important part of our European distribution family, increasing awareness of NMB and growing business into new market sectors."

Aerco's fans business development manager, Jason Slaughter, added: "NMB enables us to offer an increased capability to our customers, who will benefit from NMB's European engineering support team. We are delighted to offer availability on all NMB Minebea's product ranges. Of immediate interest to our customer base are the DC and AC axial fans and blowers, especially NMB's new IP69K-rated models, which are the only series of cooling fans ever to have achieved IP69K rating."

www.aerco.co.uk

Partnership delivers rapid access to OLED innovation

Mouser Electronics has announced a global distribution agreement with Visionox, a developer of organic light emitting diodes and display solutions. Described by Mouser as a company that rapidly moves discoveries from the lab to manufacture, the Visionox product line currently includes passive-matrix OLED, active matrix OLED and TFT LCD display modules.

PMOLED modules are available in a variety of sizes, resolutions and interfaces with white, full-colour, yellow/blue, and yellow/green display options. Alternatively, TrueColor active-matrix OLED technology is designed to deliver brilliant colours by controlling each pixel with its own red, green and blue OLED. The AMOLED displays are available in 1.2in round, 1.45in rectangle, and HD 5.50in rectangle options.

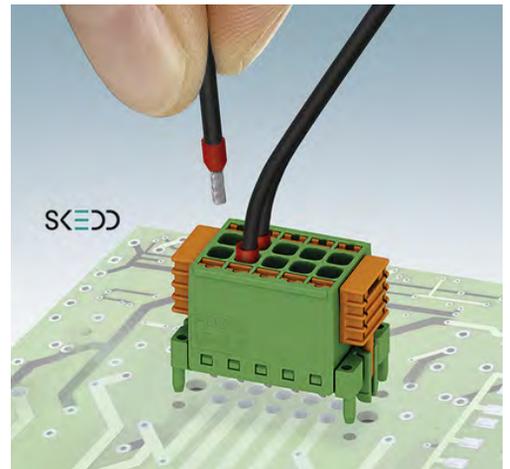
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Low power PCIe switches maximise reliability

Future Electronics has announced immediate availability of Microsemi's Switchtec PFX Fanout PCIe switches. The new PCIe switches are said to provide up to 60 per cent lower system power and utilize 75 per cent fewer chips in many common use cases. They also boast double the port density, as well as advanced error containment, diagnostics and debug capabilities.

Designed to provide a high density, low power PCIe switch, PFX products are ideal for data centre, communications, defence and industrial applications. With simple hardware configuration and advanced diagnostics, PFX switches enable PCIe solutions for systems requiring low power and high-reliability PCIe switching.

The family comprises switches from 24 to 96 lanes, from x2 to x16 lanes per port. Devices are claimed to offer the highest port and non-transparent bridge density and high switch partition density. They also boast advanced error containment and surprise-plug and unplug support to prevent system crashes. www.futureelectronics.com



Save space in wire-to-board connections

RS Components has introduced the latest Phoenix Contact connectivity device based on the company's SKEDD plug-in technology. Said to deliver a reduction in purchase and installation cost, the new series of 3.5mm pitch SDDC PCB terminal blocks provide wire-to-board connectivity in a range of applications including automotive, industrial and consumer electronics, white goods, control cabinets, power tools and medical equipment.

Designed to meet the need for smaller devices with increasing functionality, direct-plug-in SKEDD technology enables direct contact between the connector and PCB without the need for a plug and header combination. No soldering is required, as the terminal block features latches to help secure a vibration resistant connection to the PCB.

SDDC 3.5 series devices are suitable for conductor cross-sections from 0.2 to 1.5mm² and are designed to handle currents up to 8A and voltages up to 160V.

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Mixed-signal ICs underpin smaller, faster products

Avnet Silica will now distribute the product portfolio of Silego Technology in Europe, the Middle East and Africa following an exclusive global distribution agreement between the two companies.

This will enhance access to Silego's configurable mixed-signal integrated circuit technology, which uses non-volatile memory to configure and integrate analogue, digital logic and power functions. This can help reduce power, cost, size and time to market.

Senior vice president, semiconductor business development, worldwide for Avnet, Lynn Torrel, said: "The phenomenal demand for devices like smartphones, tablets, wearables and internet of things-enabled solutions has compounded designers' mandate for 'smaller, faster, cheaper.' Silego's CMIC GreenPAK platform and Integrated Power Switch portfolio provide new levels of configurability, power and performance that can significantly accelerate and optimize the development of differentiated devices and systems."

Technical marketing director, Avnet Silica, Laurence Dellicott, added: "Configurable mixed-signal ICs can mean the functional replacement of many other devices leading to a smaller footprint and a lower bill of materials. These Silego products provide an additional system building block across a range of markets including data communication, consumer, as well as the industrial sector." www.silego.com

Franchise enhances opto offering in Europe

Premier Farnell is extending its existing North American franchise with Visual Communications Company to cover Europe. Customers in the region will now have access to an enhanced optoelectronics product portfolio from Farnell element14, including VCC's panel mount indicators, light pipes, LED displays and LEDs.

Global head of semiconductors, Premier Farnell, Simon Meadmore, said: "VCC's innovative range of products further enhances our optoelectronics product portfolio."

Global distribution sales manager at VCC, Deb Gray, said: "With our focus on the European market, it is a natural progression to strengthen the partnership that was developed with Newark element14 in North America and include Farnell element14 in Europe. We look forward to supporting customers through this comprehensive partnership."

VCC products are now available from Farnell element14 in Europe and Newark element14 in North America. www.premierfarnell.com

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Enhancing displays for harsh environments

Using a standard display in harsh environments can lead to reliability concerns. Business manager for optoelectronics at GTK, Clive Dickinson, explains how thick cover lenses can overcome the issue

When procuring displays for use in harsh environments, there may be concerns that standard displays are not robust enough to work in more demanding applications. Thick cover lenses can overcome these potential concerns, even in applications using capacitive touch TFT displays.

In fact, cover lenses can be supplied in thicknesses ranging from 1.1 to 8.0mm and can be added to TFT screen sizes between 2.4 and 15in. In cases where the cover lens is over 4mm thick, an industrial capacitive

controller is needed. This solution can be used for a range of applications, including industrial electronics, fire detection, construction and the oil and gas industry.

As TFTs can also be susceptible to reflection and glare from bright lights or sunlight, optical bonding technology can be used in conjunction with the cover lenses. Here, optical bonding adhesive is inserted between the display and the cover lens to reduce the level of refraction and improve readability. Alternatively, it may be possible to apply



Cover lens can be anywhere from 1.1 to 8mm thick

anti-reflective coating directly onto the cover lens.

Where customers require thick cover lenses for a specific application, GTK can provide custom solutions.

This can include colour

printing, printing of borders or logos, slots and holes cut-out in the glass and tint printing for switch buttons and LEDs.

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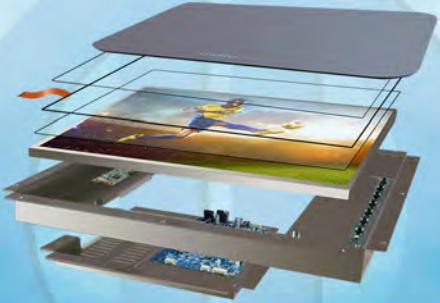
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Display sourcing made simple

Specialist supplier, Display Technology, provides a ten-point guide to purchasing liquid crystal display products

1) Price

Possibly the most obvious factor when choosing an LCD is cost, but it's important to recognise that lowest cost does not always provide the best solution. LCD distributors can usually offer

discounted pricing, depending on quantities required and the possibility of a future business relationship, but remember, cheaper products may not be legitimate panels from a trusted manufacturer.

2) Stock availability

Most large manufacturer's will have standard lead times for their products so purchasers should plan their orders to stay within schedule. If there is an ongoing requirement of certain

quantities, some suppliers will order in the stock and organise a call off for the customer. Smaller requirements can be unpredictable, so a good supplier will also have some products held in a stock.

3) Choosing a manufacturer

Thin film transistor LCD manufacturers exist in all parts of the world, each targeting different end users. For example, AUO mainly produce industrial TFT displays ideal for use within the industrial, military and automotive sectors. A decent supplier will source products from quality manufacturers and will also provide product roadmaps to help you pick the best display option. Purchase from an official distributor, rather than the grey market, to avoid the disappointment of receiving an inferior product.

4) Understand specifications

Specifications help purchasers ensure the display they choose has the attributes needed. Sometimes attributes are overlooked, however, such as overlooking ambient light conditions when deciding on brightness.



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A good supplier will offer extra services, such as optical bonding, to add value to your TFT display

The following factors should therefore be considered carefully: size, aspect ratio, brightness, viewing angle, operating/storage temperature, interface and power consumption. Speaking to a professional can provide guidance on choosing the right TFT display and can also offer alternatives which may not have been considered.

5) Longevity of supply

As with any product, TFT displays can become obsolete or be issued with end of life notices. A good supplier can advise which manufacturers offer the best longevity of supply, but they may also help find the next version of the display or a drop-in replacement. Furthermore, a select few suppliers can mechanically modify a product to meet specific requirements.

6) Supplier flexibility

Price will always be one of the biggest influences on your choice of supplier, so it's wise to 'shop around' by getting quotes from several suppliers. Usually the best pricing is achieved by building a relationship with a supplier through repeat orders. Where possible it is useful to give the supplier your target cost, which can save time for you and the supplier.

7) Financial security

In most cases, suppliers will credit check customers to ensure they can pay for their orders, but in fact,

customers should also check their supplier to ensure they have the financial strength to supply an order. Using a tool to credit check a supplier can provide peace of mind about their cash flow and provides an opportunity to address any concerns with the supplier.

8) Support products

Displays are usually part of a larger design, so it is advantageous for suppliers to have a range of products to support a TFT display. This means purchasers can find all the required support products in one place, potentially with the benefit of reducing costs. Support products can include: interface cards, TFT controllers, power supplies, cables and LED backlight drivers, some of which may be available as an easy to install kit.

9) Support services

Choice of supplier can also be influenced by the services available to add value to the solution. For example, if you need to integrate a touch screen into your solution but don't have the facilities to do this in-house, you need a supplier that can provide a touch screen fitting service. Similarly, if you are looking to improve readability, you would choose a supplier that can optically bond the display.

10) Technical support

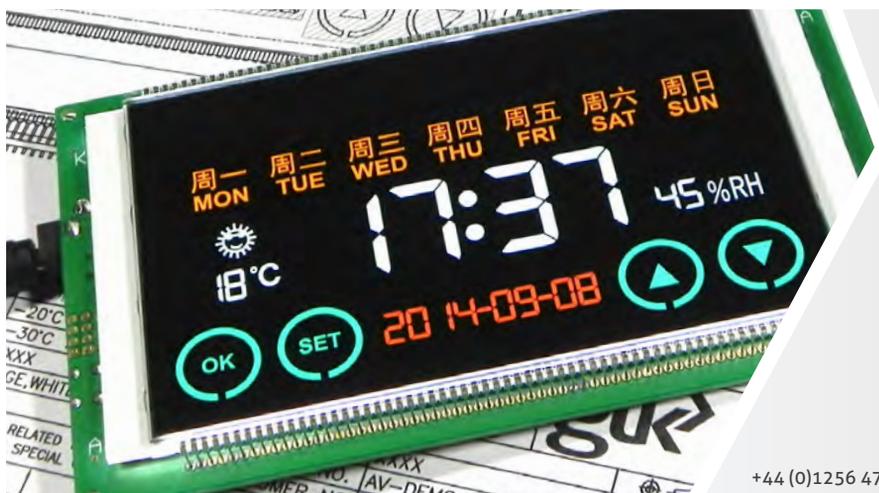
No matter what experience you have, it is important that the supplier you purchase from can offer technical



Thin film transistor LCD manufacturers exist in all parts of the world, each targeting different end users. A decent supplier will source products from quality manufacturers and will also provide product roadmaps to help you pick the best display option

support after purchase, either over the phone or in person. Speaking to the supplier ensures you follow correct procedure to avoid damaging panels further. Some suppliers also offer a repair and return service or a warranty.

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Avoiding the pitfalls of display purchasing

When the design team provides sourcing recommendations for a display, they want to make purchasing easier, but does it really help? The answer is no – not without thorough supplier evaluation

Most display manufacturers and suppliers are based in the Far East and although there are many products that seem good value, they aren't necessarily the best buy. With a market this big, it is important to evaluate suppliers thoroughly, focussing primarily on the longevity of the supplier, their ability to support the product long term and continued availability beyond the development phase.

Supplier essentials

Once a supplier has been identified as able to supply product to your technical specifications, the supplier's background should be researched. Find out how long the company has been in existence and whether it has the expertise to understand your product requirements.

It's important to establish whether the firm outsources production or if it actually undertakes manufacturing. If it is simply a Far East sales office, what ability does it have to control product quality and what technical support is available?

Obviously, unit price is a key consideration, but while it might be cheaper to buy globally, costings should be reviewed carefully. Look at the shipping costs, import duties and credit availability, all of which will impact the end price. Establish also whether the supplier can offer credit facilities or buffer stock.

Another key factor is delivery. Find out if there is an agreement which details delivery schedules, or a clause which specifies costs if delays happen due to supplier failure. As display manufacturers produce to order, this needs to be established early on.

Finally, ask whether the supplier can guarantee availability long-term and establish what will happen if the product is phased out. Ensure end-of-life warnings will be guaranteed and establish whether an upgrade will be suggested. This is particularly important in the medical and military environments, where products are expensive and

must also meet stringent approvals.

Source local

Despite the multitude of suppliers based in the Far East, there are several advantages for purchasers in buying from local suppliers, particularly from displays specialists, which may have specific expertise they can bring to bear.

As the title implies, a displays specialist, can offer more than just a quote on a part number. It should be able to provide in-depth product knowledge and technical support, plus advice on how the display might interact with other components in the application.

To get the full benefit of this expertise, a displays specialist will need to work with your engineering team prior to purchase. Discussions at an engineering level will establish the end-user application, the environment and any other technologies that are required to interact with the display, such as



A displays specialist can offer more than just a quote on a part number

motherboards or touch screens. Once evaluation sample are approved, a detailed quotation will be submitted.

Throughout the process, regular interaction with the engineering team is crucial. In this way, the displays specialist will play a key part in ensuring the product is fit for purpose throughout its life. Whatever the application, a local displays specialist may have pertinent advice and relevant experience, ultimately making your life easier.

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Expect analog IC prices to stabilise

Healthy demand for analog semiconductors will help steady average selling prices which had declined over the last five years

By James Carbone

The analog IC market will grow 6.2 per cent to nearly \$51 billion in 2017 as demand increases and prices stabilise in 2017, according to Semico Research Co.

The rate of growth for analog revenue in 2017 will be stronger than in 2016 when sales increased 5.8 per cent. Some analog chip manufacturers are forecasting even stronger growth for analog semiconductors.

"We are forecasting 20 per cent year-over-year growth in analog," said Vipin Bothra, director of market development for industrial market for chipmaker STMicroelectronics. "It is one of our strongest growth areas."

It is also a strong growth area for Texas Instruments, the analog IC market leader. TI's analog sales totaled \$8.54 billion in 2016 and accounted for 64 per cent of TI's revenue. TI holds about 18 per cent of the analog market, according to the company. Rich Templeton, CEO and president of TI, said the chipmaker's first quarter analog sales increased 20 per cent from the previous quarter.

One reason TI, ST and other analog suppliers are bullish about the analog market in 2017 is that demand for analog chips remains strong and average selling prices, which had declined in recent years,

are stabilising and will slightly increase in 2017, according to Semico.

In 2011, the average price for an analog chip was \$.46. Since then, prices declined steadily through 2016 when the average price was 36.3 cents, Semico said. However, falling prices will end in 2017—at least temporarily—and the average price will increase slightly to 36.4 cents, according to the researcher.

The good news for buyers is that price erosion will resume in 2018 and beyond. However, buyers should take increasing or declining analog IC average selling prices with a grain of salt. Changing prices can be due to changes in product mix. If a chipmaker is selling more newly released analog semiconductors, the ASP for the device will increase because new products have higher tags than older analog chips.

"We have a constant turnover of products and many new product introductions," said Bothra. "In any given year, 20-40 per cent of our revenue comes from new products. 'It's very rare we can raise prices' on older products."

Steady growth for analog
Despite price erosion after 2017, the overall analog market will rise steadily to \$59.3 billion in 2021, the researcher said.

The analog market includes a wide range of semiconductors. About one third of the market is comprised of general-purpose chips, including operational amplifiers, signal conditioning, interface circuits, and signal conversion devices such as A to D and D to A converters. Also included in general purpose analog are power management ICs, such as linear regulators, switching regulators, voltage regulators.

The other big category of analog is application-specific, which include analog chips designed for specific

functions and industries such as computer, communications, said Semico.

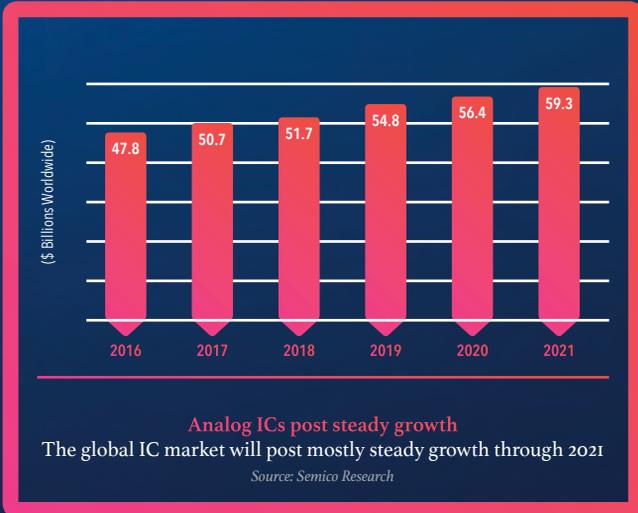
"Within analog specific, the bigger and fastest-growing markets are automotive and communications," said Jim Feldhan, Semico president.

Analog specific accounts for about 70 per cent of the analog market in revenue and 30 per cent of unit shipments. The general-purpose segment is the opposite. General-purpose represents about 70 per cent of units and 30 per cent of revenue, he said.

By The Numbers

Source: Semico Research





Both general-purpose and analog specific segments are growing. In fact, the analog growth rate outpaced the overall growth rate of the semiconductor industry twice. Overall semiconductor sales increased .4 per cent 2016, while the analog segment grew 5.8%, said Feldhan. Unit shipments of analog are also stronger than the overall semiconductor market. Analog unit shipments increased 7 per cent in 2016, while overall semiconductor unit shipments rose 4.7 per cent, according to Semico.

“This year the semiconductor industry will do better because of memory IC prices, which are skyrocketing,” said Feldhan. The overall chip market will increase 9.4 per cent, while the analog segment will increase 6.2 per cent, he said.

More analog chip demand
There are several drivers of analog chip growth including cell phones, the Internet of Things and the electronics automotive systems, all of which are demanding for analog chips.

“If you look at phones there are lots of analog, including audio and mixed-signal devices,” said Feldhan. Along with every processor in a phone or other electronics device there are analog chips.

“If you take apart an iPhone you have processors, memory, a baseband radio, all very leading edge, but the rest of the stuff is kind of lagging technology and a lot of it is analog,” said Feldhan.

He said analog chips are crucial for both battery operated devices and equipment that is plugged into the wall. “Power management is critical, either for battery life or reducing heat in a server farm, even for home electronics,” said Feldhan. He said power management is essential in all electronics equipment and “a lot of designers want to get rid of the heat sink or a fan and have a simpler board layout.”

With analog demand growing, more companies are building analog chips, although some of them are small and many are emerging in Asia. Analog is a competitive market despite recent consolidation in the industry.

Feldhan said that mergers and acquisitions have impacted analog market, but not as much as other chip segments. He said that a merger does not necessarily mean there will be one less supplier for analog or other chips.

In some cases, a semiconductor manufacturer acquires another chipmaker that manufactures analog ICs, but the acquiring

company did not have an analog business to begin with. He said ON Semiconductor is an example.

“ON Semiconductor was not really big with analog, but acquired some analog companies” such as Fairchild and strengthened its position with analog chips, said Feldhan.

Feldhan said analog revenue growth will slow down in 2018 to about 2 per cent and then pick up in 2019 as revenue rises 6 per cent.

Dealing with cyclicality
He noted that the analog market tends to be cyclical. Companies buy analog semiconductors “when they believe there will be an upturn,” said Feldhan. “They build inventory to make sure that they have the products they need for the expected upturn,” he said. An electronics manufacturing services provider does want to tell an OEM customer production of the OEM’s product stopped because the EMS provider did not have enough op amps, which cost about 6 cents, said Feldhan.

So, an EMS provider may build inventory of analog chips one year and then hold off buying any the next year until the inventories are worked off. Once analog stockpiles are reduced and another upturn is expected, analog inventories are rebuilt, he said.

There are several trends buyers should keep an eye on with analog ICs. “In special-purpose market that we continue to see more analog being incorporated onto mixed-signal devices. In some of the higher volume applications, they’re starting to make system-on-a-chip devices that have more analog on them,” said Feldhan. That is primarily for reducing size and increasing functionality of the device, he said.

Another trend buyers should monitor is packaging for analog. “Packaging is playing a very important role. Demand is growing for miniature packages that allow customers to achieve higher density in handheld devices or internet of things sensor applications and in some cases portable devices,” said Bothra. He added there is also growing demand for integration of different types of technologies in one package.

Smart purchasers prioritise enclosures

Circuitry is the beating heart of your product, but enclosures have a major impact on component layout. Putting enclosures first keeps you one step ahead, says OKW Enclosures' marketing director, Robert Cox

Every PCB needs an enclosure; even those left open to the world require some form of mounting solution, which means that at some point, every electronics manufacturer will have to consider enclosure selection. Inevitably, much of the debate will focus on design and technology, but this means it's all too easy to forget the purchasing challenges that are also involved and how much they can affect the final outcome.

Congratulations then if you've prioritised enclosure sourcing at the beginning of your project. Many companies put the PCB first, and it's an understandable mistake, because circuitry is the beating heart of a

product. It's what makes the technological magic happen.

But as marketing director of Hampshire-based, OKW Enclosures, Robert Cox, explained: "It's important to think 'enclosure first' because it has such a big impact on component layout. That means addressing some vital purchasing decisions early on.

"Will you be manufacturing the enclosure in-house? This will be an option for big original equipment manufacturers that occupy prominent positions in their chosen markets. But just because you can, should you? Bringing in an enclosures specialist doesn't just reduce the headaches involved with



creating a case from scratch, it opens up a whole new world of thinking.

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“A good enclosures partner will offer refreshing ideas and innovation that can solve problems you may not otherwise have discovered until much later in the project.”

Besides, although some engineering companies are happy to fold and machine their own sheet metal cases, moulding a plastic enclosure involves significant upfront tooling costs. Diecasting aluminium is an even larger undertaking and, of course, not everyone has their own foundry on-site.

Customisation is king

Instead, purchasing a standard enclosure customised to precise specifications is the smartest decision for most small to medium OEM electronics

companies. To meet this demand, OKW manufactures a range of plastic enclosures for handheld, desktop and wall mounted applications, plus metal cases under its Metcase brand for rack mounted electronics and desktop instrumentation. OKW is also the UK partner of Rolec Enclosures, which manufactures heavy duty industrial electronic enclosures from diecast aluminium, stainless steel, GRP, Luran and ABS.

Both OKW and Rolec offer a range of customising services, meaning that each can provide a complete enclosures solution, from start to finish. This helps satisfy another key purchasing criterion, which is to choose a single-source supplier wherever possible.



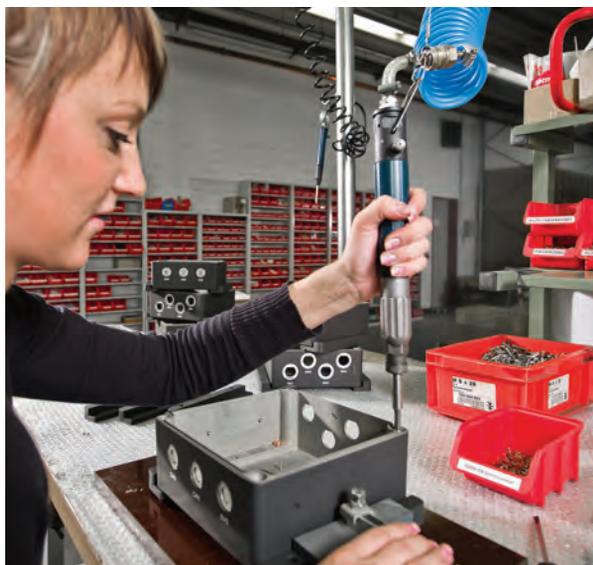
Enclosures, front panels and keypads can be supplied ready to use

In many cases, there's no point in stringing together a chain of small suppliers, each of whom tackles their part of the project piecemeal. After all, do you really want one supplier to mould the enclosure and another to machine it, while others add various finishes?

In this scenario, each supplier takes time to add their particular chunk of value, before passing your enclosure on down the chain. Time and money can be wasted while enclosures are transported from one sub-contractor to another, while in-house

▶ continued on page 20

Fitting threaded bushes, fixings and cable glands to Rolec aluminium enclosures



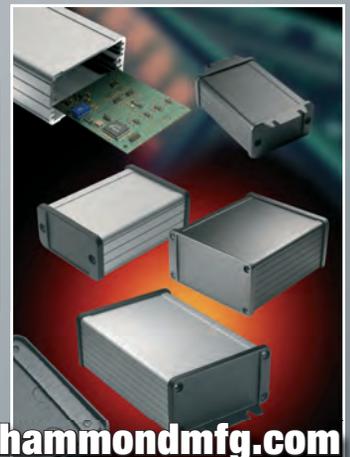
Bringing in an enclosures specialist doesn't just reduce the headaches involved with creating a case from scratch, it opens up a whole new world of thinking



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accounts teams will be tasked with trying to sort out all the paperwork.

It's also possible that one supplier in this chain could mess up. If they damage a batch of half-finished enclosures, you could end up with nothing to show

From standard enclosure to fully finished custom enclosure

for your efforts but some damaged enclosures and a series of invoices from suppliers at the start of the chain who got their part of the process right.

Single-source supplier

Robert Cox continued: "It's much easier to use one specialist supplier who can provide all the machining, finishing, special materials, electromagnetic

compatibility shielding and so on. That company will then be solely accountable for delivering your customised enclosures perfectly finished."

For complete confidence in this arrangement, you also need to be sure the supplier you choose can source components such as cable glands and interfaces as well as providing more sophisticated elements such as membrane keypads.



Robert added: "Will your chosen supplier carry out installation and assembly? Can you simply send your PCBs and outsource the entire manufacturing process?"

Complete outsourcing can be advantageous if the product in question is non-core. It can be tempting, from a cost reduction point of view, to offshore production to the Far East or other low-cost manufacturing centres, but this can be a double-edged sword. Using suppliers from emerging economies raises questions about quality, consistency, and the ability to meet delivery deadlines.

As a further concern, there's also the issue of intellectual property. Your product may end up being copied and your only recourse would be litigation, which is never easy, or cheap, especially when international borders are involved.

Robert concluded: "Venturing to the other side of the world, either for enclosure supply or for full assembly, makes sense only if you're talking about volumes of at least 1,000 units. And then, only if you use a supplier with a long and exemplary track record. For small and medium sized UK manufacturers, it pays to stick with a trusted supplier closer to home."

Whichever supplier you choose, you'll need to ensure the packaging they use is up to scratch, and that they can deliver your enclosures without damage. Each enclosure should be packaged individually and each box should arrive in pristine condition. This ensures you can put your company branding on the packaging boxes and reuse them as containers for shipping out your finished products.

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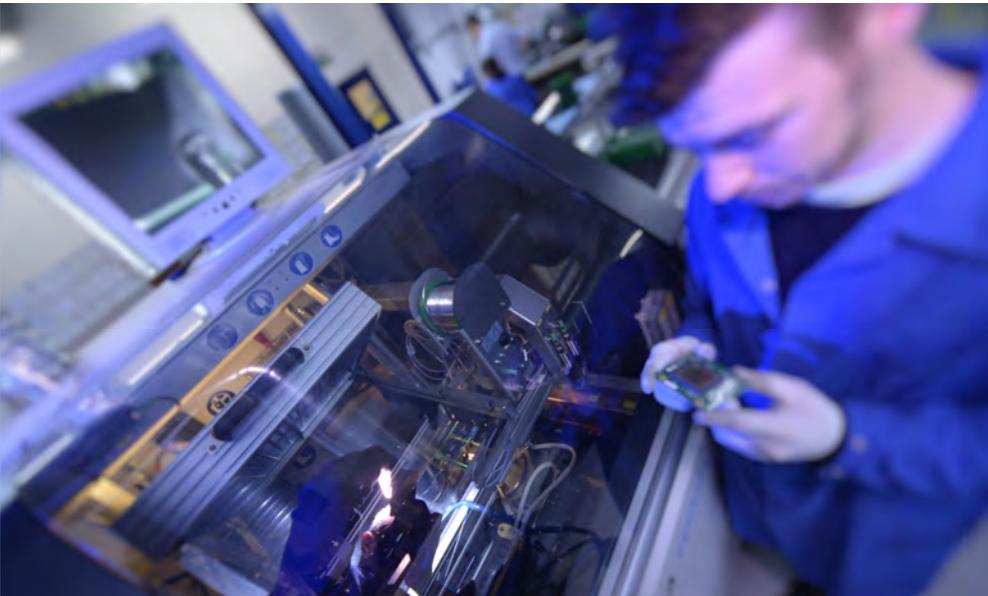




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Choice shouldn't be a barrier to change

With the UK electronics manufacturing sector thriving, and a plethora of providers to choose from, discover how to select the right CEM to team up with

The United Kingdom's electronics manufacturing sector is a thriving industry filled with talented people who are helping original equipment manufacturers drive innovation forwards.

Over the past few years, there has been a resurgence in domestic electronic manufacturing. There are a variety of reasons for this, including poor experiences and quality concerns with offshore firms, as well as OEM innovation, leading to a new wave of British excellence.

The good news is that for a company looking to reshore their production lines, ride the wave of innovation, or simply swap contract electronics manufacturers, there is an abundance of choice. Unfortunately, this also poses a problem, namely, how to select which CEM to partner with on an upcoming project.

To answer this question, it is important to know what you are looking for since each individual CEM will have its own strengths and weaknesses.

Seeking specialities

Some CEMs specialise in high-volume assemblies, while others focus on highly technical, low-volume projects. If you are looking to outsource assembly of a complex, safety-critical product, it makes little sense to work with a company that is unable to offer the expertise required to make a success of it.

In this way, the experience of the CEM's technical staff can make or break the

production process. Although every assembly is unique, there are always some shared characteristics among projects from similar industry sectors so it makes sense to enquire about the kind of products the CEM is familiar with.

More often than not, hands-on experience in certain fields will ensure a CEM is aware of sector-specific demands and how to incorporate them into production plans.

Flag up flexibility

Obviously, money will play an important part in helping to determine which CEM to join forces with. The cost of the assembly will be key, but it is also crucial to look at the bigger picture and factor in delivery charges, sourcing costs and any other value-added services.

It's also important to consider your future requirements. What happens, for example, if demand is greater than first thought and the CEM is unable to increase production? Remember to ask what buffer levels will be accommodated and how much free capacity there will be at any one time.

Flexibility is important in other areas too. Can the service provider offer tailored delivery dates, a stockholding or a supply chain management service? More agile companies may even be able to facilitate a call-off arrangement, where the CEM absorbs the annual stockholding and production costs, only delivering and invoicing on an 'as needed' basis. Alternatively, can the CEM provide design support or bespoke prototyping

to iron out any potential problems before production deadlines loom on the horizon.

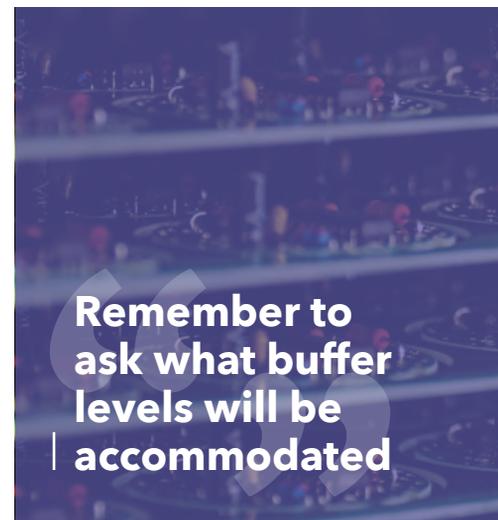
Of course, there are countless things to consider during the outsourcing process. The journey from deciding to work with an external electronics manufacturer to receiving your first completed assembly can often be an arduous one. It can be frustrating, but by addressing these often-neglected points, you will be one step closer to selecting the right CEM for your product.

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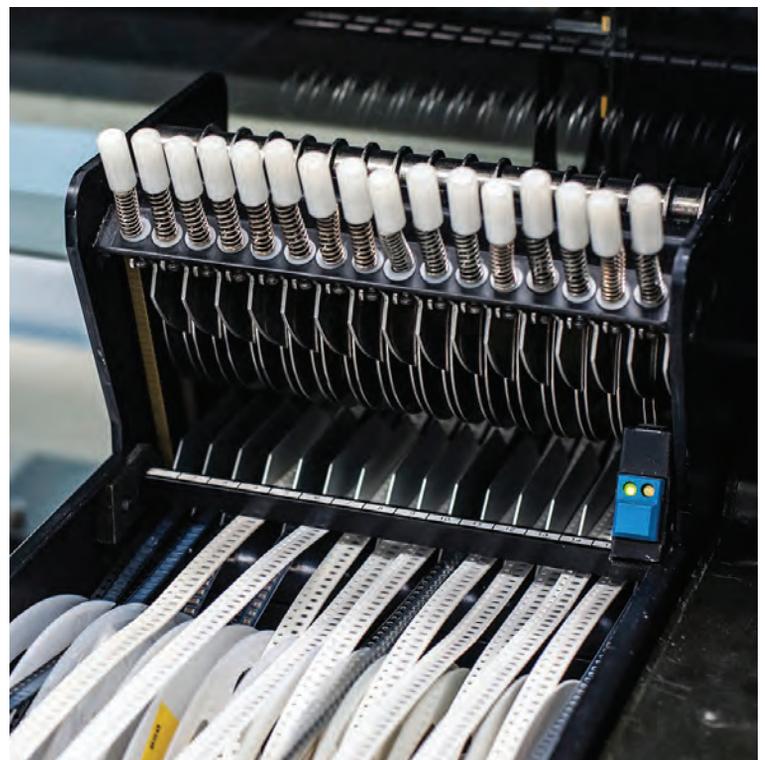
Hands-on experience in certain fields will ensure a CEM is aware of sector-specific demands



Sales manager, DJ Assembly, Bill Skelton



Remember to ask what buffer levels will be accommodated



Discover the perks of outsourcing procurement

Procurement can be challenging with many obstacles and risks. Effective CEMs understand these dynamics and can mitigate against many supply chain issues, as procurement manager at Corintech, Mark Poulson, explains

The global electronics industry is an ever-changing landscape, which means procurement can present various challenges. Receiving the right part, in the right place, at the right time, is of fundamental importance. An effective contract electronics manufacturing partner understands this and can address many of the supply chain issues faced by original equipment manufacturers.

Reliable supply

By working with original manufacturers or approved distributors, a CEM's purchasing team can provide both traceability and reliability. Industry experience, backed by established sourcing relationships, provides OEMs with confidence.

A proactive approach to component obsolescence also means CEMs can prevent breaks in supply by monitoring component end-of-life notices, advising of last-time-buy opportunities and options for alternative parts.

Strategic buying

As a further benefit, CEMs are often able to work with supply chain partners to secure economies of scale, by identifying cross-build and cross-customer parts.

This enables CEMs to pass significant cost savings downstream to OEMs. Long-term fixed-price supply agreements also offer stability against uncertain market fluctuations.

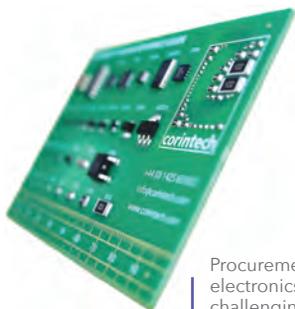
Another measure designed to avoid breaks in supply is component stockholding. This, along with robust demand analysis and forecasting, limits the risk of stock-outs and resulting OEM production downtime. Customer-focused supply services such as Kanban systems, buffer stocks and kitting, further enable a flexible, lean and cost-effective source of supply for OEM customers.

As these examples demonstrate, the procurement value offered by CEMs can help OEMs maintain and increase market share in an increasingly competitive global marketplace.

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Procurement manager, Corintech, Mark Poulson



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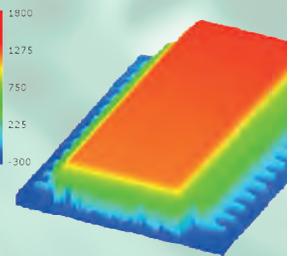
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Reshaping the supply chain of the future

Globalisation is forcing the electronics industry to re-evaluate its supply chain solutions, with regionalisation fast becoming the new offshoring. Here, Future Electronics' Tom Galligani considers what lies ahead

Over the past 20 years, supply chain solutions have evolved, largely due to changes in the global economy. In fact, the term supply chain was relatively new to most companies two decades ago, yet today, supply chain is a key function in the majority of companies. Thanks to the growing importance of this discipline, there are now over 500 universities in the US alone offering supply chain majors, including MIT Sloan, Ohio State, Stanford, and Michigan State, to name a few.

It's an exciting time to be involved in supply

chain management, but also concerning, when so much depends on it and so many factors affect it. One interruption, for example, can shut an entire production line down, or worse, cause a company to miss revenue goals and put it out of business.

Today's supply chain requirements are more complex than they were in years past. Everyone is looking for an edge to be the market leader and much of that depends on supply chain capabilities. Supply chain solutions therefore require constant oversight,



Robotics and automation are having a big effect on supply chain decisions

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transparency and flexibility. Companies must be vigilant to align themselves with a partner that can collaborate in determining the best solutions for the situation at any given moment. In this competitive environment, your supply chain team can make the difference between winning or losing.

What's changed?

Looking at the supply chain over the past 30 to 40 years, there have been significant and dramatic changes. Companies have shifted from being vertically integrated, to outsourcing, to contract manufacturing, eventually migrating to low cost regions to take advantage of lower wages and material costs. This migration began with high volume production, until medium and some low volume production followed suit due to industry pressure. One could even say it became a fashionable trend.

For a long time, there was a definite cost advantage to

making this transition, since labour and material costs were lower than the US or Europe. As outsourcing became the norm, more electronics manufacturing service providers opened in these areas, and in many cases, OEMs also opened facilities in lower cost regions. Early pioneers navigated government regulations, staffing and commercial requirements, which made it much easier for other North American and EMEA customers to subsequently make the transition and thus, it became a growing trend.

Today, however, companies understand landed cost much better than 10 years ago and are making more intelligent decisions based on solid data, rather than perceived popularity. If we fast-forward to 2017, when labour costs are rising and fuel costs have changed, we see that companies are once again rethinking their supply chain needs and priorities.

▶▶ *continued on page 26*



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Supply Chain Management

What's happening?

New cycles of regionalisation and on-shoring are starting to take shape, along with the emergence of different low-cost regions. Due to the trials and tribulations experienced in the previous cycle of change, however, we can expect this transition to be smoother.

So, what dynamics are currently at work? Regionalisation means having factories closer to the consumer. Tightening up the supply chain means shorter lead times, lower inventory levels and faster time to market, which will result in a competitive advantage for some and improves financial key performance indicators for others.

Across the industry better systems and process controls are in place. Robotics are improving efficiency, quality and cost, and drones are now being implemented as part of delivery systems. The introduction of big data also provides better analytics, enabling companies to make better business decisions. Will we see a mass exodus from Asia? No. Will we see new, more efficient factories in areas once thought to be high-cost regions? Yes.

What's ahead?

As we move into an era when we can transfer data at the speed of light using application programming interfaces to connect

businesses together, it's amazing to think how far today's factories and supply chains have come.

Globalisation is forcing companies to continually re-evaluate and develop innovative supply chain solutions. To stay ahead of the competition, they need to be fast, lean, efficient and have access to the latest technology to help them address ever changing market demands.

In this way, today's supply chain managers will develop and shape the supply chain through the next cycle of transformation. It will be interesting to see how this generation of supply chain leaders will drive change, particularly in light of the current wave of technology such as robotics, drones, 3D printing and data analytics.

Along with this trend towards robotics and automation, regionalisation is also having a big effect on supply chain decisions. This means that alongside China, Vietnam, India, Mexico, and Eastern Europe are the new options to consider.

As a final thought, it's encouraging to see the number of new supply chain managers in the electronics business, thanks to the 500 plus universities in the US offering a supply chain major. These are the new supply chain managers of the future



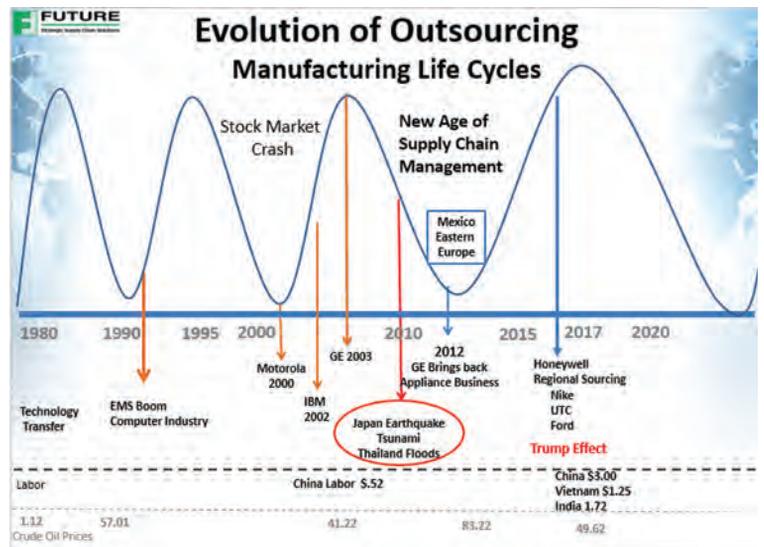
Supply chain solutions require constant oversight, transparency and flexibility

Vice president - supply chain solutions, Future Electronics, Tom Galligani

who will shape the supply chain through the years to come. Backed by technology advances in all areas, who knows what changes they will instigate.

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Purchasers can now buy Telegärtner's fibre optic cables by the drum. In addition to offering ready-to-install fibre optic links and cable in bulk, Telegärtner now offers its universal cable A/I-DQ(ZN)BH per drum for longer cable-runs. A new addition to the range is the external cable A-DQ(ZN)B2Y, which is also available by the drum. Both cables are available with four to 48 single-mode or multi-mode fibres.

Product line manager datavoice fibre optic solutions at Telegärtner, Falco Lehmann, said: "As a practical addition to

our tried-and-tested ready-to-install FO links and our bulk cable, our multi-fibre cables per drum allow a particularly cost-effective installation especially of longer cable-runs."

With its low smoke zero halogen jacket, the universal A/I-DQ(ZN)BH cable is ideal for indoor and outdoor use. Its non-metallic strength is said to provide effective protection against mechanical stresses during cable pulling and fastening, as well as against rodents.

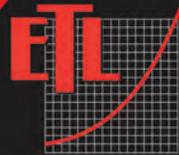
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Make smart outsourcing choices

Why you outsource will dictate how you outsource, explains John Dignan, an electronics manufacturing services provider with over 30 years' experience

If you work in electronics manufacturing, you will understand the saying, 'the convenient time to strategically plan, was yesterday.' This is true because the fruits of your labour can take a while to develop, so to establish traction, it is better to start sooner rather than later. Historically, the first quarter, from April to June, is the preferred time to reflect upon the previous financial year. This provides an opportunity to increase strategic awareness and move forward, embracing change as you learn.

If you are an original equipment manufacturer, you may therefore be considering your outsourcing strategy and asking the question, 'why outsource?' With 30 years of experience responding to this question, this is the advice I have given to many of my customers as they look to either start their outsourcing journey or to switch from one contract manufacturer to another.

EMS evolution

First, let's take a step back and look at the history of electronics manufacturing, since that can tell us a lot about our industry today. Product companies with manufacturing capability have been building sub-assemblies for other product companies for at least 75 years.

In 1961, for example, Space Craft Inc. was founded in Alabama to build satellites and communications gear for NASA, the US Navy and other governmental agencies. By the late 1970s, with NASA spending drying up, the company recognised that its greatest asset was, in fact, its relationships with the many OEMs it had worked with on the space program. The company was renamed SCI and began focussing its efforts on manufacturing products for OEMs, including IBM.

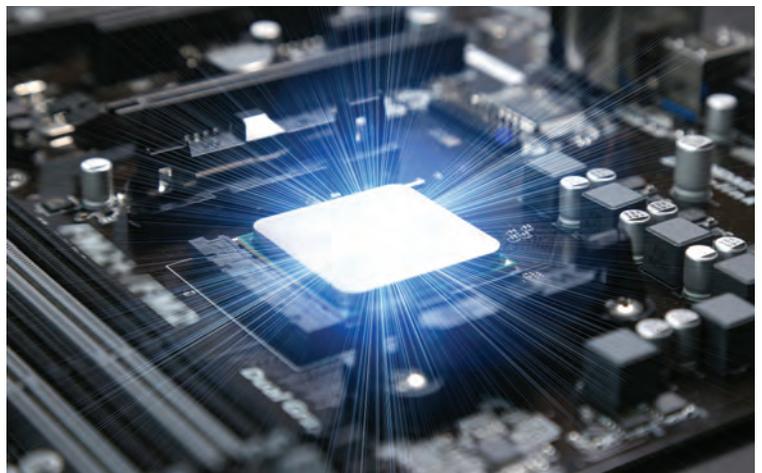
In 1984 SCI was named the world's largest electronics

subcontractor. Later that term was replaced by the phrase 'contract manufacturer' and latterly 'electronics manufacturing solutions' provider.

As the EMS business model and service offering has evolved, so too has the contractual relationship between EMS and OEM, with EMS partners taking an expanded role in the OEM

As the EMS business model and service offering has evolved, so too have the contractual relationships

Outsourced manufacturing is the dominant model



value chain. Today, for example, a company like Dynamic EMS offers full production lifecycle management, end-to-end. And just as the EMS business model has evolved, so too has the OEM's motivation for embracing outsourcing.

For instance, OEMs may want to enhance their capacity or focus on a narrower set of core competencies such as research and design. Outsourcing allows them to do this, as well as simplifying speed to market and product commercialisation. It can also provide access to advanced equipment and a reduction in market entry risks and supply chain fragility. Finally, outsourcing offers OEMs the ability to scale and potentially to reduce costs.

EMS differentiation

Today, we live in a world where outsourced manufacturing is the dominant model. Attention has now shifted to how EMS players differentiate themselves with regard to supply chain performance.

A recent supply chain study highlighted that more than 64 per cent of electronics OEMs believe supply chain management is a competitive advantage and yet, in the same study, only 29 per cent believe that their supply chain is nimbler than their competitors. To bridge this gap, more and more OEMs are looking for their EMS partner to provide them with a competitive advantage through supply chain mastery, efficiency and simplicity.

So, before making any outsourcing decisions, OEMs need to ask a series of questions. Firstly, what do you plan to achieve through outsourcing? Is your company looking to lower product cost or improve time to market? Do you require access to advanced technology or improved working capital or maybe you want to share product risk or boost capacity flexibility?

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Your needs will decide the type of business model that your EMS partner should put in place to support you

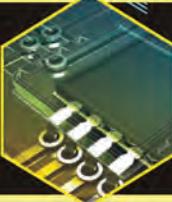
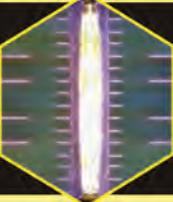
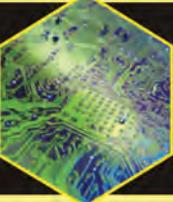
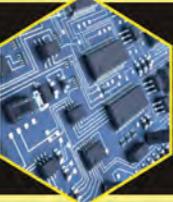


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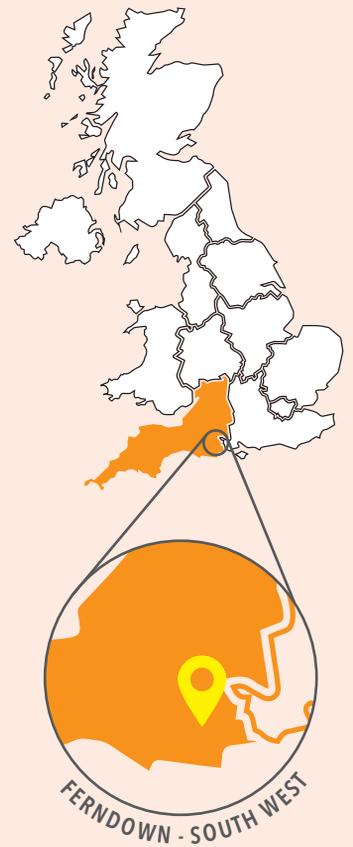


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Evaluate potential partners with confidence

Commercial director at Texcel, Peter Shawyer, provides a checklist for evaluating contract electronics manufacturing partners

During his time at Texcel, which spans over 30 years, Peter Shawyer has shown numerous customers around the facility and answered their questions as they assess the company's suitability as a supplier. This experience has given an insight into the factors OEMs deem important when looking to outsource the manufacture of their products.

Financial Stability. All OEMs want a supplier that is financially stable, but it is worth taking a close look at the financials, since the stability of the CEM will have an impact on the service levels it can offer. It can affect the ability to procure stock and buffer stocks, the ability to ramp up volume production quickly and the ability to grow with customers.

Engineering capability. It is reassuring to know that the CEM manufacturing your product understands the design and can provide value added support and help with troubleshooting if needed. Check out the depth and

strength of the CEM's in-house engineering expertise.

Approvals and Processes. Find out whether the supplier has the necessary approvals in place if there are any that are specific to your industry. The CEM should be able to demonstrate that robust processes are in place, from receipt of order to delivery of finished product.

Quality. Ask what quality practices are standard at the CEM and whether they can be customised if necessary. Depth of engineering expertise at the CEM can prove invaluable when problem-solving.

Test and Inspection. Similarly, find out what standard test and inspection procedures are in place and whether these too can be customised if needed. Is there sufficient engineering expertise at the CEM to assist with complex product builds?

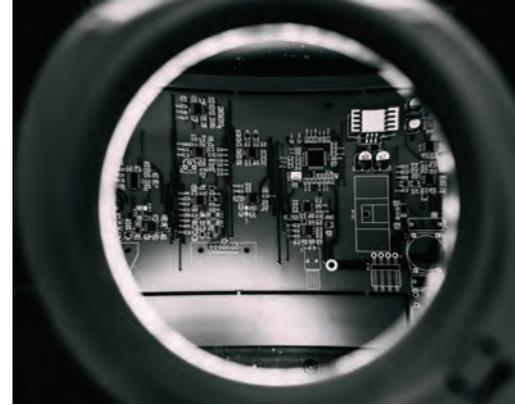
Responsiveness. How quickly can the CEM provide costings? Can they respond when you urgently need

to pull orders forwards? If the CEM is supportive it should, for example, be able to identify alternative components, support slowdowns in demand and manage emergency engineering changes? Remember a flexible CEM supplier may appear costlier at the outset, but can prove to be a money-saver as well as a life-saver.

Flexibility. Can the CEM tailor its service to meet OEM requirements? Will it hold buffer stock, consignment stock or operate Kanban? Flexibility, or agility, is a key driver in the current climate.

Communications. This is critical at all levels and across all functions. The most successful OEM/CEM relationships work where peer to peer communication is encouraged from the outset and is the sign of a true manufacturing partnership. OEMs need communications to be direct, fast, accurate and honest.

Fit. In addition to all the previous items on the



Texcel management team encompassing the purchasing manager, managing director, financial director, commercial director and materials manager

checklist, the fit of the two organisations is vital for a successful partnership. Even if the CEM ticks all the boxes for size, finances, engineering expertise and capability, the OEM must feel they trust the CEM. If it doesn't feel right – don't do it.

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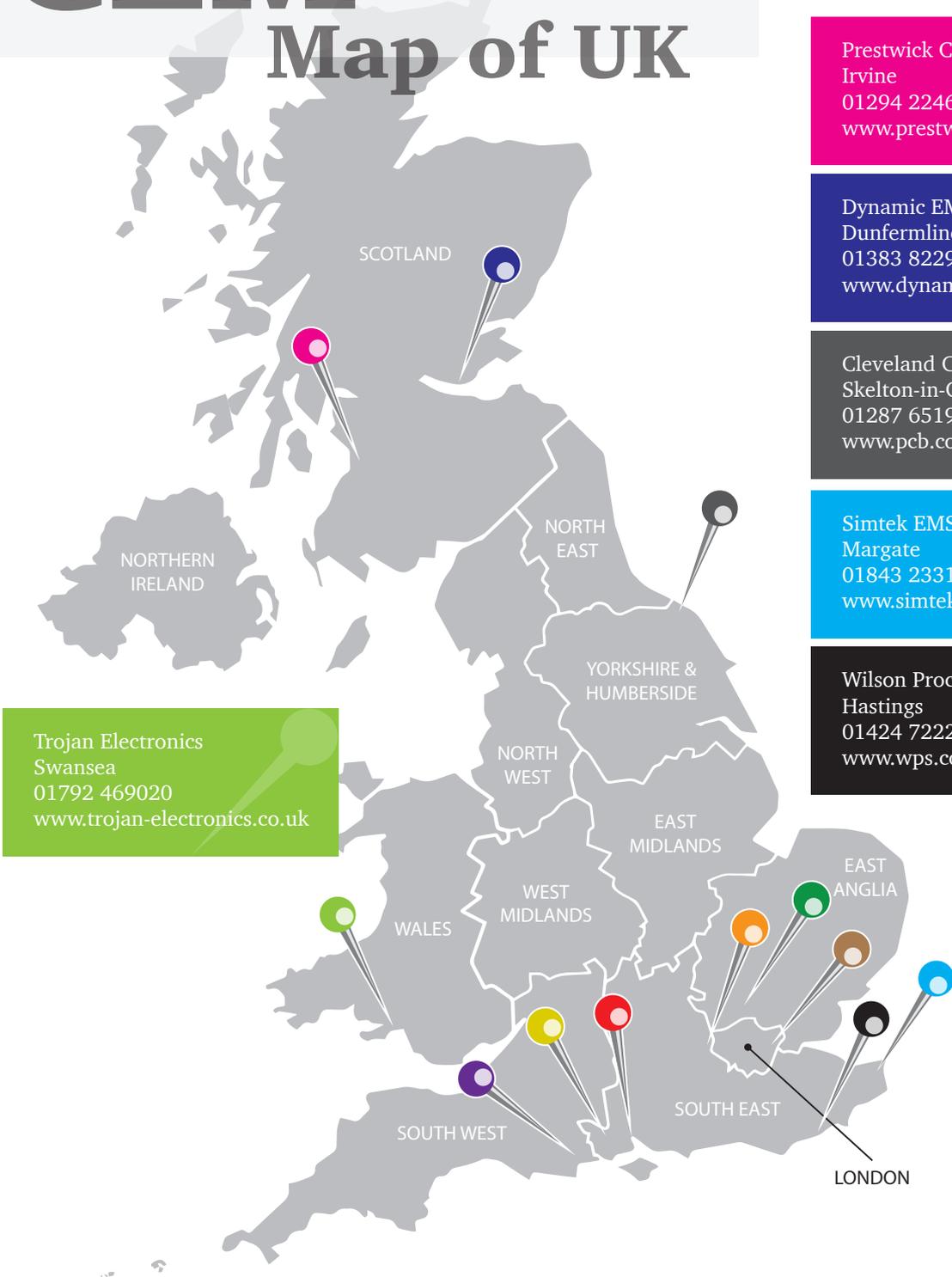
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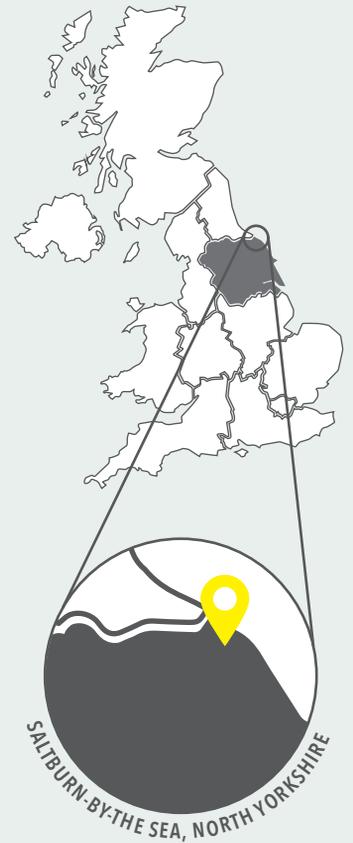
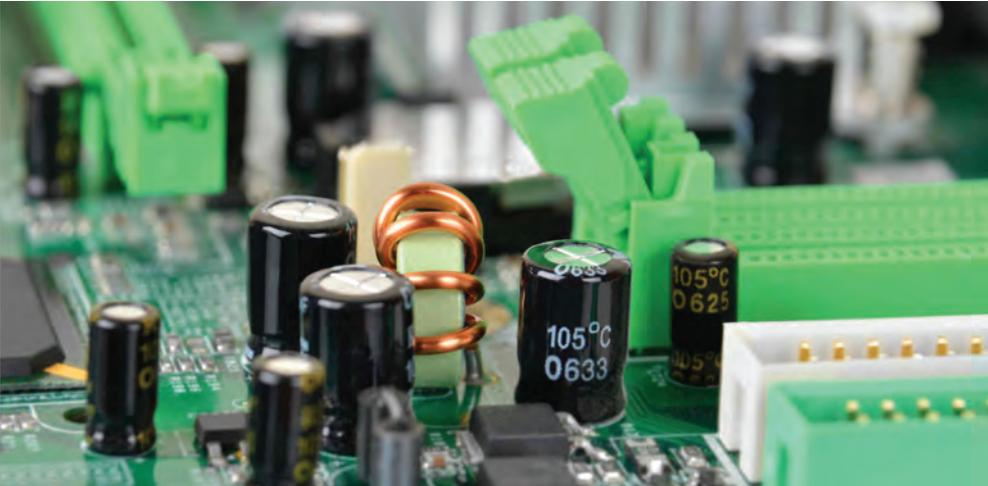
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Fine tune your IoT solution

Equipment manufacturers increasingly want to monitor machines remotely, but they're not always sure how to go about it. Speaking to a specialist distributor can save time and money when implementing a connectivity solution



Equipment manufacturers are investigating how they can use the internet to remotely manage and monitor their machines

With a dedicated internet of things website, electronic components distributor, Gateway, has seen increased interest in connectivity. Just as transactions on the site have increased, so too have calls from companies looking to optimise their connectivity to the end equipment or application. Many customers have a basic understanding of their connectivity requirements, it seems, but they often need help in fine-tuning the equipment to the end application and the user environment.

In situations like this, Gateway is able to provide

a modem, an antenna tuned to the required frequency, a suitable mounting system and a matched connector and lead length. This avoids the losses associated with long cable runs and multiple connections, which is often overlooked. Granted, it is possible to find solutions by shopping around, but by contacting a specialist IoT connectivity solution provider, it may be possible to save multiple phone calls and potentially multiple delivery charges.

According to Gateway, there has been a noticeable change in the calls that it is fielding.

An increase in enquiries is being observed from equipment manufacturers investigating how they can use the internet to remotely manage and monitor their machines. They also want to know how to use remote connectivity to streamline service plans and reduce expensive outgoings by using a router or modem to remotely manage machines from their office.

Integrating hardware and software

Thankfully there are partners that can provide the antenna,

▶▶ *continued on page 36*

An increase in enquiries is being observed from equipment manufacturers investigating how they can use the internet to remotely manage and monitor their machines

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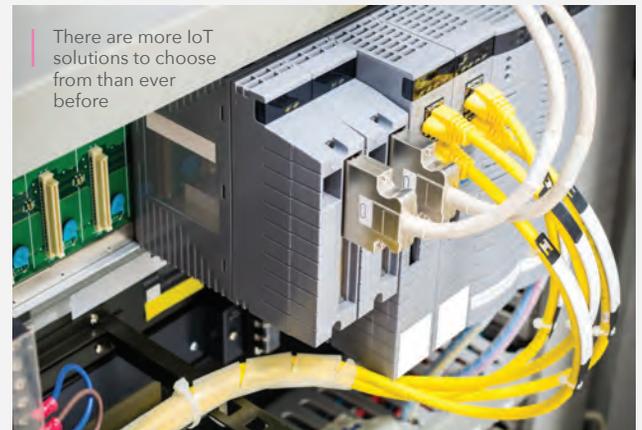
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IoT



There are more IoT solutions to choose from than ever before

modem and router hardware to achieve the required connectivity, as well as human machine interface equipment for local machine monitoring, diagnostics and control. Increasingly there are also specialist distributors that can bring these two together to provide an integrated remote monitoring solution as well as providing additional software and support to help the user with both off-the-shelf and bespoke total solutions.

One-off-the shelf solution developed to address this recurring need is SIMG8, which provides an easy way of talking to industrial equipment remotely. Increasingly, engineers who are familiar with processor code don't get involved in designing intuitive graphical user interface applications for desktop PCs. The design of such applications is usually developed and tested by a dedicated team who, perhaps, don't understand the hardware for which it is intended. SIMG8

was developed by a team that understands both disciplines, creating a system that addresses both engineering and end user requirements.

Developed by Gateway, the SIMG8 solution offers a range of 3G and 4G fixed IP sim cards from leading global network providers, offering single sim or multi sim plans across single and multiple networks, with stand-alone or aggregated data plans.

The gathering pace of IoT solutions in the M2M arena and the increasing number of providers of connectivity and HMI equipment is creating greater levels of choice, but with the risk of confusion. Thankfully, technically skilled distributors, such as Gateway, can help customers find a suitable solution for their application, also providing software and network solutions for further fine tuning.

www.gatewaycando.com



The right partner can provide the antenna, modem and router hardware

Medical buyers must deal with obsolescence and consolidation risks

Buyers at medical OEMs and EMS providers are tasked with sourcing components for leading-edge medical devices which often have lifecycles of 10 or more years

By James Carbone

The need to sole source components, long validation processes for parts and suppliers, and component obsolescence are some of the risks that buyers in the medical industry must manage.

Such risks can make it difficult for suppliers to be qualified, slow down the design process and delay the introduction of new products.

Buyers at medical OEMs and electronics manufacturing services providers (EMS) must also keep a close eye on consolidation in the electronics component industry. Consolidation is also a concern for buyers because it can reduce competition in the supply base. It's also an issue in the medical industry because medical OEMs often have sole sources for components.

"Industry consolidation is something that we follow closely," said Chris Brockland, GE Healthcare sourcing executive. "Sometimes the consolidation will improve aspects of the suppliers' performance and our relationship with them. However, the opposite effect can also occur, which can result in review of our supplier selection strategy," he said.

In some cases when two companies consolidate, the merged company becomes stronger financially and invests in new design and manufacturing technologies, which is "exciting to us," said Brockland.

He said with any consolidation, it is necessary to understand what the core strategy of the new consolidated business is going to be "especially when there's going to be technology overlaps between the two companies or investments that need to be made."

Paul Blom, chief procurement officer and senior vice president supply chain for EMS provider Celestica, said consolidation can result in an "opportunity for deeper and more focused partnering from a technology roadmap and design perspective." He added there is also a challenge in "terms of competition and breadth of selection or component alternates."

Blom said many of the acquisitions have been focused on achieving "increased breadth or diversity of portfolio, rather than just scale." But an area of future concern will be the component end-of-life plans of the now larger electronic component companies, and how this may impact overall life-cycle planning and execution," said Blom.

Many buyers in the medical equipment industry view consolidation as a risk that they must manage, but it is not the only one.

Only one supplier?

Charlie Mason, senior vice president of Sanmina's medical division, said medical equipment bills of materials (BOM) tend to have "sole-sourced components."

Medical OEMs don't necessarily have sole sources because there is just one supplier for the part. Rather it often is a time-to-market issue because of the amount of time it takes to validate a part and a supplier for a medical device during design. Validating multiple parts and suppliers can take months and delay introduction of the new product.

"The OEM is focused on time-to-market," said Mason. "Very often the additional time to go ahead and do verification testing on multiple configurations of multiple suppliers is going to add time," said Mason.

Besides delaying introduction of a product, sole-sourced parts can also increase overall risk because if the supplier has trouble producing the product, there are no alternate suppliers qualified.

Blom said Celestica works with customers to reduce the number of sole-sourced components within the product design or BOM and identify alternate or back-up sources of supply, and provide supporting engineering and design services.

"In addition, we monitor for supply chain disruptions and disasters globally, addressing continuity of supply issues rapidly as we detect threats to supply," said Blom.

In fact, maintaining continuity of supply is a

▶ continued on page 38



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Purchasing

▶ challenge for most medical OEMs and EMS providers that manufacture for the OEMs. To help maintain continuity of supply, OEMs will try to design in semiconductors and other components that have long projected lifecycles because the lifecycles of most medical devices are long.

Maintain supply continuity
Purchasers at medical OEMs also need to develop long-term relationships with multiple sources including distributors to help guarantee continuity of supply and reduce risk.

One way GE Healthcare manages risk and continuity of supply is through its global supply chain and sourcing teams, which works with more than 70 GE Healthcare plants around the world and 5000 suppliers, according to Brockland.

“Our goal is to complement our global scale with local presence, he said. “This global reach, along with a value stream approach within our product lines and regions, helps us mitigate risk and provides for flexibility in sourcing key components.”

The idea is to make sure GE has the material availability it

needs. “Material availability is a critical aspect of the relationship we have with not only our components suppliers, but our entire electronics supply chain including distribution, contract manufacturing, and brokers.” He added when GE designs a component into one of its products it is expected that “the supplier will maintain capacity to meet our customer demand, regardless of market conditions,” said Brockland. This may be challenging at times and requires work by all parties “to make sure demand for GE Healthcare products is supported.”

To support that effort, GE analyzes technology roadmaps and involves design engineers, component engineers, purchasers and suppliers. “However, it’s not just about aligning our product roadmap needs to the suppliers,” said Brockland. “We’re at our best when we collaborate with strategic suppliers on how they can design products to solve our future technological opportunities. A partnership mentality is key. We, including the end customer, benefit most when we innovate together versus just buying parts from a catalog,” he said.

Risk tools developed
Of course, other medical OEMs and EMS providers have developed other strategies and tools to address supply chain risk. For instance, EMS provider Plexus has created a proactive risk identification toolset which looks at individual components used in certain markets, specific suppliers of the parts and locations of the suppliers to help evaluate risk.

Plexus determines if the suppliers have their own risk mitigation plans in place and if they have multiple locations where they could manufacture a needed part, said Mike Tendick, healthcare/life sciences market sector vice president.

The toolset helps the EMS provider determine which customers use certain parts and if they are at risk. Plexus will develop proactive solutions to reduce the risks, said Tendick.

Reducing risk in the medical equipment supply chain may be more complicated than in other industries because of the wide range of components that are needed.



“Industry consolidation is something that we follow closely. Sometimes the consolidation will improve aspects of the suppliers’ performance and our relationship with them” said Chris Brockland, GE Healthcare sourcing executive

“One of the things that is unique about healthcare medical space is the diversity of the products in the segment,” said Mason. He said medical has many lower volume, high complexity products such as diagnostic imaging type products, including nuclear medicine, CT scanners, PET scanners, lab diagnostic and ultrasound equipment.

“There’s a lot of unique technology that is going into those products and a huge diversity of components that procurement needs to source,” he said.

Medical equipment market posts robust growth

Demand for electronics medical equipment will grow over the next five years as the need for healthcare increases as more members of the Baby Boomer generation enter their golden years.

The worldwide medical electronics market will rise from about \$39.5 billion in 2016 to \$47.8 billion in 2020, according to researcher IHS Markit Technology.

That’s good news for medical OEMs and their contract manufacturing partners. The medical segment of worldwide electronics manufacturing services will grow 6 to 7 per cent through the period just behind the automotive segment, according to Dan Panzica, chief analyst, outsourced manufacturing intelligence service for IHS Markit Technology

“Automotive is growing by about 7-9 per cent per year. Medical will be at the low range of that. Volumes are lower for medical than automotive,” he said.

Panzica added that the growth rate for the North American EMS medical segment will post stronger growth than other regions as revenues increase from about \$10 billion in 2016 to more than \$12 billion in 2020.

One reason for the healthy EMS medical business in North America is that a lot of medical is low-volume, high-mix and labor costs are not as much of a factor as they are in other EMS segments such as computers and cell phones, which tend to be high-volume, low-mix businesses.

“Hourly labor is not that big a deal in

medical, so having manufacturing in the U.S. is not as onerous compared to other manufacturing,” he said. As a result, more medical will be manufactured in North America.

The electronics medical equipment market will grow to \$47.8 billion by 2020

Source: IHS Technology

Demand for electronics medical equipment grow



There are some custom components in every product. "It could be an application-specific integrated circuit (ASIC) or custom memory," said Mason. "It can vary from product to product, but each one will have some custom or specialized devices in it." Of course, there are standard parts such as discrete semi-conductors, logic and passives and connectors that also need to be purchased as well.

The lifecycle factor

Another unique aspect of medical industry sourcing compared to other industries is product lifecycle. Unlike computers or cell phones, medical equipment tends to have long lifecycles. As a result, obsolescence is more of an issue and needs to be factored in sourcing decisions.

"We always have to think about the lifecycle of the product that we are producing," said Mason. "Many of these medical devices have 10-year or longer lifecycles. Many components don't have anywhere near that type of lifecycle," he said.

As a result, "we are constantly having to evaluate the supply chain for end-of-life componentry to make sure that we are going to be able to support products throughout its lifecycle. That is certainly critical for us," said Mason.

Another issue in sourcing for medical is change control. "The healthcare/medical market is very focused on any change to the componentry, the process that makes the component and the location of the product where it's manufactured," said Mason.

"We constantly monitor, communicate with and manage the supply base to make sure that we understand any potential changes that may be occurring or being planned to risk and identify what validation submittal may be required," he said.

Mason noted that every manufacturing process for medical needs to be validated. "With medical you can't just move a production line," he said. "You need to go through risk assessment and you have

to re-validate," he said. "That flows down to the component suppliers as well."

That is one reason why medical OEMs need to have strong relationships with component suppliers and be proactive in managing them.

"So many issues and recalls that have occurred in the industry have occurred not because of the medical OEM or the EMS company, but because of suppliers a bit further down the supply chain," said Tendick. "So how we support and how we manage our suppliers is critical."

He said medical device OEMs expect Plexus and other EMS suppliers to have strong supplier management. "Medical device manufacturers hold themselves to high standards and so do we. We need the same thing from our suppliers," he said.



"There's a lot of unique technology that is going into [medical] products and a huge diversity of components that procurement needs to source," said Charlie Mason, senior vice president of Sanmina's medical division

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James Carbone
contributing editor



Distribution: It's a risky business

Distributors must manage risks that impact their own businesses, but also help customers identify, avoid and mitigate risk in the supply chain *By James Carbone*

Distribution Market Watch

The role of electronics distributors has changed over the last 25 years. Back in the day, distributors basically had to stock parts from component manufacturers and sell them to OEMs and contract manufacturers.

But times have changed and the role of distributors has evolved. Of course, selling parts to customers too small to do business directly with component manufacturers is still core to the distribution model. But distributors are also expected to provide value-added and supply-chain services to help customers reduce cost and supply chain risk.

Distributors hold inventory for OEMs and component manufacturers, provide customers with extended payment terms, keep customers apprised of new technology and components and provide timely information about long lead-time and obsolete parts and alternative solutions.

Despite the added cost and risk to their own businesses, distributors have not only accepted the new role, but have embraced it. Many distributors say that helping customers manage risk may be a challenge, but it is also an opportunity. They know that by assisting OEMs and electronics manufacturing services providers

(EMS) reduce inventory, manage component obsolescence, manage cash flow, distribution's role in the supply chain is enhanced and becomes more valuable to OEM and EMS customers as well as the component manufacturers.

Distributors help customers reduce risk in different ways. One way is by holding inventory. Most companies regard inventory as a necessary evil and want to have as less inventory as possible. But inventory is part of a distribution's value proposition to customers.

"When you think of risk, the risk that comes to mind is inventory," said Dave Doherty, president and chief operating officer for Digi-Key. "Do we have the right inventory? The wrong inventory is a liability. The right inventory is an asset," he said.

He said to mitigate its own risk concerning inventory it's necessary to have a large customer base. It's the ultimate diversified portfolio.

He said some distributors focus on the "A and B runners", parts that are in high demand. "That helps to mitigate risk for some distributors," said Doherty.

"The other way is to go in the other direction to widen your customer

"We send out not-recommended-for-new designs emails to customers that have bought the part over the last 12 months," said Kevin Hess, senior vice president of marketing for Mouser Electronics



base and you can only do that by having a wider selection parts. It's a contrarian approach," said Doherty.

"We grow our customer base between 5-10 per cent every year. It's up over 500,000 now. But at the same time, we turn about half of that." That means to grow the customer base it's necessary to continuously find new customers.

Managing EOL risk

Besides inventory, distributors often help customers reduce risk by helping them manage component obsolescence, which impacts buyers in all industries, but especially in industries that build electronics equipment with long product life cycles such as defense and aerospace and communications.

"As soon as we get notification from the manufacturer that a part is going obsolete we update our database, post it on the website and send out end-of-life changes," said Kevin Hess senior vice president of

marketing for Mouser Electronics. "We send out not-recommended-for-new designs emails to customers that have bought the part over the last 12 months," said Hess.

He added Mouser also directs customers to a webpage that recommends drop-in replacements for obsolete parts. "Our responsibility is to relay the information from manufacturers on risk," said Hess.

Mouser also has a BOM tool that will analyze a bill of materials and inform a buyer or engineer if there are components on the BOM that are not recommended for new designs. The tool also suggests alternative parts.

"If you bought a part and it has become obsolete, we proactively send you an email that there is risk with a part and you may want to consider other parts," said Hess. If a buyer or an engineer is in the "quoting or buying process we let

you know if there is a risk” with a part, he said.

Easy payments

In some cases, distributors reduce financial risk by offering extended payment terms. More customers are looking to pay for products beyond 30 days.

A payment term that used to be “30 days is now 60 days,” said Matt Waite, president of Dove Electronic Components, a crystal and oscillator specialist distributor, based in East Setauket, N.Y. “What used to be 60 days is now 90,” he said.

Obviously, there is financial risk to distributors offering extended payment terms to the customers.

Some risks are due to technology changes. “With cellular and Internet of Things, wireless technologies are changing all the time,” said Wing. Because of rapid changes, customers may change their minds concerning which technologies they should use, said Wing. As a result, “it’s kind of risky to go down the road with a customer the way you used to,” said Scott Wing, president of Symmetry Electronics

In the past, we would “pitch technologies and pitch a product to a customer and get some parts designed into a product which would then go through to production. Now with wireless,

cellular and the whole IoT play, it is very, very dynamic. Customers are changing their mind more than they used to,” said Wing.

That can create risk for a distributor because the distributor could carry inventory of product for a customer, but the customer could decide to use parts based on a different technology and the distributor is stuck with the inventory.

Consolidation risk

Wing said, however, the biggest “unique risk is consolidation of suppliers.” There have been many mergers and acquisitions in the semiconductor industry and some distributors have lost lines due to consolidation. However, in some cases distributors have picked up lines because of consolidation

“We have been fortunate. We had a great line called Silicon Image,” which produce chips for wireless video applications. They got bought by Lattice. Symmetry was not a big enough distributor, for Lattice but once Lattice purchased Silicon Image, Symmetry got to carry Lattice products as well.

Some risk involved intellectual property for distributors that help to develop products.

“We have taken on more risk jointly in the intellectual-property area of



“We have taken on more risk jointly in the intellectual-property area of the equation,” said Ralf Buehler, chief sales and marketing officer for Premier Farnell

the equation,” said Ralf Buehler, chief sales and marketing officer for Premier Farnell. He said an OEM may outsource design and manufacturing and we may “become part of that value chain.”

For example, “we develop boards for customers. We have had conversations today, do we guarantee we protect IP on these? Are we making sure that the board doesn’t conflict with any existing IP out there,” he said.

If Premier Farnell develops a board, “we obviously do as much work as we can to make sure that we are not infringing any IP,” said Buehler

The risk of differentiation
Buehler added that product risk has increased because customers are looking for differentiated products and distributors may have to stock more variations of products. For instance, with microcontrollers, 10 years ago “you had five variants of a microcontroller,” said Buehler. “Today every supplier has thousands of variants of the same microcontroller” and there are thousands of customers using different variants, he said.

“That has become a real risk because a larger part of the inventory that distribution holds is almost customer specific,” said Buehler. He said there may be only one or two customers buying a product in large quantities.

One risk that some distributors have concerns about are noncancelable nonreturnable (NCNR) policies that some component manufacturers have.

Some OEMs and EMS providers will award business to a distributor based on parts being non-NCNR. To take such business, “is a risk play. Some of my competitors will opt to take that risk,” said Waite. And maybe sometimes I will. So that’s a new dimension to the industry.”



“With cellular and Internet of Things, wireless technologies are changing all the time. It is very, very dynamic,” said Scott Wing, president of Symmetry Electronics

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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.
ALCOSWITCH Switches /
TE Connectivity
AlfaMag Electronics (AMGIS)
All Sensors Corporation
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Alliance Memory, Inc.
Alpha and Omega Semiconductor, Inc.
Alpha Wire
Altera (Intel® Programmable
Solutions Group)
American Electrical, Inc.
American Technical Ceramics
Ametherm
Amgis
AMI Semiconductor /
ON Semiconductor
AMP Connectors / TE Connectivity
Amphenol
Amphenol Advanced Sensors
Amphenol Aerospace Operations
Amphenol Audio
Amphenol Commercial Products
Amphenol Connex (Amphenol RF)
Amphenol Entertainment
Amphenol FCI
Amphenol Industrial
Amphenol LTW
Amphenol Pcd
Amphenol RF
Amphenol Sine Systems
Amphenol SV Microwave
Amphenol Tuchel Electronics
Ampleon
ams
Amulet Technologies, LLC.
Analog Devices, Inc.
Anaren
AnDAPT
Angstrom / Vishay
Antenova
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
Arduino.CC
Arduino.ORG
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
Axiom Relays / TE Connectivity
Aztronic / Vishay
B B Battery
B&F Fastener Supply
B&K Precision
B+B SmartWorx, Inc.
Beau Interconnect - a Molex company
BEI Sensors
Bel
Bel Fuse, Inc.
Bel Power Solutions
Belden
Bergquist
BI Technologies / TT Electronics
Birtcher / Pentair
Bivar, Inc.
BlueCreation
BlueRadios, Inc.
Bluetechnix GmbH
BNS Solutions
Bomar (Winchester Electronics)
Bopla Enclosures
Bosch Sensortec
Bourns, Inc.
Brad - a Molex company
Bridgelux, Inc.
Broadcom Limited
Buchanan Terminal Blocks /
TE Connectivity
Bud Industries, Inc.
Bulgin
Burr-Brown (Texas Instruments)
Bussmann (Eaton)
C&D Technologies (Murata Power
Solutions)
C&K
Caddock Electronics, Inc.
Cal Test Electronics
Califia Lighting (Bivar)
Calmark / Pentair
Cannon
Cantherm
Capital Advanced Technologies, Inc.
Carclo Technical Plastics
Cardinal Components
Carling Technologies
Catalyst Semiconductor /
ON Semiconductor
CEL (California Eastern Laboratories)
Central Semiconductor
Cera-Mite / Vishay
CGS Resistors / TE Connectivity
CH Products
Chemtronics
Cherry Americas
Cherry Switches (ZF Electronics)
Chip Quik, Inc.
Cicoil
CII / TE Connectivity
Cinch Connectivity Solutions
Cironet / RFM (Murata Power
Solutions)
Cirrus Logic
Citizen Electronics Co., Ltd.
Citizen Finedevice Co., LTD.
Clarostat (Honeywell Sensing and
Productivity Solutions)
CMD (ON Semiconductor)
CNC Tech
Cogent Computer Systems
Cognimem
Coiltronics (Eaton)
Comair Rotron
Comchip Technology
Concept Technologie (Power
Integrations)

Condor / SL Power
Conec
Connex (Amphenol RF)
Connor-Winfield
Conxall / Switchcraft
Cooper Bussmann (Eaton)
Copal Electronics
Corcom Filters / TE Connectivity
Cornell Dubilier Electronics
Cortina Systems (Inphi)
Coto Technology
CR Magnetics, Inc.
Cree
Crescent
Critical Link
Crouzet
Crydom
Crystek Corporation
CSR PLC (Qualcomm)
C-Ton Industries
CTS Electronic Components
CUI, Inc.
Curtis Industries
Curtis Instruments
Custom Computer Services
CW Industries
Cynergy3
Cypress Semiconductor
Daburn
Dale / Vishay
DAVE Embedded Systems
Davies Molding, LLC.
DecaWave
Delta Electronics
Delta Electronics / EMI
Delta Electronics / Fans
Delta Electronics / Power
Desco
DEUTSCH Connectors /
TE Connectivity
DEUTSCH ICT / TE Connectivity
DFRobot
Dialight
Dialog Semiconductor
Dielectric Laboratories (Knowles)
Digi International
Digent, Inc.
Digital View Inc.
Diodes Incorporated
Displaytech
DLP Design, Inc.
Draloric / Vishay
dresden elektronik
Dynastream Innovations Inc.
E Ink
EasyBraid Co.
Eaton
ebm-papst Inc.
Echelon
Econais
ECS Inc. International
EDAC Inc.
Elco (AVX)
Elcon Connectors / TE Connectivity
Electric Imp
Electro Corp (Honeywell Sensing
and Productivity Solutions)
Electro-Films (EFI) / Vishay
Electronic Assembly GmbH
Electroswitch
Elna America
Embedded Artists
Emerson Connectivity Solutions
Emerson Embedded Power (Artesyn
Embedded Technologies)
EMIT
Energiizer Battery Company
Energy Micro (Silicon Labs)
EnerSys
enmo Technologies
EnOcean
EPC
EPCOS
Epcos / RF360
Epson
Equinox Technologies
EREM
ERP Power
Essentra Components

ESTA / Vishay
E-Switch
E-T-A
Ethertronics
Eupec (Infineon)
Eveready (Energizer Battery Company)
Everlight Electronics
EverSpin Technologies, Inc.
Exar Corporation
Excelitas Technologies
Excelsys Technologies Ltd.
E-Z-Hook
Fairchild/ON Semiconductor
Fan-S Division / Qualtek
Electronics Corp.
FCI (Amphenol FCI)
FCT Electronics - a Molex company
FDK America
FERROXCUBE
Finisar Corporation
FIT (Foxconn Interconnect Technology)
Flamar - a Molex company
Flambeau, Inc.
FLIR
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)
GeneSiC Semiconductor
Genuino (Arduino)
GHI Electronics, LLC
Global Power Technologies Group
Global Specialties
Grayhill, Inc.
Greenlee Communications
GWConnect - a Molex company
H&D Wireless
Hamlin / Littelfuse
Hammond Manufacturing
HARTING
Harwin
Heatron
HellermannTyton
Henkel/Loctite
Heraeus Sensor Technology USA
HiRel Systems / Vishay
Hirose
Hittite (Analog Devices)
Holsworthy Resistors /
TE Connectivity
Holt Integrated Circuits, Inc.
Honeywell Microelectronics &
Precision Sensors
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Solutions
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Initial State Technologies, Inc.
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Inphi
Inspired LED
Integrated Device Technology (IDT)
Integrated Silicon Solution, Inc. (ISSI)
Intel® Programmable Solutions Group
Intematix
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Interlink Electronics
International Rectifier (Infineon
Technologies)
Intersil
InvenSense / TDK
Inventek Systems
Inventus Power
IR (Infineon Technologies)
IRC / TT Electronics
ITOUCH Systems Co., Ltd.
Isocom Components
ISSI (Integrated Silicon Solution, Inc.)
ITT Cannon, LLC
ITT Interconnect Solutions
ITW Chemtronics (Chemtronics)
IXYS Corporation
IXYS Integrated Circuits Division
J.W. Miller / Bourns
JAE Electronics, Inc.
Jinlong Machinery & Electronics
Co. Ltd.
JKL Components Corporation
Johanson Dielectrics, Inc.
FLIR
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)
GeneSiC Semiconductor
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Holt Integrated Circuits, Inc.
Honeywell Microelectronics &
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Marktech Optoelectronics
Marlow Industries, Inc.
Martel Electronics
Marutsuelec Co., Ltd.
Master Appliance Corp.
Matrix Orbital
Maxim Integrated
Maxwell Technologies, Inc.
MCB Industrie / Vishay
Measurement Specialties /
TE Connectivity
MEC switches
Mechatronics
MegaChips
Melexis
Memory Protection Devices
MEMSIC
Menda
Mentor Graphics
Metelics (MACOM Technology
Solutions)
MG Chemicals
Micrel / Microchip Technology
Micrium
Micro Commercial Components (MCC)
Microchip Technology
microEngineering Labs Inc.
Micro-Measurements /
Vishay Precision Group
Micron Technology
Micronas
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
Molex FCT Electronics
Molex Flamar
Molex GWConnect
Molex Interconnect Systems
Molex NuCurrent
Molex Oplink Communications, LLC.
Molex Phillips-Medizise
Molex PolyMicro Technologies
Molex Temp-Flex
Molex Woodhead
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 /
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Navman Wireless (Telit Wireless
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NDK
Nearson
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Nesscap Co., Ltd
NetBurner, Inc.
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Newhaven Display, Intl.
Nexperia
Nichicon
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
Octavo Systems
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Ohmite
OK Industries (Jonard Tools)
Olimex
Omron
Omron Automation & Safety
ON Semiconductor
ON Semiconductor/Fairchild
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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.
Patco Electronics
Patco Services
PCD / Amphenol
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Pericom Semiconductor Corp.
(Diodes Incorporated)
Pervasive Displays
PIHONG USA
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Phoenix Contact
Phoenix Mecano
Phoenix Passive Components /
Vishay
Phyton, Inc.
Pimoroni
PolyMicro Technologies -
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Pomona Electronics
Pontiac Coil, Inc.
Portescap
Potter & Brumfield Relays /
TE Connectivity
Power Integrations
Powerex, Inc.
Power-One (Bel Power Solutions)
PowerStor (Eaton)
PRD Plastics
Preci-Dip
Precision Design Associates, Inc.
Precision Electronic Components Ltd.
ProAnt
Products Unlimited Transformers &
Relays / TE Connectivity
Protektive Pak
PUI Audio, Inc.
PULS
Pulse Electronics Corporation
PulseCore Semiconductor /
ON Semiconductor
Q-Cee's / TE Connectivity
QT Brightek
Quadcept
Qualcomm
Qualcomm (RF360 - A Qualcomm &
TDK Joint Venture)
Qualtek Electronics Corp.
Quatech / B+B SmartWorx
Radial Magnet, Inc.
RAFI
Ramtron (Cypress Semiconductor)
Raspberry Pi
Raychem Cable Protection /
TE Connectivity
RECOM Power
Red Lion Controls
REDEL / LEMO

Renesas Electronics America
RF Digital
RF Solutions
RF360 - A Qualcomm-
TDK joint venture
Richco, Inc. (Essentra Components)
Richtek
Riedon
Rigado
Roederstein / Vishay
ROHM Semiconductor
Rose Bopla
Rose Enclosures
Rose+Krieger
Roving Networks / Microchip
Technology
RPM Systems
Rubycon
RushUp
Sagrad
Samsung Electro-Mechanics
America, Inc.
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
Seed
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
Sharp Microelectronics
Sierra Wireless
Sigma Designs
Sigma Inductors / TE Connectivity
Signal Transformer
Sil Semiconductor Corporation
Silicon Labs
SINE Systems / Amphenol
Siretta
SiTime
SkyTek
Skyworks Solutions, Inc.
SL Power Electronics - Manufacturer
of Condor / Ault Brands
SMC Diode Solutions
Soberton, Inc.
SolidRun
Souriau Connection Technology
Spansion (Cypress Semiconductor)
SparkFun
Spec Sensors
Spectra Symbol
Sprague Goodman
SSI Technologies, Inc.
Stackpole Electronics, Inc.
Staco Energy Products Co.
Standex-Meder Electronics
Stanley Electric
Steinel
steute Wireless
Stewart Connector
STMicroelectronics
Storm Interface
Sullins Connector Solutions
Sumida Corporation
SunLED
Sunon
Susumu
SV Microwave (Amphenol SV
Microwave)
Swanstrom Tools
Swissbit
Switchcraft / Conxall

Syfer
Synapse Wireless
Tag-Connect
Taitien
Taiyo Yuden
Talema
Tallysman Wireless
Tamura
Taoglas
TAOS / ams
TDK Corporation
TDK InvenSense
TDK RF360
TDK-Lambda Americas, Inc.
TE Connectivity
TE Connectivity Aerospace Defense
and Marine
TE Connectivity ALCOSWITCH
Switches
TE Connectivity AMP Connectors
TE Connectivity Corcom Filters
TE Connectivity DEUTSCH Connectors
TE Connectivity DEUTSCH ICT
TE Connectivity DEUTSCH
INDUSTRIAL & COMMERCIAL
TRANSPORTATION
TE Connectivity Measurement
Specialties
TE Connectivity Potter & Brumfield
Relays
TE Connectivity Raychem Cable
Protection
TE Connectivity Raychem Circuit
Protection / Littelfuse
TE Connectivity's Agastat Relays
TE Connectivity's Axicom Relays
TE Connectivity's Buchanan
Terminal Blocks
TE Connectivity's CGS Resistors
TE Connectivity's CII
TE Connectivity's Elcon Connectors
TE Connectivity's Holsworthy
Resistors
TE Connectivity's Kilovac Relays
TE Connectivity's Neohm Resistors
TE Connectivity's OEG Relays
TE Connectivity's Products Unlimited
Transformers & Relays
TE Connectivity's Q-Cee's
TE Connectivity's Schrack Relays
TE Connectivity's Sigma Inductors
Teccor / Littelfuse
Techflex
TechNexion
Techno / Vishay
TechTools
Telcodium
Teledyne LeCroy
Telit Wireless Solutions, Inc.
Temp-Flex - a Molex company
Tensility International Corporation
Terasic Technologies
Test Products International (TPI)
Texas Instruments
t-Global Technology
Thermometrics / GE Measurement
& Control
ThingMagic
Thomas Research Products
TOKO / Murata
Torex Semiconductor Ltd.
Toshiba Semiconductor and Storage
Touchstone Semiconductor
TPI (Test Products International)
TPK America LLC
Transphorm
Trenz Electronic
Triad Magnetics
TRINAMIC Motion Control GmbH
Tripp Lite
Trompeter / Cinch Connectivity
Solutions
Tronics

TRP Connector
TT Electronics
TT Electronics / BI Technologies
TT Electronics / IRC
TT Electronics / Optek Technology
TT Electronics / Welwyn
Tuchel / Amphenol
Twin Industries
TXC Corporation
Tyco Electronics
Tympany (Peerless by Tympany)
U.S. Sensor
UD00
Ultra Librarian®
Ungar / Weller
United Chemi-Con
US-Lasers, Inc.
Varitronix International Ltd.
VCC (Visual Communications
Company)
VEAM
Vector Electronics & Technology, Inc.
VersaLogic Corporation
VersaSense
Vicor
Vifa (Peerless by Tympany)
Virtium Technology Inc.
Vishay
Vishay / BCcomponents
Vishay / Beyschlag
Vishay / Dale
Vishay / Huntington Electric, Inc.
Vishay / Semiconductor -
Diodes Division
Vishay / Semiconductor -
Opto Division
Vishay / Sfernice
Vishay / Siliconix
Vishay / Spectrol
Vishay / Sprague
Vishay / Thin Film
Vishay / Vitramon
Vishay Foil Resistors
Vishay Precision Group
Vishay Precision Group /
Micro-Measurements
Visual Communications Company, LLC
Vitelec / Cinch Connectivity
Solutions
Volgen / Division of Kaga
Electronics USA
Voltronics (Knowles)
VPG / Micro-Measurements
Wakefield-Vette
Walsin Technology
Wandboard
WeEn Semiconductors Co., Ltd
Weidmuller
Weller
Welwyn / TT Electronics
Wickmann / Littelfuse
Wiha
Winbond Electronics Corporation
Winchester Electronics
Wintec Industries
Wiss
WIZnet
Woodhead - a Molex company
Wurth Electronics
Wurth Electronics Midcom
Xcelite
Xeltek
Xilinx
XMOS
XP Power
Xsens
Yageo
Zentri
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/TKD	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35000	N/A	£0	67%	50	1,500+	Y
DISPLAYS & LEDs											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ELECTROMECHANICAL											
CUI CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	15,168	N/A	£0	91.34%	150	3,400	Y
MURATA CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	61,903	N/A	£0	99.72%	150	3,400	Y
OMRON CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	70,119	N/A	£0	95.28%	150	3,400	Y
PANASONIC CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	156,533	N/A	£0	93.83%	150	3,400	Y
TDK CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	64,978	N/A	£0	99.30%	150	3,400	Y
TE CONNECTIVITY CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	437,107	N/A	£0	75.47%	150	3,400	Y
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Evatron Plastic Enclosures Ltd	Evatron Plastic Enclosures Ltd	01908 675121	www.evatron.com	N	2,000	N/A	£0	100%	3	9	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
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 (continued on next page)											
ALLEGRO MICROSYSTEMS, LLC	Digi-Key	0800 587 0991	digkey.co.uk	Y	2,867	N/A	£0	86.22%	150	3,400	Y
ALTERA	Digi-Key	0800 587 0991	digkey.co.uk	Y	10,502	N/A	£0	80.39%	150	3,400	Y
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y



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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
ANALOG DEVICES	Digi-Key	0800 587 0991	digkey.co.uk	Y	50,633	N/A	£0	73.33%	150	3,400	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,500	N/A	£0	83.00%	50	1,500+	Y
Atmel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,700	N/A	£0	58.00%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
BROADCOM LIMITED (AVAGO)	Digi-Key	0800 587 0991	digkey.co.uk	Y	2,237	N/A	£0	99.96%	150	3,400	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
CREE INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,398	N/A	£0	100.00%	150	3,400	Y
CYPRESS SEMICONDUCTOR	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,030	N/A	£0	89.02%	150	3,400	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
DIODES INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	32,186	N/A	£0	89.01%	150	3,400	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
FAIRCHILD	Digi-Key	0800 587 0991	digkey.co.uk	Y	39,380	N/A	£0	97.62%	150	3,400	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Digi-Key	0800 587 0991	digkey.co.uk	Y	486	N/A	£0	100.00%	150	3,400	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	97%	50	1,500+	Y
Infineon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
INFINEON TECHNOLOGIES CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,610	N/A	£0	85.64%	150	3,400	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
INTERSIL CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,063	N/A	£0	74.18%	150	3,400	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
IXYS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	7,268	N/A	£0	99.55%	150	3,400	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	36,207	N/A	£0	76.91%	150	3,400	Y
MAXIM CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	65,795	N/A	£0	77.63%	150	3,400	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,200	N/A	£0	67.00%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
MICROCHIP CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	58,558	N/A	£0	90.13%	150	3,400	Y
Microsemi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	40%	50	1,500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	38,701	N/A	£0	99.27%	150	3,400	Y
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	Y
ON SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	57,566	N/A	£0	79.85%	150	3,400	Y
Power Integrations	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	Y
ROHM Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	55.00%	50	1,500+	Y
SEMTECH CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	3,694	N/A	£0	87.63%	150	3,400	Y
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
SILICON LABORATORIES CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	17,747	N/A	£0	96.09%	150	3,400	Y



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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 on from previous page)											
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spanion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	99%	50	1,500+	Y
STMICROELECTRONICS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	43,448	N/A	£0	97.47%	150	3,400	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
TEXAS INSTRUMENTS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	210,905	N/A	£0	89.60%	150	3,400	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
XILINX INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	7,354	N/A	£0	51.78%	150	3,400	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION (continued on next page)											
3M	Digi-Key	0800 587 0991	digkey.co.uk	Y	54,086	N/A	£0	93.83%	150	3,400	Y
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
AMPHENOL	Digi-Key	0800 587 0991	digkey.co.uk	Y	426,945	N/A	£0	82.42%	150	3,400	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
Anderson Power Products	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	82%	50	1,500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
EDAC	EDAC	01933 427300	www.edac.net	N/A	N/A	N/A	£100	100%	34	500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
HIROSE ELECTRIC CO LTD	Digi-Key	0800 587 0991	digkey.co.uk	Y	39,499	N/A	£0	91.53%	150	3,400	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100.00%	6	38	Y
JAE Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,200	N/A	£0	32%	50	1,500+	Y
JST SALES AMERICA INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	4,320	N/A	£0	81.46%	150	3,400	Y
Kycon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	99%	50	1,500+	Y
LEMO	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	65%	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	16,900	N/A	£0	75%	50	1,500+	Y
MOLEX CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	123,772	N/A	£0	95.41%	150	3,400	Y
Neutrik	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,000	N/A	£0	99.00%	50	1,500+	Y
Phoenix Contact	Premier Farnell	08447 111111	www.uk.farnell.com	Y	2,000	£250,000	£0	100%	20	3,000	N/A
Phoenix Contact	Rapid Electronics	01206 751166	www.rapidonline.com	Y	16,000	N/A	£0	100%	11	200	N/A
Phoenix Contact	RS Components	08457 201201	www.uk.rs-online.com	Y	7,000	£250,000	£0	100.00%	30	4,000	N/A
Phoenix Contact	Anglia Components	01945 474747	www.anglia.com	Y	500	£25,000	£0	100%	12	200	Y
Polanco	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



same-day Shipping

Buyers' Guide

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Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y

OBsolescence / HARD TO FIND

America II Europe		01462 707070	www.americaiiurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y
Cyclops Electronics		+44 01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y

OPTO ELECTRONICS

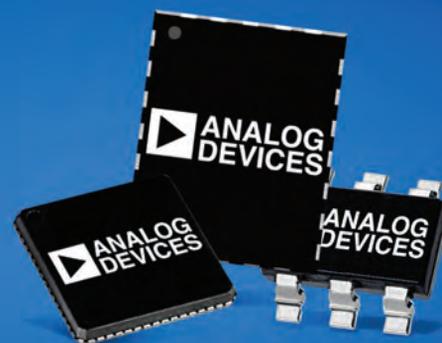
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,800	N/A	£0	99%	50	1,500+	Y
VCC	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	92%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	99%	50	1,500+	Y

PASSIVES (continued on next page)

ABRACON CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	28,548	N/A	£0	98.89%	150	3,400	Y
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
BEL FUSE	Digi-Key	0800 587 0991	digkey.co.uk	Y	4,207	N/A	£0	83.53%	150	3,400	Y
BOURNS	Digi-Key	0800 587 0991	digkey.co.uk	Y	59,314	N/A	£0	82.47%	150	3,400	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
Coilcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EATON CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	28,434	N/A	£0	86.49%	150	3,400	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
HONEYWELL CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,319	N/A	£0	86.01%	150	3,400	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	48,025	N/A	£0	90.12%	150	3,400	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
KYOCERA ELECTRONICS CORPORATION (AVX)	Digi-Key	0800 587 0991	digkey.co.uk	Y	65,718	N/A	£0	83.48%	150	3,400	Y
LAIRD CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	14,568	N/A	£0	97.21%	150	3,400	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
LITTELFUSE CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	86,652	N/A	£0	82.87%	150	3,400	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
NICHICON	Digi-Key	0800 587 0991	digkey.co.uk	Y	35,421	N/A	£0	96.30%	150	3,400	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	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
PULSE CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	11,098	N/A	£0	93.56%	150	3,400	Y
ROHM SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	63,003	N/A	£0	99.85%	150	3,400	Y
Samsung Electro-Mechanics	Digi-Key	0800 587 0991	digkey.co.uk	Y	21,522	N/A	£0	100.00%	150	3,400	Y
TAIYO YUDEN	Digi-Key	0800 587 0991	digkey.co.uk	Y	16,677	N/A	£0	99.96%	150	3,400	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TOKO	BEC Distribution Ltd	0845 4900 405	www.bec.co.uk	Y	6,000	£300,000	£20	70%	2	8	Y
TT Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	32,800	N/A	£0	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	13,900	N/A	£0	99.00%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
VISHAY CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	275,942	N/A	£0	88.52%	150	3,400	Y
WURTH CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	22,245	N/A	£0	100.00%	150	3,400	Y
Wurth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	141,986	N/A	£0	83.67%	150	3,400	Y

POWER & BATTERIES

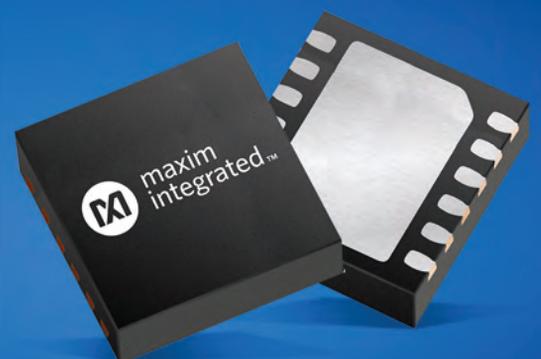
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y

SENSORS

All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y
Sensirion	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	N/A	50	1,500+	Y



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Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	70.00%	50	1,500+	Y
Apem	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	84%	50	1,500+	Y
Carling Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	87%	50	1,500+	Y
CHERRY	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	77%	50	1,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
E-Switch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	94%	50	1,500+	Y
Grayhill	EAO Ltd	01444 236000	www.eao.co.uk	Y	2,300	£150,000	£150	99%	6	22	Y
Grayhill	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98%	50	1,500+	Y
NKK Switches	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	94%	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	68%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	98%	50	1,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	+44 01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
ADDA	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	59.00%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	99%	50	1,500+	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	N/A	50	1,500+	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	86.00%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

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PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie Break/Manufacture &/or Repair)	Location	Approvals	Volume - Small/Medium/Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Flexi / Flex-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO 9001:2008	SML	Y	4-10	Y	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2008, UL	SML	Y	4-16	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	M	NE	ISO9001:2008, UL	SML	Y	4-30	Y	N	Y	Y	Y
CS Electronics (UK) Ltd	0116 242 4058	www.cs-electronic-pcb.co.uk	B	M	UL, ISO 9001, TS16949	SML	Y	4-32	Y	Y	Y	Y	Y
Daleba Electronics Ltd	+44(0)1992 510000	www.daleba.co.uk	B/M	SE	ISO9001:2008, TS, UL	SML	Y	4-30	Y	Y	Y	Y	Y
DK Thermal Ltd	+44(0)1992 514200	www.dkthermal.co.uk	M/R	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	N	Y	N	Y	Y	Y
European Circuits Limited	0141 9411388	www.european-circuits.co.uk	M	Scotland	BS EN ISO9001: 2008 CERTIFIED	SM	Y	8	Y	Y	N	Y	Y
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	BSEN, ISO9001:2008, TS16949:2009, UL, CECC release, Queens Award	SML	Y	4-16	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2008, UL	SML	Y	4-30	Y	F/R	Y	Y	Y
Photronix Group	01903 231901	www.photronix.co.uk	B	SE	ISO9001:2008, ISO14001:2004, AS9100-B, NADCAP, TS16949:2002	SML	Y	4-58	Y	F, F/R	Y	Y	Y
Prestwick Circuits GPS Ltd	01294 224631	www.prestwickgps.com	B	UK, Portugal, China	ISO 9001, ISO-TS16949, AS9100, IPC610 Class I/III, UL	SML	Y	4-48	Y	Y	Y	Y	Y
Tate Circuit Industries Ltd	01889 583627	www.tatecircuits.com	B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	Y	Y	Y	Y
Tecbridge Circuits	0207 993 6503	www.tecbridgecircuits.co.uk	M Rep.	UK Europe	UL, TS16949(2009), ISO14001(2004), ISO9001(2008)	SML	Y	4-16	Y	N	Y	Y	Y

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.aws-electronicsgroup.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-mns.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
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	£3.7m	NE	60	2	ISO9001:2008 UL	Y	Y	Y	Y	Y	Y
Contract Production Limited	01751 475950	www.contract-production.co.uk	£1.9m	North Yorkshire	20	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£7.5m	UK	72	3	AS9100, ISO9001, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
CRS Electronics Ltd	01920 871061	www.crs-electronics.co.uk	£3m	SE	44	2	ISO9001:2008	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£14m	Andover (Hampshire)	130	6	ISO 9000, IPC610, ISO 13485	Y	Y	Y	Y	Y	Y
DJ Assembly	01904 436 456	www.djassembly.com	£1.25m	North Yorkshire	15	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610-F class 3, ISO14001, UL	Y	Y	Y	Y	Y	Y
Electronic Technician Ltd	01202 897722	www.etluc.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.elltees.com	£17m	UK	160	5	ISO9001, ISO13485, UL, IPC610/620	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Exception-Fabrinet	01249 814081	www.exceptiongroup.com	£21m	UK/Thailand/US	210	5/31/2	AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4m	S	50	3	ISO9001, ISO13485, IPC-A-610, IPC-JSTD-001, IPC 7711/7721, BS EN 61340-5-1/2 (ESD)	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 798294	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	6	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2011 ATEX, IPC-A-610 Class3	Y	Y	Y	Y	Y	Y
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iwco.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	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
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
Northern Hi-Tec Ltd (NHT)	01524 67833	www.nht.co.uk	£4.5m	Lancashire (NW)	66	4	ISO9001:2008, IPC-A-610/D	Y	Y	Y	Y	Y	Y
NOTE	01453 797580	www.note.eu	£100m	UK/EU/China	1,000	14	ISO9001, 13485, 14001, 18001, IPC-610 Class 3	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001:2008, IPC-A-610 Class 3/WHMA-620/ISO14001-2004/IPC7711/7721	Y	Y	Y	Y	Y	Y
Pektron PLC	01332 832424	www.pektron.com	£40m	E-Midlands	350	7	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL, TickIT	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	UKAS ISO9001:2008, IPC-A610	Y	Y	Y	Y	Y	Y
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£95m	Havant/Global	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£4m	SE	50	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
Speedboard Assembly Services	01753 746700	www.speedboard.co.uk	£11.1m	Windsor, SE	92	5	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	N	Y	Y
Tenkay Electronics Ltd	01903 855455	www.tenkay.co.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£12m	SE	105	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£12.5m	Derby / Corby	110	7	ISO 9001:2008, ISO 13485, UL, IPC 610F Class 3	Y	Y	Y	Y	Y	Y
Trojan Electronics Limited	01792 469020	www.trojanelectronics.co.uk	£2m	South Wales	20	2	BS EN ISO 9001:2008, ISO 14001:2007	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	4	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

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