ELECTRONICS

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UK & IRELAND

TOP 15 SPECIAL

DISTRIBUTORS REPORT

AN MMG PUBLISHING TITLE

On the cover – Top 15 Special Distributors Report

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Editor's Word

When distribution lets down design

After many years of hard use our kitchen demanded a refit. I secretly love this type of work. I can dig out the router and aligning doors feeds my engineering OCD. So the decision was made to choose a supplier offering design support, followed by DIY installation.

The design process was swift and pleasing, offering a mix of online CAD and one-to-one advice. That just left the delivery of the parts.

Delivery was set for a Monday. On the Sunday it was rescheduled for Tuesday. On Monday it was rescheduled for Thursday. Then on Thursday, 30 minutes before the delivery was due, it was rescheduled for Saturday week.

By this time the old kitchen had been removed and the electrician cancelled three times. The telephone customer support was apologetic but referred me back to the store. Then the fun really began.

The reason the delivery kept being cancelled was that some line items on the bill of materials were missing and their system would only allow delivery of a complete order. The solution was to cancel the entire first order, and start two new orders, one containing the parts that were in stock and one comprising the missing parts for later delivery. All this was done manually by three people as we watched.

On the Sunday, the initial part-order arrived. Then over following days a succession of couriers brought the remaining parts. Then to our surprise, the following Saturday the company redelivered the entire kitchen for a second time! You guessed it, they had forgotten to process the order cancellation.

Couriers continue to arrive, now delivering duplicate parts we don't need. I have no idea when it will stop. In the end we all laughed it off, felt rather sorry for the couriers, and can now stand back and admire what is a rather dandy new kitchen.

It is, however, a classic case of distribution letting down design.

Jon Barrett

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ES News

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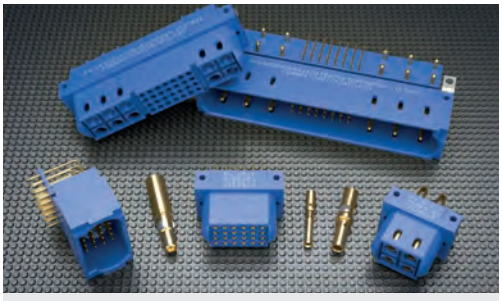

Simplify sourcing with modular connectors

Lane Electronics has introduced a new rack and panel connector system, claimed to allow users maximum pin configuration choice. Manufactured by Positronic, the Scorpion system can be configured for use as a power or signal connector or as a combination of the two.

Lane's Nick Wheeler said: "In essence, engineers can specify any configuration they wish, from any number of power and signal modules as well as a range of guide and locking arrangements. All this and any combination from just one module to many up to a maximum connector length of 101mm."

Scorpion rack and panel connectors are available in several formats including board to board, cable to cable or board and panel to cable or board. Contacts are available in crimp, straight and 90deg solder as well as straight press-fit PCB termination. Lane Electronics can also supply a selection of accessories to add to the versatility of the series.

www.fclane.com

Additional brands extend industrial focus

Charcroft Electronics has extended its franchised distribution agreement with Sensata Technologies to cover three additional brands: Kavlico, BEI Sensors and Crydom. They join the existing Sensata franchise for Airpax and Klixon products, all supported by Charcroft's team of field-based product specialists. This in-depth support enables the team to help customers meet engineering and procurement challenges in demanding applications.

The Kavlico brand covers mission-critical, linear and rotary position sensors used by aerospace OEMs and tier one suppliers as well as pressure sensors used in the industrial market. BEI's position sensors, motion control sensors and optical and magnetic encoders are used in the industrial, aerospace, agricultural and medical device markets. Finally, the Crydom range of solid-state relays and contactors target applications in the industrial market.

Charcroft director, Debbie Rowland, commented: "The extended franchise agreement enables us to deliver a greater depth of expertise to customers who work in the demanding military, aerospace and industrial sectors."

www.charcroft.com

Expanded infrared options

TTI is now stocking APT2012 series infrared emitters and detectors from Kingbright. These LEDs are targeted for sensing applications in industrial and medical equipment applications.

Kingbright's IR LED selection, available in industry standard SMD and through-hole packages, features infrared emitters and phototransistors in the wavelength range from 880 to 940nm at 20mA with different lens options and viewing angles from 20 to 160deg. This selection offers multiple package alternatives including PLCC, subminiature, top emitting, right angle, dome lens SMD LEDs, as well as three and five millimetre through-hole in matching emitter/detector pairs.

www.ttiinc.com

One source for industrial automation

Farnell has added 12,000 new Schneider Electric products to its extensive portfolio offering purchasers a single source for all of the company's industrial automation products. With more than 50,000 products in stock from 600 brands, it also helps position Farnell as a first-choice supplier for all industrial automation products.

Schneider Electric's industrial automation and control solutions target multiple markets with solutions for energy and infrastructure, industrial processes, building automation, manufacturing automation and control solutions for industrial, infrastructure and building sectors. Farnell's stock includes sensors, drives and motors, switches and relays, circuit breakers, wall boxes, enclosures, racking and more.

This ensures Farnell is well equipped to support industrial automation applications, which combine the advantages of industry 4.0 with advanced data analytics. Farnell also provides a range of industrial automation and control resources on its website.

www.farnell.com

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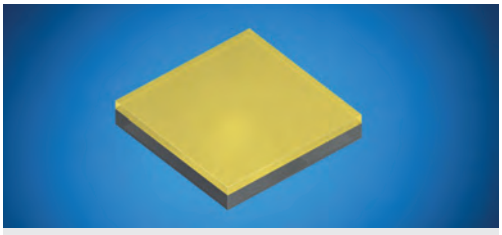
ES News

In Brief

Discover AI innovation
Arrow Electronics is running a series of events across Europe to support delegates as they deploy artificial intelligence. The AI Experience Tour, which will be hosted with Intel, Microsoft, Nvidia and other suppliers, comes to London on 3 December. Visitors to the one-day event will learn about AI trends, key growth areas, best practice and use cases as well as discovering how Arrow can offer in-house engineering to support complex AI development.
www.arrow.com

Training hub boosts skills
Harwin has opened a new apprentice training hub and R&D centre as part of its continued drive to address the skills gap in the engineering sector. Located at Harwin's Portsmouth headquarters, the new facilities will provide a fully equipped environment for apprentices. Likewise, the R&D division will have access to new resources that will significantly accelerate product development cycles.
www.harwin.com

Power workshop comes to UK
Vicor's high-performance power conversion seminar and workshop will take place in London on 30 October 2019. The one-day event will provide expert-led interactive workshops to identify common pitfalls and provide guidance on successful high-performance power system design. Real-world applications will be used to illustrate today's power challenges with information on new techniques for EMI mitigation, thermal modelling, PCB layout, DC/DC designs and implementing AC/DC front ends.
www.vicorpower.com



Bright ideas in stock

Mouser Electronics is now stocking Oslon Pure 1010 LEDs from Osram Opto Semiconductors. Housed in a real chip scale package measuring 1.0 by 1.0mm, the LEDs offer a top-emitting surface with a 120deg viewing angle ideal for high-end retail lighting, customised chip-on-board designs, and small luminaires with narrow spotlight requirements.

Designed to provide scalable lighting for compact spaces in one of the smallest form factors available, Oslon Pure 1010 LEDs feature an innovative design. The light-emitting surface is contacted within the component itself without the need for bond wires. This, combined with the small form factor and automotive-grade flip chip die, allows directional light to exit only from the top surface of the LED package. According to Osram, this enables tighter LED clusters and outstanding flexibility in creating custom lighting solutions.

The LEDs have a typical luminous flux of 100lm at 350mA, a colour temperature range of 2,700 to 5,000K, and a colour rendering index of 80.

www.mouser.com

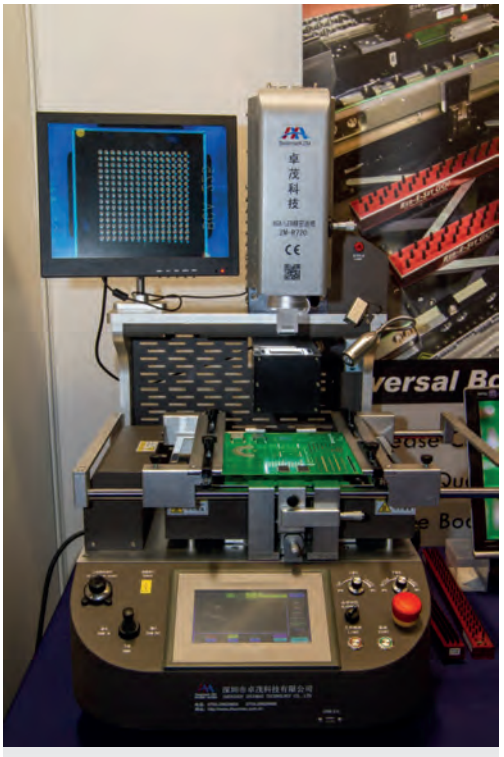
Cutting the cost of reliable power

RS Components has announced availability of the THL 15WI series of shielded 15W DC/DC converters from Swiss power supply specialist, Traco Power. Designed to be reliable but cost efficient, THL 15WI devices are certified to the latest IEC/EN/UL 62368-1 IT safety standards making them suitable for applications such as mobile equipment, instrumentation, and distributed power architectures for communications and industrial electronics.

Encapsulated in one by one by 0.4in metal package with an internal EN 55032 class A EMI filter, the converters offer a versatile 4:1 input range at nominal input voltages of 24 or 48V DC. Various single output options can be specified, all regulated to within ±1 per cent accuracy, along with several DC dual output options.

Boasting high efficiency up to 91 per cent, THL 15WI converters can operate at full load over an operating temperature range from –40 to 70°C, with a MTBF exceeding 1.3 million hours.

uk.rs-online.com



Head north for purchasing inspiration

Northern Manufacturing and Electronics returns to Manchester's EventCity on the 2nd and 3rd of October, once again showcasing a variety of components, subassemblies and service providers.

With many aerospace and automotive manufacturers located in the region, the show has developed rapidly to become a vitally important marketplace for both electronics procurement and subcontract services. Both electronics and mechanical engineering are represented under one roof, providing a great opportunity to address multiple sourcing issues in a single trip.

Various component suppliers and manufacturers will be present, with Northern Manufacturing and Electronics highlighting the hottest solutions in connectors, sensors, enclosures and other electromechanical components. Power products will be a focus with solutions from Luso Electronics, Efore and Delta Electronics. Further highlights include Calman Technology custom membrane keypads, CIE Electronics connectors and cables and Crystal-Tech Electronics TFT LCD display modules.

Complementing the electronics on show is an equally diverse selection of production services covering everything from PCB production to full contract assembly. Flux Rose, Hallmark Electronics and LCL Electronics are just a few of the CEM service providers present.

A free technical seminar programme sits alongside the exhibition. Highlights for 2019 include author and lean expert Gary Griffiths, TPM authority Andy Brunskill, and the latest on CE Marking from the CE Marking Association. The full seminar programme is available online, where you can also register for free tickets.

www.industrynorth.co.uk

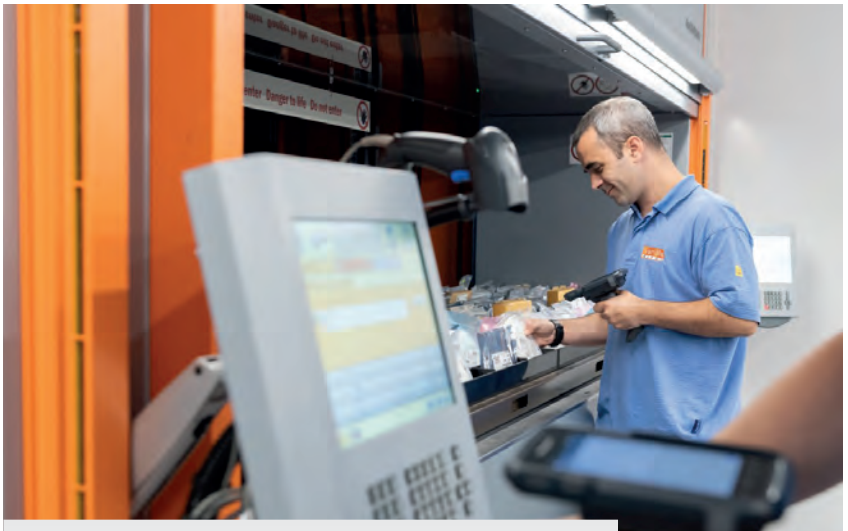
More choice on medical converters

Available from Rutronik UK, the new Recom REM2 series features modular 2W DC/DC converters with complete medical certification. Thanks to their compact SIP8 package and multiple variants they offer freedom in PCB layout design. The series is available with several input voltage ranges, all common output voltages, as well as single or dual outputs.

These board-mount converters come with reinforced isolation of 5.2kVDC/one minute as well as two means of patient protection. With an input voltage of 3.3 to 24V DC, output voltages between ±3.3 and ±12V DC are feasible.

Models in the REM2 series are compliant to class A/B EMC and 60601-1-2 fourth edition medical EMC using a simple external LC filter, as well as being certified to CB, IEC/EN and ANSI/AAMI 60601-1 third edition medical safety standards.

www.rutronik.com



Intelligent storage streamlines supply chain services

Electronics distributor and manufacturer, Vanilla Electronics, has invested in new automated storage at its technology centre following a £200,000 funding package from HSBC UK.

Vanilla Electronics, which provides supply chain and manufacturing services, purchased automated warehousing equipment to drive efficiencies. The two 9.6m tall automated tower storage units automatically pick components, allowing operators to focus on the main product or kit assembly, not the time-consuming task of picking of individual materials. Installing the new equipment has also cleared valuable floor space previously dedicated to traditional rack storage.

Managing director of Vanilla Electronics, Dan Croft, said: "Installing the lifts has sped up the overall component picking process, giving assemblers more time to focus on their core roles. It has resulted in happier staff, higher quality output, higher throughput, quicker delivery and the capacity to increase volumes.

"HSBC UK's funding means our proposition is even more attractive to customers looking to outsource their supply chain activities."

www.about.hsbc.co.uk

Distributor is IoT-ready with gas detector range

Anglia is expanding its portfolio of IoT-ready sensors with the Figaro range of gas sensors, widely used in air quality monitors, gas leak detectors and fire detectors.

Commenting on the new UK and Ireland distribution agreement, marketing director at Anglia, John Bowman, said: "Gas detection is now a mainstream requirement on the internet of things as customers seek to remotely monitor all aspects of the environment and detect fault conditions. Figaro is recognised in this field and its range of sensors sits perfectly alongside Anglia's already extensive sensor range, as well as being highly complementary to our processor, communications and analogue semiconductor portfolios." Figaro's senior manager, marketing department, Yuki Fujimori, added: "Designing in gas sensors requires specialist skills and knowledge and it has become extremely apparent, during our training with the Anglia FAE team, that they 'get' this technology and are fully ready to work with customers on live design projects."

Anglia is supporting Figaro with an extensive stock profile of popular sensors and evaluation kits available for same day shipment and its field application engineering team has received full training on the range.

www.anglia.com

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Distributors see IoT as an important driver for future sales growth

The growth of the Internet of things will mean distributors will see robust demand for sensors, microcontrollers, and wireless modules, as more consumer devices and industrial equipment are connected to the Internet

James Carbone

"You Ain't Seen Nothing Yet" was a song by 1970s Canadian rock group Bachman-Turner Overdrive, but it is also a phrase many distributors say describe the impact that the Internet of Things (IoT) is having on distribution and the overall electronics industry.

Distributors say IoT is already having a positive impact on business, driving sales of sensors, microcontrollers, wireless modules, high-speed connectors and other components. But over the next five years, more devices ranging from home thermostats and appliances to self-driving cars and factory robots will be connected to the Internet and will help drive distribution sales to new heights.

One distributor that is bullish about IoT is Arrow Electronics. "IoT is not a vertical, it is not a technology. IoT is a movement," said Murdoch Fitzgerald, vice president sales and engineering at Arrow. "It's about aggregating more and more technology together across the entire technology stack to be able to influence business outcomes," he said.

Arrow has a global IoT practice within the company. About $1 billion of Arrow's annual revenue is connected to IoT and involves sales of components, software and services, said Fitzgerald.

"It can be anything from a Wi-Fi or Bluetooth module all the way up to some type of engineering service that we provide, or data connectivity from a mobile network operator," said Fitzgerald. IoT offers "tremendous potential" for Arrow as more customers develop IoT strategies and "are looking to monetise their data," he said.

"One interesting fact is for every dollar of engineering service within an IoT type of application, there is about a 5X multiplier for hardware," Fitzgerald said. As a result, IoT is helping drive semiconductor sales, including microcontrollers, sensors, wireless modules and other chips. IoT is also having an impact on "passive technology," he said. "Antennas are perfect example. Any type of radio needs an antenna, and an antenna is a passive of technology," said Fitzgerald.

Interconnect is also critical to Internet of Things, especially with industrial IoT. Industrial companies are looking at how they can get greater operational efficiency, reduce cost and improve quality through machine learning, machine vision and video inspection, said Fitzgerald. High-speed connectors are needed to accomplish those goals, he said.

Demand for IoT solutions is coming from established OEMs as well as emerging startups and Arrow services those customers with its components business. "Then we have enterprise computing business. They are working with system integrators and value-added resellers," he said.

More to IoT than Fitbits

"There's obviously been a great deal of IoT growth in consumer, but I think the largest amount of growth will be in industrial and business applications"

Kevin Hess, senior vice president of marketing for **Mouser Electronics**

A lot of IoT growth has been driven by the consumer market. Products such as smart watches Fitbits and other fitness devices are IoT devices and need sensing, processing and connectivity capability. But many distributors believe over the next several years, industrial and commercial applications will drive IoT applications, resulting in greater component sales.

"There's obviously been a great deal of IoT growth in consumer, but I think the largest amount of growth will be in industrial and business applications," said Kevin Hess, senior vice president of marketing for Mouser Electronics. Hess said it is hard to predict the impact IoT will have on the electronics industry, but IoT is going to be in a lot of equipment and products. "IoT is going to be part of autonomous vehicles, part of warehouse automation, factory automation, and the smart home and medical."

As IoT become more ubiquitous, component demand will grow and some distributors will have to add product lines for sensors, wireless modules and microcontrollers. However, Hess said that Mouser was not adding suppliers strictly because of IoT.

"We are adding suppliers because of the advances in sensing types of products" and advances with components that require lower power and chips that have the processing strength to power multiple functions, he said.

One distributor that has seen sales of certain components increase because of IoT and has added product lines is Digi-Key, based in Thief River Falls, Minn. Dave Doherty, president and COO, said Digi-Key has added products from established suppliers and related startups because of IoT applications.

"Our sales of sensors have outgrown Digi-Key overall sales. That's validation that IoT does have a meaningful place in our industry," he said. Digi-Key is seeing greater demand for MCUs due in part to IoT. However, it's hard to measure the impact IoT is having on Digi-Key's MCU business because use of microcontrollers has increased in a wide range of electronics equipment over the last 20 years. "It's a little harder to distinguish and attribute which of those microcontroller sales are going into IoT," said Doherty

Digi-Key has added about 118 suppliers over the year and a half. A high percentage of those suppliers are because of IoT, including "additional new sensor guys and connectivity suppliers," he said.

Long-term impact

IoT will impact distribution in the overall electronics industries for years, said Doherty. IoT applications such as wearable electronics are in early stages and will continue to grow. IoT will also become more prevalent in industrial, medical and energy-efficiency applications, he said.

Karim Yasmine, senior corporate vice president for Future Electronics, said IoT has helped increase revenue for Future and is more than just a" great buzzword" for the industry. "It has driven excitement" because it is being used in so many applications, including factories, homes and businesses. "There really is no end to how many more things will become smarter and more connected. IoT has a great amount of growth potential," he said.

To take advantage of that growth, Future is adding more services providers. "You have to continuously add partners on the services side because it's moving fast and you have to be in touch with who the newcomers are that have a differentiated service," he said. He said Future is looking at data service providers and device management solutions companies.

"That's where there are a lot of new partners and we are signing two or three per month of new partners on the services side to remain relevant and have the services level that customers require," said Yasmine.

Murdoch Fitzgerald, vice president sales and engineering at **Arrow Electronics**

"One interesting fact is for every dollar of engineering service within an IoT type of application, there is about a 5X multiplier for hardware"

He says Future did not have to add new component suppliers because of IoT. "We have a very solid line card and IoT did not require us adding any new lines."

"Certainly, our line card continues to expand because it's a necessity, but it's not a necessity on the semiconductor lines for microcontrollers, wireless modules or sensors. We have a very healthy line card for sensors so we don't need to buffer that," said Yasmine.

He said Future' focus has been to provide value to customers with design services and components. "The end goal is to sell components. I think it's important that people don't just talk about IoT at a nebulous high level, but drive down to an application level," said Yasmine. The idea is to sell sensors, connectivity components and services to the IoT customer base that's trying to make 'their products more intelligent and connected," he said.

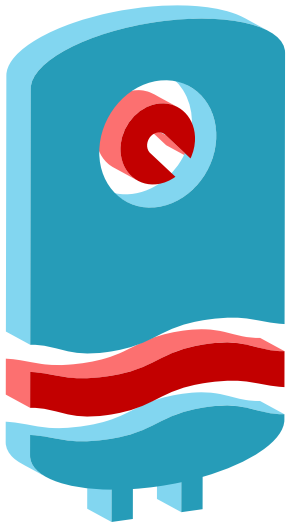
The IoT challenge

For some distributors, IoT has great potential, but it is also a challenge. Dan Stewart, vice president of marketing and eCommerce for Allied Electronics, a distributor that focuses on industrial automation, says IoT is an opportunity, but it "seems no one has done a great job of making it simple and easy" for industrial users of IoT.

He said IoT has been successful in the consumer segment but customers in the industrial segment are "still struggling a little bit with IoT. Distributors and manufacturers have not been able to communicate to customers about how IoT can solve a problem on the factory floor .

"Distributors and manufacturers have to do a better job of coming out with a good message about why a customer needs IoT," he said. The message needs to be "here's a way to make your machine run more efficiently. Here's a way to reduce downtime on your machines. Here's a way that you as machine builder can build something that is more attractive to your end customer," he said.

Time-saving EMI solutions



With smaller enclosures and more components, today's devices often require both EMI protection and thermal management. Custom shielding may provide an answer but can add leadtime. Laird EMC offers a solution

Due to reduced form factors and the need to include more and more components in every device, many original equipment manufacturers are looking to combine electromagnetic interference and thermal management solutions in a single assembly. This complicates the thermal design process and creates a need for multiple thermal interface layers whose performance interacts with each other.

With the ability to design and manufacture products for wireless and other advanced electronics applications, Laird specializes in both electromagnetic interference shielding or absorption products and thermal transfer materials. The company's multi-compartment shields can cover multiple-board areas simultaneously, incorporating thermal interface materials with board-level protection.

Combined EMI and thermal solutions

In one such application, Laird Performance Materials recently worked with an OEM to design a combined EMI/thermal solution capable of reducing package temperature. A simulation showed that the package temperature of the heat source initially exceeded the maximum value of 90°C. Laird's subsequent optimization reduced this to an acceptable level, 13°C below the original design.

What's more, the design was optimized in only a few days compared to the many weeks that would have been required using the normal one-iteration-at-a-time method.

To achieve a heat reduction, Laird developed a custom solution consisting of a printed circuit board with a heat source and an EMI shield consisting of a metal plate that also serves as a heat spreader. The heat source is separated from the EMI shield by a layer of thermal interface material. A heat sink is mounted to the EMI shield and separated from it by another layer of thermal interface material.

As this is a complex design, there are numerous alternatives that could be changed to deliver an optimized solution. The traditional approach would be to use hand calculations to develop the initial design concept. Then a prototype would be built and tested to evaluate temperatures at key points. An iterative process of modifying and testing could take months to find an acceptable solution.

Simulation speeds development

Instead of building a physical prototype, however, Laird simulated the initial concept using thermal simulation software.

Rather than randomly evaluating alternative designs, Laird used the software to automate the process of design optimization. The software defined parameters that could be varied, such as the number of heat sink fins, fin thickness, heat sink base thickness and thermal resistance of the two thermal interface materials. Each of the design parameters could vary by ±50 per cent of the initial design concept.

Absolute limits were specified for several variables and Laird was able to specify that the goal of the optimization was to minimize the junction temperature. Automatic sequential optimization then created and ran the required simulations to explore the entire design space in the most cost-effective way.

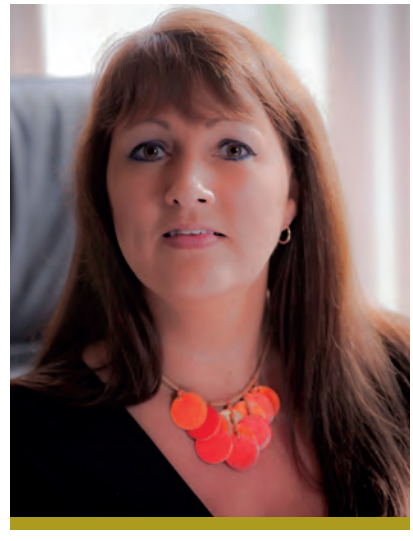
The thermal simulation software generated a response surface showing the value of the design goals for all combinations of variables. Laird viewed the results in 3D to visualize the effectiveness of changes in each design parameter. To complete the project, Laird picked out the preferred optimum value, selecting a design that substantially reduced junction temperatures while meeting all other design constraints.

Laird technicians then built and tested a prototype of the optimized design. The thermal performance of the prototype matched simulation predictions closely and the thermal/EMI solution is now in production. Feedback from the customer is positive and the whole process was completed in just a few days.

www.laird.com

Harsh conditions for hi-rel purchasing?

Harsh-environment sectors are seeing growth and although leadtimes have decreased, buyers are still faced with some tricky procurement challenges says Charcroft Electronics director, Debbie Rowland



Director, **Charcroft Electronics**, **Debbie Rowland**

Availability is changing and the extended leadtimes experienced over the past two years are shortening and stabilising. For some harsh-environment sectors, such as oil and gas and satellites for Low Earth Orbit (LEO), there is also evidence of a strong increase in demand. Buyers are seeing a change from delivery-driven procurement to purchasing driven by price as well as by availability.

During the leadtime crunch, buyers overcame shortages by looking for alternative devices which had a slightly different specification and shorter leadtimes. They checked for alternatives for sole-source parts, which resulted in OEMs extending their approved vendor list.

By the end of 2018, orderbooks had been generated for deliveries which stretched out to August 2020. Some buyers placed multiple orders for the same part to secure delivery. The result was a procurement climate which was sharper than had been experienced over the past 26 years.

As manufacturers have adjusted their production levels to meet demand, leadtimes for multilayer ceramic capacitors have now reduced from 52 weeks to 43 weeks and other passives are seeing 22-week leadtimes, which is half the previous leadtime. Manufacturers are also beginning to accept new orders for capacitors which were previously on 'no order' lists.

High-reliability growth

There certainly is strong growth in some sectors operating in harsh environments. For example, there are 430 launches of LEO satellites estimated to

take place in 2019, compared to 240 launches in 2018. The basis for this growth lies in the difference between the performance and cost of a LEO satellite, compared to the those of a major satellite operating beyond LEO. For every major satellite, there are perhaps 50 smaller satellites working to a shorter lifecycle and with a lower reliability threshold.

Helping buyers to define the exact specification for each application is vital for efficient procurement for harsh environments. The standard to which each part must comply may not be specified on the bill of materials, so buyers may need support in selecting appropriate component reliability. For LEO satellites, the balance between reliability and cost can be achieved by using an automotive-grade device rather than a full space-grade version. This is particularly true during the design and prototyping phase, moving to higher reliability for the launch.

In support of this approach, manufacturers such as Kemet, Exxelia and TT Electronics are offering in-house up-screening across a pick-and-mix range of tests. Kemet's testing matrix offers 25 individual screening processes which allow buyers to screen each component for specific reliability parameters. Processes range from seal testing, capacitance dissipation and thermal shock, to x-ray and space qualification. This enables buyers to select automotive, COTS, MIL-PRF and QPL devices and use custom screening to enhance one or more reliability criteria.

For TT Electronics, the New Space Electronics initiative offers screening over 15 parameters for small-signal discretes and multi-chip arrays, with full traceability, using a space-proven die. The range of space-grade capacitors and filters which are qualified by the European Space Agency has also been extended by Exxelia, including surface-mount inductors and transformers.

A tin-whisker mitigation process on solid fuses is being provided by AEM for RoHS-exempt applications. The process adds lead to components which have 100 per cent tin terminations. This enables RoHS-exempt applications to use surface-mount devices without allowing tin whiskers to compromise reliability.

ATEX and IP protection

As manufacturers place emphasis on filling production lines to meet demand, there have been fewer new components released for use in harsh environments. The exceptions include new ATEX-rated optical encoders, waterproof power supplies and radiation-capable optoisolators, which buyers can now expect to see on their BoM.

The waterproof power supply, from MTM Power, combines a patented thermoselective vacuum process with an IP67 rating which protects against water and dust ingress. Solid encapsulation provides extreme resistance to shock and vibration and adds to the reliability for operation in industrial, oil and gas, and rail markets.

TT Electronics' radiation-tolerant optoisolator will be seen on BoMs for satellites, launch vehicles and planetary rovers, whilst the new optical encoders from Sensata's BEI Sensors meet the ATEX demands of the oil and gas industry.

In addition to helping buyers match the reliability of each component, managing existing leadtimes continues to be essential. Sometimes this means enlisting help from a distributor like Charcroft to find a close alternative from inventory or on a short leadtime. Thus, the time for managing allocation and year-long leadtimes is coming to an end. In its place, buyers are turning to distribution for knowledge-based answers which can be used to address the new procurement challenges for harsh applications.

www.charcroft.com

This power supply with waterproof IP67 rating from MTM Power is one of the few new components released for use in harsh environments

The waterproof power supply, from MTM Power, combines a patented thermoselective vacuum process with an IP67 rating which protects against water and dust ingress

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The Americas - IP stealth-wealth transfer

John Denslinger is a former executive VP Murata, president SyChip Wireless, and president/CEO ECIA, the industry's trade association. His career spans 40 years in electronics

In this article, John Denslinger investigates the cost to company and country when technology-based intellectual property is lost or traded

Tariffs • By John Denslinger

Given an engineering background and lengthy career in hi-tech, I am fascinated by the tariff one-upmanship between the USA and China. It seems every week brings another rate hike threat. Often it's just words. A negotiating head fake meant to tilt the debate in one direction or the other. Don't be duped into thinking the rate juxtaposition is the battle. It's merely the leverage vehicle. The real battle is all about safeguarding intellectual property and the stealth-wealth transfer that results.

No one can doubt China successfully accelerated its economic and technological development through a systematic theft of IP from more advanced trading partners. To be fair, China did: make capital investment cheap and a key priority; created an inexhaustible, well-educated, dexterous workforce; enabled access to foreign markets for its products; and openly solicited overseas companies to manufacture in a low cost/high value environment. There is also no doubt US companies eager to participate in the Chinese economic miracle willingly traded away the crown jewels, their IP. It's unfortunate that so many companies capitulated to this forced technology transfer. They didn't have to, but I sense FOMO (fear of missing out) was too great a risk not to take. China, on the other hand, bears full responsibility for the balance of its ill-gotten gains achieved through coordinated acts of deception: cyber hacking; unlawful infringement on registered patents, trademarks, and copyrights; bonuses for theft of trade secrets; and deep state industrial espionage. Given all this, is it possible to stop this ongoing IP stealth-wealth transfer?

Before tackling that question, allow me to add monetary perspective to the conversation. Imagine the advantage a company would have over its competition if it didn't have to invest in R&D and could readily covet any 'know how' it needed without consequence. Now imagine a country that has done so on a truly enormous scale; a country that costs the American economy alone somewhere between $225 billion and $600 billion annually according to a 2018 US Trade Representative report; a country that readily commercialises new technologies locally then exports its version often under-cutting the same domestic suppliers it stole the technology from in the first place; a country that in less than 40 years became the world's number two economic and military powerhouse.

As for the injured companies, the cost is significant as well. According to Harvard Business Review, intangible assets, which includes IP, is 80per cent of the value of S&P 500 companies. Unlawful IP theft is ongoing and irreversible. The consequence to most: lost opportunity, lost competitive advantage, lost sales.

The sad fact remains: the IP stealth-wealth transfer continues today despite the tariff bantering. Until now, no country, including the USA, has ever dared to enforce an economic showdown over the IP issue. While the media focuses exclusively on the tariff battle, ending IP theft as a routine industrial practice is the real goal. I see negotiations difficult and enforcement relentlessly challenging.

Earlier I asked the question: is it possible to stop the IP stealth-wealth transfer? The simple answer might be yes in principle, but highly doubtful in practice and definitely not soon. It seems the tariff pain isn't great enough yet.

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DK-DALEBA
Printed Circuits

DALEBA ELECTRONICS LTD AND DK THERMAL LTD EXCITED TO ANNOUNCE AMALGAMATION INTO DK-DALEBA

WHAT IS HAPPENING?

Daleba Electronics Ltd and DK Thermal Ltd are excited to announce they are amalgamating to create a single organization once again. The organisation will be trading as DK-Daleba Printed Circuits. The move is intended to ensure we are better positioned to service the ever-changing market of PCB supply, with shared resources and a more streamlined supply chain.

WHY IS IT HAPPENING?

DK Thermal Ltd was initially formed as an offshoot from Daleba Electronics in 2008. Tasked to specifically focus on Metal Based PCBs with the emerging LED market creating a surge in the demand for this technology. More recently, we have seen an increased demand for both Metal and FR4 boards from our customers, with an increasing number of customers using both these technologies.
DK Thermal has also been supplying the industry with Thermal Interface Materials (TIM) for the past 10 years to offer an all-round solution to thermal management.

WHEN IS IT HAPPENING?

The re-branding will come into effect as of the 1st October 2019.

GLOBAL LEADERS IN PCBS

Founded in 1963, from our headquarters in Hertford United Kingdom, we provide a total PCB Supply and Stock Management solution. With our own manufacturing plants in UK and in Asia, Logistics centres in UK, Central Europe and North America we are truly positioned as a global supply company.

CAPABILITIES

DK-Daleba focuses on building personal, dedicated relationships in order to offer the best advice and PCB solutions, backed up with engineering, technical, logistics, and quality management staff on 3 continents. Whatever your requirements, from a simple single-sided board to a complex board in excess of 50 layers, our in-house CAM engineering resource allows us to rapidly check, panelise and commercially optimise a fast turnaround prototype. Mass production moves seamlessly to our Asian manufacturing facility or one of our approved quality assured partners. From our warehouses we are able to stock and distribute product to your manufacturing locations worldwide.

LOOKING TOWARDS THE FUTURE

Going forward with the merging of DK Thermal and Daleba Electronics, DK-Daleba will continue providing the industry with excellent PCB supply and Stock Management Solutions along with a strong focus on new technologies. These include Ceramic based PCB's for particularly thermally challenged systems, Heavy Copper boards for high power applications and our own range of Thermal Interface Materials, 'EMI Thermal', to better supply the changing market.

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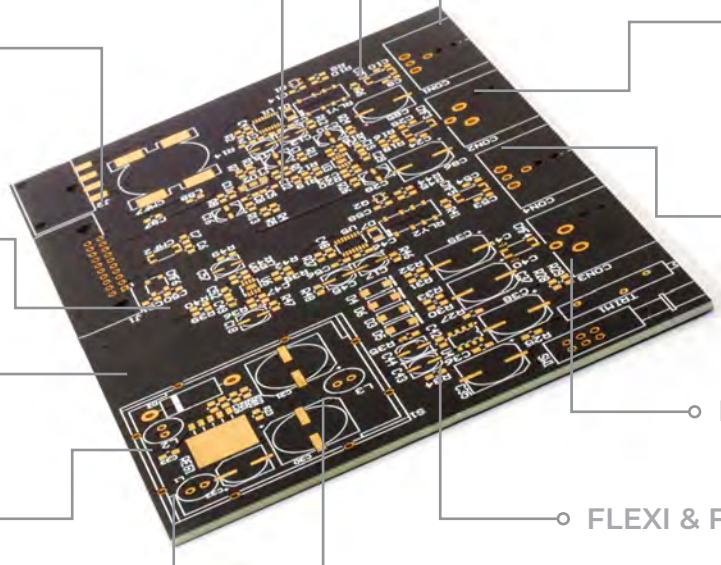

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PCBs: the forgotten component?

If a PCB fails, chances are, the product will cease to function. Purchasing reliable printed circuit boards is a vital part of mitigating this risk, but what should buyers look out for?

Technical manager, **NCAB Group UK**, **Steve Shipway**

Reliability is a key factor right from the start of the PCB production process and it's important to get things right first time. Trying to improve reliability once the product is designed and in production can significantly increase costs. In medical equipment or motor vehicles, it could even become a matter of life and death.

Sales director at NCAB UK, Ryan Pellow, explained: "Once the finished product has been assembled and delivered, the PCB could be described as a forgotten component, The software is there, as are the other components and it can be easy to forget that it's the small hidden things like a PCB that can impact the reliability of the finished item."

Preventing problems

To create reliable PCBs, it's important to consider all aspects that can affect reliability as early as possible in the production process. If there are problems with the PCB design, this is the best time to tackle them. As Ryan explained, you can't compare a PCB to other components since its design has been tailored to a specific product and specific application.

Technical manager at NCAB UK, Steve Shipway, added: "To ensure reliability, we need to apply design guidelines based on what the PCB manufacturers can achieve in practice. In this way, we can make sure that customers get the most cost-effective and reliable product that we can provide.

"Today, everything is incredibly small. The more technology that can be placed on a board, the more complex both construction and manufacturing becomes. Perhaps the most important thing is to ensure that the track and gap on the board is appropriate to the required copper thickness. With today's components, you need smaller track and gap, which means you need to use thinner copper."

progressing a design, it is vital the designers know exactly what is achievable with the specified copper weight requirements. If changes are needed to the layer stack up, for example, if high power areas are needed on the board, ensure that those high power sections are in the inner layers. Avoid the outer layers, since that is where the fine-pitch components are located. This approach makes the board easier to produce.

As Steve pointed out, the higher the technology, the greater the effort required to design the board optimally for manufacturing. In high-technology products there is far less room for error, with reduced tolerances applied in every single process. A better design therefore increases product reliability and reduces the risk of failure.

Factory choice

Once the design is complete, ensure the manufacturer has the appropriate capability and competence to produce the board in question.

Steve continued: "Although the manufacturing processes for a two layer and HDI PCB are similar, the technology is very different. To ensure reliability, the factory needs a

higher level of understanding and control of the manufacturing process. At the same time, one should strive to design boards such that they can be manufactured reliably by as many factories as possible. In this way, you can attain better lead times and a better cost picture, while maintaining quality.

For example, if it's possible to avoid designs containing, six or seven different layers of blind or buried vias to track out a BGA component and reduce it to a standard multi-layer board, do so, advises Steve. This does away with extra drilling and plating processes and significantly reduces costs, while at the same time improving the manufacturability of the product.

"If you keep your manufacturing options as open as possible through a smart design," Steve explained, "this will allow you to switch production from one factory to another, which reduces exposure to risks. If one factory is under-performing, you'll want to move production to another facility, so the last thing you want is a PCB design that limits you to using a single factory."

Focus on standards

One factor behind achieving reliable circuit boards is to ensure that they meet industry standard IPC requirements. NCAB Group has taken this a step further and produced its own standard product specification. At present, it comprises up to 103 different requirements and criteria that factories must follow when manufacturing for NCAB. This document is continuously updated and improved in cooperation with customers and several of the requirements are considerably tougher than those stated in IPC class two.

NCAB's Ryan Pellow explained: "PCBs cannot be treated like other components because there are so many levels to consider. The IPC industry standard applies to many different types of products, requirements and performance levels. In the case of PCBs, it is unable to cover everything. But for the product owner, an unreliable board involves huge risks and that's why it is worth taking all aspects into consideration."

Over the years, NCAB has built up a wealth of knowledge covering factors affecting PCB quality and reliability. Material selection, copper thickness and solder mask can all affect reliability, for example.

Ryan continued: "Our standard requirements specification covers areas where a higher degree of control is necessary. The factories must use only approved brands for the materials specified. For the plating of the hole wall, 25μm copper thickness must be achieved, which exceeds IPC class two. No track welding or open circuit repairs are allowed if the boards are to be approved and there are requirements for factors such as cleanliness."

NCAB also defines clear cosmetic requirements for the PCBs since multiple scratches on a board can suggest

> **Our standard requirements specification covers areas where a higher degree of control is necessary**

accuracy and care issues during the manufacturing process, which could affect reliability.

Creating partnerships

Odd as it seems, in some cases it may be better to afford the factory some freedom and responsibility to take control of decisions. For example, it may seem like a good idea to specify an exact material or a precise brand to ensure adequate control, however, it might be safer to settle for an IPC standard, such as IPC 4101, and several approved brands.

Ryan continued: "The factory will then be free to choose the material with which it has the greatest experience, and which is best suited to its manufacturing processes. Forcing a specific choice on to the factory can create problems, since it could impact the reliability of the factory's processes, compared to using a material they are familiar with."

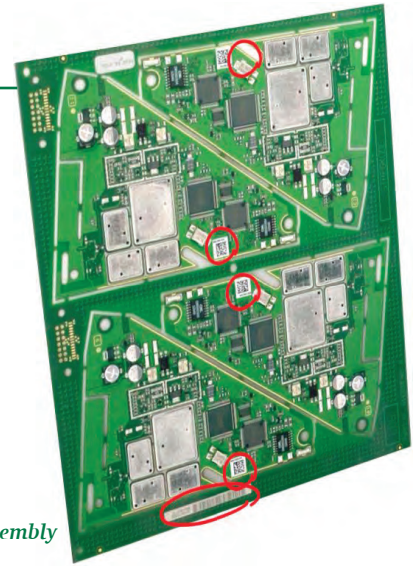
Having NCAB staff and expertise in place at the factories is vital as a means of checking that all processes are optimised and specifications are met. This also means that NCAB can help its factories grow their business if needed.

Ryan explained: "Just as we strive to be a partner for our customers, for example by helping them with the design of PCBs, we also work closely with factories to help them improve their offering and reliability. Although individual factories may be focused on a specific technology, NCAB has built up an enormous breadth of knowledge that includes almost all types of PCB. We are ready to share this experience, to the benefit of both our customers and the factories."

Steve concluded: "NCAB's factories know why we apply high standards and why we go beyond IPC. We help them live up to our high demands and they can improve their manufacturing ability in general. Our model leads to a win-win-win relationship that purchasers and factories benefit from alike."

www.ncabgroup.com

"Just as we strive to be a partner for our customers, for example by helping them with the design of PCBs, we also work closely with factories to help them improve their offering and reliability



Five statistics that will change your buying behaviour

Strategic choices about how and where electronics are manufactured have a significant impact on purchasing. Mentor Graphics presents five key facts that will make you rethink purchasing for PCB assembly

Manufacturing is an old process, yet new consumer buying patterns are increasingly putting pressure on factories to become more flexible. Innovations such as Industry 4.0 attempt to meet these market-force requirements with technology solutions, but in reality, the problem surpasses manufacturing and includes the whole business process, which has become entrenched in bad habits.

Here, we expose some of the shocking statistics in manufacturing, as well as highlighting the opportunities they present for agile companies and progressive purchasers.

1. 95% of manufacturing businesses focus on optimising just 1% of their total business cost

Looking at the latest technology products built today in China, the labour contribution to the final product retail cost can be as little as one per cent. Why then, are companies so concerned with this, to the detriment of quality, flexibility, and risk?

Historically, when factories existed close to the market, labour represented most of the fixed cost of operation. Consequently, there was a move toward off-shoring manufacturing, but once all the major companies had followed this pattern, the once competitive edge of lower cost labour was lost. Now companies are fighting to reduce the last one per cent that labour contributes to the final price of fashionable high-tech products.

Unfortunately, during this process other cost contributors have been ignored. For example, if we look at a quality LED lightbulb, we find that it is available online with free shipping from a small Chinese supplier for around one fifth of its in-store retail price. We can assume that the lower figure represents a fair price for the manufactured product, with a reasonable

profit for the manufacturer, some profit for the Chinese sales company, and of course the real cost of postage.

Consumers can pay the higher price and have the bulb today or wait three to six weeks for the product to be delivered from China, saving 80 per cent of the cost. For many, it will be worth the wait. If customers are willing to buy goods on-line from China despite the wait and risks involved, wouldn't it be better if the factory was based close to home, using the same model as the Chinese sales company and shipping directly to customers?

An on-shore factory with direct shipping could have a far higher degree of success with a simple warehouse inside the factory, although of course, the factory would need to be flexible to respond to more random shopping requests while still remaining productive. The labour cost in such an on-shore factory could be five to ten times that of the corresponding Chinese factory, but this will still be small compared to the cost saving from distribution.

2. SMT operations often run at as little as 20% absolute productivity

The important word here is 'absolute.' In high-volume manufacturing, when production lines were dedicated to a specific product and lines ran at full capacity, absolute productivity could be as high as 85 to 95 per cent.

Today, however, very few SMT operations operate in this way. With rapid technology evolution and multiple product variants, each with a limited lifecycle, consumer items have only a small window to attract premium pricing, after which there is rapid price depreciation.

The effect of this on the factory is a need to not only produce a high mix of products but also to cope with sudden changes in demand. These factors are the key cause of the low productivity currently seen in many SMT operations.

Factors such as changeover time, line balance losses, engineering setup time, maintenance, and new product introduction time can all be used to boost the headline number. The reality is that many 'unavoidable' losses are effectively ignored, even though they may actually be avoidable. As product mix and demand volatility continue to increase, attention on these issues will be essential.

Many of these issues can be addressed, even in a high-mix and high-volatility scenario, for example, by using software tools to create common material feeder setups that adapt dynamically to customer-demand patterns, and optimising work-order sequences.

3. 75% of raw materials in an SMT factory need not be there

The adoption of lean material logistics is an essential part of providing flexibility in SMT production. By enhancing the accuracy and control of enterprise resource planning tools, especially for work in progress on the shop floor, lean material logistics can reduce the amount of buffer stocks in the factory.

Since SMT materials are supplied on bulk carriers, such as reels, many more materials are issued to production than are actually needed. In a high-mix environment, it can be that most materials issued will not be immediately consumed by the targeted work-order. There can also be spoilage during the placement operation, both through the machine and manual operations. The amount of materials left unused after executing a work-order is therefore unknown.

Periodical stock checks often reveal the need to write-off significant amounts of materials, potentially at great cost. Furthermore, accumulated inventory inaccuracy brings unexpected internal material shortages, which in turn leads to the

Collecting data directly from equipment helps to account accurately for usage and spoilage

Looking at the latest technology products built today in China, the labour contribution to the final product retail cost can be as little as one per cent

Inventory turns will double as warehouse space halves

habit of instructing material requirement planning to over-order materials, creating a bloated warehouse inventory.

Introducing lean material management can eliminate 95 per cent of the material WIP on the shop floor because materials are issued only when needed and are returned to the warehouse when no longer required.

Collecting data directly from each SMT machine helps to account accurately for usage and spoilage. With material inventory accuracy maintained, internal material shortages are eliminated. MRP can then maintain buffer stock levels more accurately, according to real business needs. As a result, warehouse inventory can be reduced by as much as 75 per cent without risk of production shortages.

4. 30% of products leaving the factory were never tested

There are several different categories of product defect, from untestable defects to defects that pass tests in the factory, only to fail once the product has been in use for a while.

With a firm grip on the statistical situation, however, the emphasis moves away from test towards the manufacturing processes themselves. Manufacturing defects are most often caused by variations in the production process, some with a simple cause-and-effect, others as a result of two or more factors working together.

First, check each process to ensure that the setup and operational guidance was correct. Today's process preparation tools can create SMT programs, test and automated inspection data, as well as operation standards for manual processes, from a single product model. Next, ensure that all production operations are carried out as specified and that any variances are highlighted and eliminated. For most SMT operations, test and repair processes are the third and final step.

The most neglected tool, however, is the application of traceability data within manufacturing. If traceability data is accurate, complete, and timely, then information about defects is already available and could be used to identify potential risks before they leave the factory. Analysis of traceability data can, for instance, highlight PCBs that were printed with solder paste but left too long before placement, increasing the risk of poor solderability.

It's impractical to think that every possible deviation from the normal operation of a production line can be addressed as it happens, but complete, accurate, and timely traceability data could be the ultimate quality tool, acting in a far more effective way than regular test processes.

5. 80% of factory management know these statistics, but feel powerless

In many cases, there is a different management process relating to the business of a product compared to the business of manufacturing. In an OEM company, manufacturing is usually treated as a non-profit operation, with factories working to a budget. This creates a barrier that can prevent investment in product performance-related issues. Using EMS services can make this barrier even larger.

> **The adoption of lean material logistics is an essential part of providing flexibility in SMT production**

Going forward, it's clear that with volatile patterns of customer demand and an increasing number of product variants, there is an inevitable need for extreme manufacturing flexibility. Considering the complete needs of the business and analysing all costs, of which manufacturing is only a part, it's clear that the operation and location of manufacturing processes need to be reassessed.

www.mentor.com

Cooling module is spot on

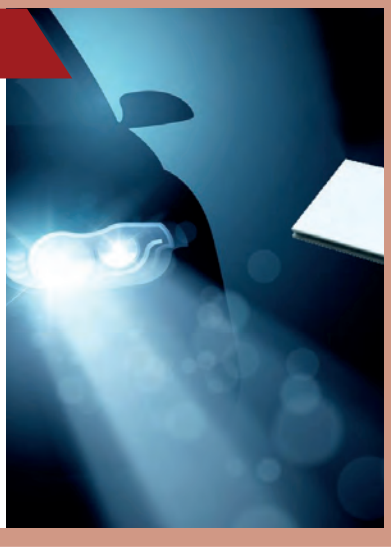
A Peltier module from Laird Thermal Systems has been used to provide active spot cooling for sensitive electronics in the latest automotive headlights. The HiTemp ET series module operates in elevated temperatures to provide thermal stability in designs featuring digital light processing technology.

DLP technology is used in many smart automotive headlight systems to cast sharper and brighter light in front of a vehicle. The headlights operate in environments that can reach 110°C, however, going beyond the 70°C temperature limit of a DLP risks failure. Implementing a HiTemp ET series thermoelectric cooler module protects sensitive DLP electronics and ensures optimum performance.

Laird states the HiTemp ET series can lower the control temperature by as much as 40°C below ambient dependent on active heat load. The Peltier cooler also boasts reliable solid-state construction, long life operation, and a compact form factor that fits into tight space constraints.

Purchasers can choose from a range of products to cover DLP design requirements with 53 models available to accommodate various heat-pumping, geometric form factor, and input power requirements.

www.lairdthermal.com



Delivering thermal management for tomorrow's data centres

Molex highlights its new BiPass thermal management configuration for use in data centre applications. The new QSFP-DD modules operate up to 20W with a 15°C change from the ambient temperature. Molex claims the BiPass solution allows higher wattage modules to be cooled, helping support products on the path toward 112Gbps.

As the industry prepares for next-generation copper and optical QSFP-DD transceivers, thermal management strategies are critical. Molex offers a QSFP-DD belly-to-belly BiPass configuration, QSFP-DD belly-to-belly surface mount configuration, two by one QSFP-DD stacked configuration and one by two QFSP-DD BiPass in a vertical orientation with dual heat sinks. Running at 15W, all configurations were able to cool at less than 25°C delta T rise.

The BiPass solution routes high-speed signals through Temp-Flex twinax cables, bypassing the lossy printed circuit board to achieve greater channel margin. It also allows for a second heat sink on the bottom side of the cage, providing additional cooling.

Global product manager, Molex, Chris Kapuscinski, said: "As demand for faster data rates grow, data center technology is evolving quickly, and thermal management technology must keep up. The BiPass solution is a key enabler as we move forward with 112Gbps PAM-4 implementations."

www.molex.com

Standardise for medical savings

FiDUS Power has introduced a new option for purchasers of medically approved power supplies in the form of the Versatile Power Series, comprising power solutions from 600 to 1000W. The series is ideal in applications where standardizing on a single reference power platform could help simplify installation, rather than stocking many different power supply variants with different mechanical installation requirements.

Common features across the Medical Versatile Power Series include the latest approvals for safety IEC 60601-1 and EMC immunity IEC 60601-1-2, as well as universal input range and output voltages from 12 to 58V DC for use worldwide.

Engineering manager at FiDUS Power, Mark Gibbons, commented: "These simple to integrate power supplies in industry standard 1U height offer not only a cost-effective system power supply but also form, fit and function replacements for other manufacturers' products in 19in racks. The units are perfect for body floating applied part applications where the safety requirements need to be higher than standard operator safety levels."

Free engineering samples can be delivered from stock on short lead-times with 3D step files available for quick CAD integration.

www.fiduspower.com

Lighting up power supply choice

Luso Electronics is now stocking Delta Electronics' latest open frame power supply, the PJL Series, which is specifically targeted for lighting applications.

The series comprises two models, both with 48V constant voltage in a 200 or 400W output power version. Complete with built-in active power factor correction, the fan- or convection-cooled design boasts optimised thermal management for power efficiency of up to 90 per cent. Supplies can operate from -40 to 80°C across the entire input voltage range of 85 to 305V AC and the products are also said to feature low earth leakage current of less than 500µA, as well as low inrush current less than 20A. Products are housed in a standard industrial three by five inch footprint.

Products in this series include major international safety standards for lighting applications according to UL 8750 and IEC 61347-2-13, plus other approvals according to IEC/EN/UL 60950-1, IEC/EN/UL 62368-1, as well as being certified for EMI standards according to EN55032 Class B.

www.lusoelectronics.com

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New range gives Jauch Quartz a long-term energy boost

In an exciting new addition to their portfolio of Battery solutions, Jauch quartz has launched a comprehensive variety of Lithium Thionyl Chloride cells in both Bobbin and Wafer construction, with multiple mounting configurations. There are 20 parts in the new line-up which directly complements Jauch quartz already extensive range of Primary, secondary and customised battery solutions.

Nicholas Ribton, Managing Director of Jauch UK and Ireland, elaborates, "For modern electronic devices, Lithium Thionyl Chloride is a secure energy source with high cell voltage and energy density for maximum reliability even at high power consumption and in extreme temperature conditions.

Typical applications are the off-grid power supply of electronics in military and industrial applications, security technology, oceanographic, IoT sensors and utility meters. Our cells are extremely competitively priced in the market and carry the same high quality, local technical support, and EMEA stockholding as our existing Battery and Frequency series"

The chemical content of the Li – SOCl2 battery consists of a lithium (Li) anode, a carbon (C) cathode, and a non-aqueous electrolyte. This solution performs two functions, as the electrolyte for ion transport, and as an active depolarizer. The Carbon cathode serves as a catalyst for cathodic reduction. The nominal voltage of the cell is 3.6 V, which remains nearly constant throughout the discharge time. Its maximum energy density, among all primary batteries of up to 650 Wh/kg, is outstanding. Particularly long shelf life and service life is achieved by the hermetically-sealed housing. Jauch LiSOCl2 cells offer unmatched safety due to their unique "fail-safe" construction. These batteries are also free of heavy metals, making them amongst the most environmentally friendly of all primary batteries.

For further information visit *www.jauch.com*

e-mail: *info@jauch.com*
phone: *+44 (0) 1276 605900*

Jauch's new LiSOCl2 cells are available in multiple mounting configurations

Size	Capacity (mAh)	Termination style
2450	500	Pin
½ AA	1200	Button top, Solder Tab, Pin
⅔ AA	1650	Button top, Solder Tab, Axial leads
AA	2700	Button top, Solder Tab, Axial leads
A	3600	Button top, Solder Tab
18505	4000	Button top
C	8500	Button top, Solder Tab
1/10 D	1000	Pin
1/6 D	1700	Pin
D	19000	Button top, Solder Tab

Purchasing power cords: a flexible new option

Following its acquisition last year by Volex, GTK is now offering buyers a new range of hybrid power cords designed to offer enhanced flex performance and durability

Set to include UK, Europe, North America and China, GTK's new Volex V-Novus hybrid power cords claim to combine innovative design with versatility. The sets boast a low profile, light weight, and include flexible strain relief, enhancing their flex performance and making them more durable. All cord sets are compliant with the required industry standards and regional safety approvals.

Purchasers opting for the standard product will find a range of 1.8m black cord sets with the relevant country plug at one end and a choice of C7, or C13 connectors at the opposite end. Custom options with different cable types, colours or lengths, or different current ratings are available on request.

Business manager for cable assemblies at GTK, Tom Hennessey, said. "Our acquisition by Volex last year means that we now have access to its product range, and we are adding power cords as an additional product family for GTK. Volex is recognised as a leading manufacturer of high quality, standards compliant power cords. It has a global manufacturing footprint and supplies power cords to blue-chip customers around the world.

"This product set is a natural extension to our portfolio, as many of our existing OEM customers have a requirement for cord sets and we are confident that we are price competitive. Our standard range of cord sets includes what we consider to be the most popular cords, but there are also many options for customisation."

www.gtk.co.uk

V-Novus cord sets are supplied with the relevant country plug at one end and a choice of C7, or C13 connectors at the opposite end

The basics of buying wire and cable

Wiring and cabling can be found everywhere from consumer applications to industrial equipment. Here, president of Memory Protection Devices, Tom Blaha, helps purchasers as they address performance and cost efficiency queries

When sourcing wire and cable products, purchasers will find a wide range of wire and cable products with variable characteristics, including: size or gauge measured in AWG or KCMIL; physical strength; radiation resistance; weight; electrical properties; chemical/oil/moisture resistance; flexibility; temperature rating; durability; sunlight resistance; flame resistance; and finally cost and availability. Prioritising these characteristics will help determine the ideal solution, as trade-offs are often required.

What is wire?

A wire is a single conductor, usually copper or aluminum, while cable is defined as two or more insulated wires wrapped in one jacket. Multiple conductors not separated by an insulation layer are typically classified as a single conductor.

There are three types of cable: signal; power; and control. Signal cables are rated for low power, low current for applications such as TV cable, electronic cable, fiber optic cable, data cable, electromagnetic wire, low voltage power, and communications. Signal cables are usually shielded and carry data modulated power ranging from four to 20mA DC current.

Analog signal transmission typically consists of two-wire signal leads or three-wire signal leads. Where precision and accuracy are required, a third signal lead, or shield, is necessary. In the three-wire configuration, the shield is grounded at the signal source to reduce common-mode noise. Four types of signal cables are used to carry analog signals: plain pair, twisted pair, co-axial, and shielded-pair. These cables are normally single pair cable with a cross-sectional area ranging from 0.5 up to 1.5mm^2.

Power or control cables come in larger gauges and typically deliver 24V DC or 110/230V AC unshielded to heavy-duty applications including mining, energy, transportation, infrastructure, or industrial machines. Control cable is usually insulated and sheathed with PVC and paired with a circuit protection device.

Understanding electricity

Electricity is measured in volts, amps and watts. Volts represent the amount of electrical force delivered, with the specific voltage determining insulation thickness requirements. Amps represent the quantity of energy delivered, with conductor size determined by the required amperage. Watts measure total energy using the formula: watts = volts x amps.

Different applications are UL-rated for a specific voltage and current. Low voltage or low tension LT cable can be used up to 1000V while high voltage or high tension HT cable is used between 1000V and 11KV. Super tension or ST cable is suitable for use from 11 to 33kV and extra high voltage or EHT cable from 33 to 66kV. Finally, for applications above 66kV, specify extra super voltage or EST cable.

Common cable choices

Wire and cable are integral to many electronics applications from circuit prototyping and wire harnessing to Ethernet connectivity and high voltage power transmission. Electronic devices primarily use copper wire, which is considered an excellent conductor and relatively inexpensive, ensuring it is popularly used for transmitting both AC and DC current. Tinning can be used to alter the properties of wire as can annealing, a process where wire is heated to 700°F, then cooled to make it more flexible.

Popular wire products used in electronics include solid hook-up wire which comprises a single strand of insulated copper wire. While not very flexible, this is often used as magnet wire in transformers and motors or for prototyping on a breadboard. Stranded hook-up wire is more flexible making it ideal for use in tight spaces. It consists of a bundle of thin copper wires twisted or braided together to extend the life of the wire in high-vibration applications.

Another commonly specified product is coaxial cable. Coax combines a solid copper core with a tubular insulating layer surrounded by a tubular conducting shield and a plastic jacket. It is commonly used to transmit radio frequency signals that require protection from electromagnetic interference.

Network cable includes coaxial, as well as CAT3, CAT 5, CAT6, CAT 7 and fiber optic cable. It can be used for high speed data transmission and is typically available in twisted pairs to cancel out EMI. Finally, various types of computer cable are commonly available including ribbon, socket ribbon, male to female ribbon, USB data sync, ATX, extension cables, power charging cables, and more. A common requirement for these applications is the need for flexibility.

Products sold in the US usually carry Underwriters Laboratory registration, including: UL1007; UL1569; UL1423; UL94V; and

ULVW-1. Other notable US approvals include MIL-C for military-grade cables and components, and CL2 / CL3 for audio cables and speaker wire.

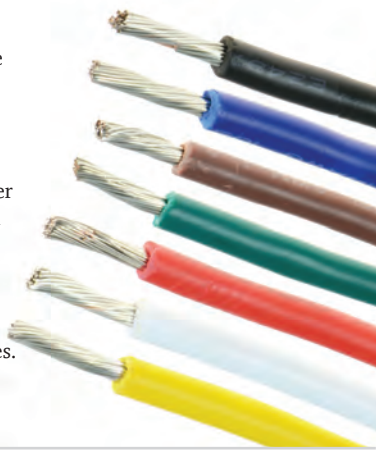
Specifying jackets and insulation

Purchasers will be aware that jackets and insulation also offer many variables, including: wall thickness; electrical variables such as capacitance, insulation resistance, and dielectric strength; physical characteristics such as abrasion resistance or deformation; chemical/ environmental resistance; long-term reliability; flexibility; radiation resistance; and smoke and flame resistance.

Designed to help prevent shorting, insulation is a non-conductive material applied over conductors to provide electrical isolation between conductors. Jackets are applied over conductor insulation or a cable core to enhance its mechanical, chemical, or electrical properties. Versions include thermosetting; thermoplastic; fluoropolymer; elastomer; and rubber. Armoring and shielding provides even greater protection.

Finally, any wire and cable products used in electronic assemblies need to be properly terminated and tested to ensure that a reliable electrical connection has been achieved. Through careful consideration of all these factors, purchasers will be better equipped to select, specify and buy the optimum cable for their application.

memoryprotectiondevices.com



EMC Products

Specify rail-specific EMC solutions

Available now from Dengrove Electronic Components, Recom has introduced two new railway power supply reference designs set to solve challenges including filter layout for EN 50121-3-2 EMC compliance and surge prevention according to the UK RIA12 specification.

The R-REF04-RIA12-1 board targets high-voltage applications up to 110V, while the R-REF04-RIA12-2 is built to handle DC input current up to 10A. Both are input-side fused and can be used with single-output DC/DC converters up to 45A. The boards feature a universal pinout for two by one inch, quarter-brick and half-brick standard case sizes, allowing users to choose from converters of various power ratings up to 240W.

RIA12 surge protection is provided using an active input-voltage clamp featuring a surge-stopper IC, which acts to block surge voltages up to 385V DC. The clamp circuit also provides inrush current limiting. The boards provide a nominal value of hold-up capacitance, with connectors to add extra capacitance if required.

www.dengrove.com

Top 15 UK Distributors Report

Welcome to the inaugural Electronics Sourcing Top 15 UK Distributors Report which looks at industry challenges, future opportunities and trends shaping the sector

Thomas Smart, Special Projects Editor for **Electronics Sourcing Magazine**

Preparedness key to future success

In 2018 we saw a year of continued uncertainty in the electronic component marketplace with price and availability fluctuating at unprecedented levels. The underlying causes of this included a global component shortage, the ongoing China/US trade war and, most importantly to the UK market, Brexit uncertainty.

Preparedness is on the mind of purchasers and distributors alike as being critical to alleviating the uncertainty and ensuring future success. Anglia Components' CEO, Steve Rawlins, explained: "It is fair to say that the global market is particularly difficult to call at the moment for a number of well-documented reasons. Factors include Trump's trade war with China and weakness in the Eurozone. Here in the UK, there is the specific issue of Brexit, and like most distributors, we are being asked about our preparedness."

Farnell's global head of IP&E, Simon Meadmore, echoed this: "Geopolitical events such as Brexit and the US/China trade war continue to destabilise the economic playing field. Confidence and growth may be slower to return."

Supply and demand have been choppy at the best of times and this has hit pricing., Digi-Key Electronics' executive vice president, digital business, Jim Ricciardelli highlighted this link: "Supply and demand for electronic components goes through cycles. 2018 was a year in which supply was tight relative to extremely high customer demand which caused factory lead times to extend out and pricing to be firm."

Anglia Components' CEO, **Steve Rawlins**

Meadmore agreed with this and asserted that we are moving towards the end of the cycle and a return to a more balanced supply and demand scenario: "The market is currently in the downturn of its cycle, and as such, there are increasing pricing pressures due to weaker market demand and reduced lead times for products. This may normalise in the next three to six months and we expect to see a return to more traditional supply and demand balance."

A constant stream of supply is critical for purchasers as Rawlins explained: "It is our job to work with customers and protect them as far as possible from these fluctuations with intelligent forecasting of supply and demand. One of Anglia's biggest advantages has always been that we hold all of our inventory on shore here in the UK. It's there, instantly accessible to UK customers whatever the weather, the delays at customs or the terms of any Brexit deal."

Strength of innovation not faltering in a weaker marketplace

There are positives to take going deeper into 2019 and longer term,

> **"The market is currently in the downturn of its cycle, and as such, there are increasing pricing pressures due to weaker market demand and reduced lead times for products**

with emerging markets showing strong customer demand even in the face of a slowing collective outlook. Rawlins supports the long-term importance of innovation, stating: "The UK electronics industry is driven by innovation. We have customers who are leading their industries with technologies in the medical, automotive, industrial and other fields. Such innovative businesses will ultimately always succeed in the long term whatever short term fluctuations occur in the supply chain."

Meadmore agreed and highlighted the key innovation hubs as being the medical, environmental and industrial technologies: "There are certain developments such as 5G infrastructure, and performance within key industry sectors of medicine, environmental and industrial technologies that are likely to stay relatively strong regardless of current market factors."

Innovation is no longer a priority of the few but is now the key for many as the strategy to alleviate the pressures faced by a turbulent marketplace. Ricciardelli said: "Innovation is still driving a very exciting market and customer demand is still high with new products. As connectivity technology expands around the globe, IoT, AI, and machine learning are driving demand for electronics components. We are in a very exciting and growing industry."

Ricciardelli also explained that growth is not only limited to the innovative aspects themselves but also supplements the supporting component groups: "We are experiencing growth in all component groups. While IoT technologies such as sensors, microcontrollers and software are enabling innovation, many core supporting product groups such as connectors and passive components are needed to provide the total solution."

Digi-Key Electronics' executive vice president, digital business, **Jim Ricciardelli**

Electric vehicles add to automotive demand

One sector seeing an increase in demand from industry and end consumers is the electric vehicle (EV) market. With consumers looking at more environmentally sustainable options the attention of the automotive industry is shifting away from the conventional combustion engine driven cars to EVs.

This shift has increased the need for more complex and numerous power management systems as Meadmore expanded: "Whilst the traditional automotive sector has undoubtedly seen a slowdown in the face of these challenging market conditions, the much newer electric vehicle market has emerged as a key area of opportunity for electronics suppliers. Power management to optimise power consumption is becoming an increasingly important technology in electronics, both on and off board, as more devices become battery powered. Electric vehicles are a great example of this as engineers must work to maximise battery performance in an already complex system."

> **With consumers looking at more environmentally sustainable options the attention of the automotive industry is shifting away from the conventional combustion engine driven cars to EVs**

Interestingly this demand is volatile, often ending up at either end of the spectrum. Rawlins concluded: "Big automotive or smartphone suppliers can mop up all available capacity at times of high demand or flood the market with unwanted devices when their demand dries up. At the moment demand is weak so prices are lower and lead-times shorter, but this could change quickly."

Farnell's global head of IP&E, **Simon Meadmore**

World's Largest Selection of Electronic Components Available for Immediate Dispatch!

Digi-Key Electronics, a global Internet-based distributor of electronic components, is an authorized distributor of more than 7.9 million components, including over 1.5 million in stock, from more than 800 trusted suppliers. The company's reputation extends worldwide through the continuous choice of Digi-Key's customers as the provider of the widest range of electronic components in the industry, ready for immediate delivery. With this wide range of products available in both design and production quantities, Digi-Key is the best resource for designers and buyers alike.

Product availability is one of the distinguishing features of Digi-Key from other electronic component distributors. They stock over 1 million products at its distribution center in Thief River Falls, MN. New products are added every day, in a continuous effort to offer the full range of electronic components required by the customer. Whether semiconductor, passive, interconnect, electromechanical, wireless or lighting components, Digi-Key will carry the parts you need when you need them.

Digi-Key's main channel strategy remains providing the broadest selection of electronic components in stock and available for immediate shipment, anywhere in the world. The company is committed to offering the newest emerging technologies from supplier partners and being an industry leader in NPI.

Digi-Key is currently on-track with the construction on a 93,000-square-metre Product Distribution Center expansion that will allow the company to expand inventory even further to meet current and future demands of customers. It will also allow for searching out new and innovative technologies and products from new and existing electronic component suppliers, allowing Digi-Key to continue being a one-stop-shop for customers in all industries.

The company offers a vast selection of online resources including a range of EDA and design tools, DK IoT Studio, reference design library, product selectors, parametric search, on-demand multimedia library, a comprehensive article library, and community forums, among others. Digi-Key also offers numerous Supply Chain solutions such as API solutions, bonded inventory, and just-in-time shipping, as well as a newly updated BOM manager. The website is updated regularly with new features in response to customer feedback and industry needs.

Digi-Key prides itself on the ability to provide the best possible service to customers. A customer can request electronic components or reach the talented team of technicians and application engineers 24 hours a day, seven days a week, 365 days a year, either by phone, fax, e-mail, or through the website chat option.

From prototype to production, Digi-Key has the resources and products to fuel your innovation and take your design to the next level!

For more information, view the Digi-Key Electronics website: www.digikey.co.uk

Contact: Ian Wallace, Director, Business Development EMEA
0800 587 0991 or 0800 904 7786
uk.support@digikey.com

TOP ELECTRONICS DISTRIBUTORS 2018

Rank 2018	Company	UK Sales (£ millions) 2014	2015	2016	2017	2018	Sales Breakdown % Active	Passive	Electro	Interconnect	Computer Products	Other	% sales Value added	Employees
1	Arrow Electronics (1)	n/a	n/a	n/a	n/a	1630.0	68	19	0	0	10	3	n/a	n/a
2	Farnell (2)	n/a	n/a	n/a	n/a	202.0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3	Digi-Key Electronics	39.7	34.9	39.7	53.6	82.5	53	25	10	12	0	0	23	3
4	Anglia Components Ltd	n/a	n/a	53.2	61.4	67.3	60	20	8	9	1	2	15	154
5	Mouser Electronics	22.8	24.3	28.6	35.7	50.9	45	19	8	15	0	13	0	14
6	Rutronik UK Ltd (1)	n/a	n/a	n/a	n/a	43.2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7	Solid State Supplies	13.4	16.0	16.1	19.0	24.2	25	0	25	0	25	25	22	45
8	Rapid Electronics	18.7	19.2	19.4	20.2	20.9	10	5	15	10	2	58	5	120
9	Aerco Ltd	12.3	11.5	13.3	15.1	14.0	2	9	28	61	0	0	15	51
10	Transonics PLC	5.4	6.3	6.5	7.7	9.0	60	20	10	5	0	5	60	40
11	Ineltek Ltd	3.5	3.5	3.0	4.0	4.5	90	10	0	0	0	0	25	6
12	Telegartner UK Ltd	2.6	3.0	2.8	3.0	2.8	0	0	0	97	0	3	39	41
13	Foremost	2.1	2.2	2.3	2.4	2.5	0	0	100	0	0	0	0	14
14	Bürkiin GmbH & Co KG	0.1	0.5	0.9	1.0	1.4	5	10	10	70	0	5	20	1
15	Selwyn Electronics ltd	n/a	n/a	n/a	n/a	1.0	n/a	n/a	n/a	n/a	n/a	n/a	40	n/a

(1) Data dirived from global sales and is a Electronics Sourcing estimate.
(2) Data used from closest finacial year, majority of which falls in the given year

Diversification into value added services remains strong

Traditionally distributors have been seen by purchasers as just a reliable stream of components to fill their bills of materials, but increasingly we are seeing a shift towards the importance of value-added services.

In total distributors saw value added services equate to 16.3 per cent of all sales made in the UK for a total value of £352m. The key factors driving this have been a shorting in component and product lifecycles, a growing maker market and a shortage in technical know-how.

Rapid innovation has progressively shortened the life cycle of electronic products and the components they are comprised of, this leaves original electronics manufactures (OEMs) in a tough position: either stock up or source a supply which will outlive the end of production. These options ultimately lead to the need for a redesign to accommodate a replacement component.

The option of stocking up may not always be available as shortages can strike the supply chain also the resources needed to perform a redesign may not be prevalent and is often caused by a lack of technical knowledge. This has been identified by distributors, with a wealth of knowledge they are able to bridge the gaps that appear for OEMs.

This is accentuated even more so in the maker market as many don't have the capacity to cover all aspects needed to bring a product from inception to market, in turn distributors are feeling more inclined to get involved at the earliest design stages. This is a trend I see continuing into 2019 and further, with value added services becoming more mainstream.

The Top 15 report is comprised only of companies which have opted in

TOP 15 DIRECTORY

AERCO Ltd
Rank: 9
16-17 Lawson Hunt Industrial Park, Broadbridge Heath, Horsham, West Sussex, RH12 3JR, 01403 260206
Distributor Type: Stocklist
Managing Director: Robert Laughton
aerco.co.uk
Major Supplier Lines: Smiths Interconnect, TTAB Connectors, Oxley Developments, Honeywell Sensor & Control, Alpha Wire, TE Connectivity
Value-added Services: Kitting, Connector Assembly, Custom Fans

Anglia Components Ltd
Rank: 4
Sandall Road, Wisbech, Cambs PE13 2PS, UK, 01945 474747
Distributor Type: Broadline
Managing Director: Steve Rawlins
Director: John Bowman
anglia-live.com
Major Supplier Lines: STMicroelectronics, Analog Devices, Renesas, Murata, AVX, Panasonic, CREE, Bourns, Omron, TDK, Littelfuse, IXYS, Rohm Semiconductor, Hirose, Harting, Harwin, Toshiba, Mitsubishi, Eaton
Value-added Services: Cable Assemblies, Customised Products, Split Pack Quantities, Programming, Repackaging, Component Cropping & Preforming

Arrow Electronics
Rank: 1
Kao One, Kao Park, Hockham Way, Harlow, Essex CM17 9NA, 01279 455060
Distributor Type: Broadline
Chairman, President and CEO: Michael J Long
UK & Ireland Sales Director: Peter Rudd
arrow.com
Major Supplier Lines: ADI, TI, Intel, Micron, Infineon, Microchip, NXP, Microsemi, ST,TE
Value-added Services: Design, Tape + Reel, Kitting, Testing, Tinning, Marking, Assembly and Production Services

Bürklin
Rank: 14
Grünwalder Weg 30, 82041 Oberhaching, Germany, +49 89 55875-0
Distributor Type: Broadline
Managing Director: Ralph Bürklin
Director: Alfred Lipp
buerklin.com
Major Supplier Lines: Molex Industrial, TE Connectivity, TDK/Epcos, Harting, Volex, Weller
Value-added Services: Kitting, Cable Assemblies, Re-reeling, Calibration

Digi-Key Electronics
Rank: 3
701 Brooks, Ave. South, Thief River Falls, MN, 56701, 218-681-6674
Distributor type: Catalogue
President / Chief Operating Officer: Dave Doherty
digikey.co.uk
Major Supplier Lines: Texas Instruments, Analog Devices, Panasonic, TE Connectivity, TDK Corporation, Murata Corporation
Value-added Services: Kitting, Cable, Assemblies, Battery Packs, Breaking Down Pack sizes into smaller quantities, Programming

Farnell
Rank: 2
Farnell House, Forge Lane, Leeds, LS12 2NE, England, 03447 11 11 11
Distributor Type: Broadline
CEO: Chris Breslin
uk.farnell.com

Foremost Electronics Limited
Rank: 13
14 Bluegate Business Park, Great Bardfield Essex CM7 4PZ, 01371 811171
Distributor Type: Technical Distributor
Managing Director: Alan Cook
4most.co.uk
Major Supplier Lines: Thermo Disc, Elma, Nvent Schroff, Binder

Ineltek Ltd
Rank: 11
2b Saturn House, Calleva Park, Aldermaston, RG7 8HA, UK, 01189 9703388
Distributor type: Specialised
Chairman: Bernhard Sonnentag
Managing Director: Paul Davies
Director: Shaun O'Brien
www.ineltek.co.uk
Major Supplier Lines: Microchip (Atmel, Microsemi), ST, E Ink, Adesto, AMIC, AP Memory, FMD, Haechitech, IAR, MAS, Qorvo, Epson, Inova, Nuvoton, Redpine, Pyramid, Wisekey, Bolymin, Hantronix, Santek, Touchnetix, Espressif, Identiv, Explore, ITE, Magnachip, OriginGPS, Elec&Eltek, Link-PP, Microcrystal, Premo, Renata, Sunny
Value-added Services: Programming, Marking, Design Services, Sub-assembly Design and Build

Mouser Electronics Inc.
Rank: 5
Suite C, First Floor, Artisan Building, Hillbottom Road, High Wycombe, Bucks, HP12 4HJ, United Kingdom, +44 (0) 1494-427500
Distributor type: Catalogue
Vice President EMEA, Customer Service: Graham Munson
Customer Service Manager: Laura-Jane Kinchella
mouser.co.uk
Major Supplier Lines: ADI, Amphenol, Maxim, Microchip, Molex, Murata, Onsemi, TE, TI, Vishay
Value-added Services: Order Automation, BOM Tool, EZ Buy, Project Manager, Project tracking, Basket/Project Share, Request Quote, Mouser Account, Ordering Services (Invoices, notes, order history, quote history, request quote, part packaging options, newest products, Applications & Technologies, Returns, iOS and Android Mouser Mobile App, Download Centre, Custom Search Engine, Search Accelerator, Microsoft Office Add-ins, Search Tools, Project Sharing

Rapid Electronics
Rank: 8
Severalls Lane, Colchester, Essex, CO4 5FU 01206 751166
Distributor type: Broadline
Managing Director: James Bates
rapidonline.com
Major Supplier Lines: 3M, ALphawire, Ambersil, Arcol, CamdenBoss, FAcom, Finder, Hammond, Kingbright, Knipex, Loctite, Neutrik, Phoenix Contact, Schneider, Tektronix, Telemecanique, Tesa, Testo, Vigortronix, Weller & Wera. Plus 100s more. We also deal directly with manufacturers in the Far East regarding our own brand products
Value-added Services: Enclosure modifications for all enclosures we list Kitting, Cable assemblies, Long term stock agreements (Call-Off and schedule orders), Bespoke Terminal blocks (Colour and Marking)

Rutronik UK Ltd
Rank: 6
1-3 The Courtyard, Calvin Street, Bolton, BL1 8PB, +44 1204 363311
Distributor type: Broadline
President: Helmut Rudel
CEO: Thomas Rudel
Director UK: Jezel Hardern
rutronik.com
Major Supplier Lines: Vishay, Samsung, Omron, Melexis, TDK-Micronas, Bosch Sensortec, Telit, Alliance Memory, Amphenol, ASJ, AVX, TDK, Knitter Switch, JRC, Recom, Tianma, Intel, Molex, ST, Yageo, Sensirion, Osram, Infineon, JAE, Nordic, Littelfuse

Selwyn Electronics ltd
Rank: 15
Unit B8, Chaucer Business Park, Kemsing, Sevenoaks, Kent, TN15 6QY, 01732 765100
Distributor type: Specialised
Sales Manager: Chris Read
selwyn.co.uk
Major Supplier Lines: Chogori, ODU, Leoco, E-Tec, Advanced Interconnections, Fujikura DDK

Solid State Supplies Ltd
Rank: 7
Ravensbank Business Park, Hedera Road, Redditch B98 9EY, 01527 830800
Distributor type: Independent
Chairman: Anthony Frere
Managing Director: John Macmichael
Director: Jon Baxter
sssltd.com
Major Supplier Lines: Microchip including Microsemi, Silicon Labs, Quectel, Digi International
Value-added Services: Kitting, FPGA Programming, Tape & Reel Bake & Seal, Opto Electronic Design Services, Light Assembly

Telegartner UK Ltd
Rank: 12
Unit 1-A1(M) Business Centre, 151 Dixons Hill Road, Welham Green, Hertfordshire, AL9 7JE, 01707 636 600
Distributor type: Limited Line
Chairman: Daniel Gartner
Managing Director: Robert Mulley
Director: David Norrington *(Operations Director)*
telegartner.co.uk
Major Supplier Lines: Telegartner Coax and Datavoice Components, Binder Circular Connectors, Provertha Circular and D-sub connectors and hoods, Hummel Circular Connectors and Cable Glands, Pei tel Handsets, Microphones and Loudspeakers, Procar 12-24V Connecting Systems
Value-added Services: Coax, Multiwire, Panel and Data Cable Assemblies, Wiring Looms/ Harnesses, Enclosure/Box-build Assemblies, Overmoulded Assemblies, Kitting

Transonics PLC
Rank: 10
Breakspear Park, Breakspear Way, Hemel Hempstead, Hertfordshire, HP2 4TZ, 0845 5678899
Distributor type: Specialised
Managing Director: Daniel French
Director: Helen French
transonics.com
Major Supplier Lines: Hongfa Relays, PCB'S, Power Supplies, "Actus" Active Semiconductors, CDIL Diotec Gorten Iskra, Zettler Apex Switches
Value-added Services: PCB, Cable Assemblies, Kitting,Consignment Stock, Auto Replenishing Buffers, Device Programming, Taping and Reeling, CAM 350 Engineering Support, Multi Currencies, 2 year fixed price agreement, Custom LCDS, Factory Customer Visits

The Top 15 report is comprised only of companies which have opted in

Shortages are over but buyers face other supply chain issues

Tariffs, the trade war with China and dealing with excess inventories of components are some of the issues electronics buyers are grappling with

Most buyers are rejoicing over the fact that shortages of multilayer ceramic capacitors (MLCCs), chip resistors and power transistors, which plagued the industry last year are over.

Many parts had lead times of 40 weeks or more and some were on allocation. Buyers had to search far and wide to find shortage parts on the open market and pay high, if not exorbitant, prices for them. "Last year was one of the biggest shortage years in history," said Paul Romano, chief operating officer for independent distributor Fusion Worldwide, based in Boston. "Now a lot of that is abated and supply conditions are not the same as they were last year."

For instance, standard-grade, small-size MLCC lead times are less than 30 weeks. Metal oxide semiconductor field emitting transistor (MOSFET) lead times are in the 22- to 26- week range after being 40+ weeks last year. Resistor lead times from several manufacturers have shrunk to about 20 weeks after being on allocation last year, according to electronics manufacturing services provider Vexos. Lead times for discretes are normal, about 12 to 16 weeks.

The good news for buyers is that lead times will stay the same or shrink because of oversupply in the supply chain, which as of September, had not been worked off. The bad news is though despite greatly improved supply conditions, there are still short-term spot shortages of some parts. In addition, buyers this year are dealing with other supply chain issues including tariffs, trade wars and excess inventories.

Spot shortages seen

While it appears to be a buyer's market for many parts, independent distributors say there are still spot shortages of some components. "We always see spot shortages and it drives a fair amount of activity," said Romano. Such shortages can occur if a company had an unexpected spike in demand for its products and did not order enough parts from component manufacturers or distributors or didn't have inventory on hand to meet demand.

"We still see some minor issues with MLCCs in larger case sizes." Larger case size MLCCs are very low-margin parts and "there was never a significant amount of investment in expansion" in them. Some suppliers are producing fewer of them in favor of higher margin capacitors in small sizes, which are in high demand. Lead times have also stretched for some relays and CMOS image sensors, said Romano. Those are generally used in surveillance cameras and other devices. "There's been a huge growth in that market because of smart phones," he said.

> **Last year was one of the biggest shortage years in history. Now a lot of that is abated and supply conditions are not the same as they were last year**

Paul Romano, chief operating officer for independent distributor **Fusion Worldwide**

Memory IC buyers may face some longer lead times for NAND. A fab jointly run by Toshiba Memory and Western Digital suffered a power outage in June, which reduced production of NAND flash wafers. Western Digital said the outage would likely reduce the company's life production by about half for the third quarter.

Some Intel microprocessors are also in short supply as Intel has tried to transition customers to its newer MPUs. However, demand has remained strong for its older Skylake processors resulting in shortages.

"The transition from Skylake to Cascade Lake Xeon processors has played a part in the current shortage, which, from our view, is not entirely uncommon when generational migrations occur," said Todd Burke, vice president of business development for independent distributor Smith, based in Houston.

"We're still seeing significant open-market demand for many processors." He said there has been high demand across the board for Intel CPUs used in desktops, mobile computers, and servers.

Tight supply will return

While shortages of components have eased many in the supply chain say it's only a matter time until tight supply returns. "There are a number of things that will have an impact on the electronics market, including artificial intelligence, the continued digitisation of transportation, and 5G," said Romano. Such trends will result in robust demand for electronic components.

Fifth generation cell phone technology will "necessitate the replacement of a lot of gear," which will result in higher demand for semiconductors, passives and other components.

Burke noted the rollout of 5G is starting across Europe, Asia and North America. As a result, "we expect to see an overall increase in demand for the active and passive components needed not only in handsets, but also in the cellular infrastructure equipment including core network equipment, base stations, and antenna arrays," he said.

He said that initially supply will be impacted by the buildout of 5G networks, then there will be an increase in demand for smart phone components as people upgrade their phones to take advantage of 5G capabilities.

"We're not seeing tight supply for specific 5G components yet." said Burke. "The industry is still scaling, and manufacturers at the OEM and CM levels still have a lot of inventory on their shelves," he said. However, there should be an increase in overall demand beginning in late 2019 and early 2020 for components used in 5G applications, according to Burke.

Automotive will also continue to have an impact on electronics supply. In fact, some buyers blame automotive for causing some of the shortages of MLCCs, chip resistors and MOSFETs last year and in 2017. More sophisticated electronics systems are being designed into more vehicle models, resulting in higher demand for many components. Vehicle sales have been flat to down in recent years but if they should increase by a few percentage points, it could likely result in tighter supply, and shortages.

Automotive demand grows

While the auto industry often buys directly from component manufacturers or their authorised distributors, independent distributors say they recently have seen an increase in demand from the automotive segment.

"We saw a lot more opportunity in automotive reaching out to us," said Carleton Dufoe, CEO and founder of independent distributor NewPower Worldwide, based in Nashua, NH." We did not know a lot of them in the past. But we had people from the auto industry coming to us," he said. "It's one of the higher performing segments for us. So, we're seeing more and more activity in that space."

Automotive customers "know what they want, they know what they need. It's no nonsense. They need authentic product and it needs to be automotive grade and traceable to the manufacturer," said Dufoe.

While buyers may have to plan for increased demand caused by 5G networks, new handsets and rising demand from automotive, they also have other concerns, including tariffs, and the trade war between the U.S. and China and its potential impact on supply. So far there has not been a big impact on the component business because of the trade kerfuffle, according to Burke.

"The semiconductor industry is coming off a record-breaking revenue year. The U.S.-China trade issue hasn't impacted the component business as much as market cycles have," he said.

However, the tariff dispute is causing a lot of ambiguity, uncertainty and cautiousness in the electronic components industry. "Lots of changes have occurred with parts being added to the tariff list and then some taken off," said Burke.

"We're also seeing some OEMs and CMs, to avoid the tariffs, move U.S.- bound projects out of China to manufacturing clusters in other countries, such as Taiwan, Vietnam, and Mexico," he said.

Dufoe said that tariffs are a challenge, but don't seem to be dampening business to any great degree except for very large global companies that may be moving "hundreds of millions of dollars of product globally."

Dealing with tariffs

Ron Bishop, president of connector industry research firm Bishop & Associates, said the tariffs are also causing some connector manufacturers and other electronics manufacturers to move manufacturing to other regions. "I think the tariffs are hitting China big-time. There are a lot of people pulling production out of China. Some of it is moving back here (to the U.S.) or to Singapore, Hong Kong" or other countries, he said.

> **We saw a lot more opportunity in automotive. We're seeing more and more activity in that space**

Carleton Dufoe, CEO and founder of independent distributor **New Power Worldwide**

The tariffs may impact future investment in China from companies in the U.S. and Europe, according to Bishop. "I don't think you'll see a huge investment in China from American or European companies that once existed," he said.

He also noted that China used to be the fastest growing region for connectors. However, in the first seven months of 2019, connector sales were down 8.3 per cent in China, while the North American market was up 2.8 percent. "China is the worst region of the world in connectors. It is something we have not seen in probably 15 to 20 years," he said.

While it is unknown how long the tariffs and trade dispute will continue, there are "ways around tariffs," said Burke. "We have warehouses strategically located in Amsterdam and Hong Kong from which that product can be shipped. Our global team of procurement specialists can also help qualify other manufacturers to stay in line with pricing objectives." In fact, some buyers are also qualifying component manufacturers in other regions for parts to avoid the tariffs.

Buyers have other concerns this year besides tariffs. Last year and in 2017, many buyers double and triple ordered parts because of the shortages to make sure their companies had enough components to keeping production lines humming. As it turned out, all those parts were not needed and some electronics companies have large stockpiles of components .

One example is MLCCs. "With MLCCs everyone was going crazy," said Dufoe. "A lot of people bought a lot more than they needed, but now customers have oversupply. Some are trying to burn through those inventories, while others are trying to resell the parts. Customers are asking us can we sell parts to someone? Can we scrap them? What's the solution?" said Dufoe.

Large companies with more than $1 billion sales often aren't overly concerned about the excess parts and will write them off or scrap them, said Dufoe. Smaller companies feel they need to consume the parts or sell them to recoup some revenue.

Recouping revenue from parts can be difficult in a buyer's market especially with low-cost components. "A lot of these parts cost below a penny a piece, said Dufoe. However, buyers may have purchased them on the open market for three, four, five cents or 10 cents.

"How much can you recoup if the component manufacturer is now selling that part by the millions for $.007 a piece? How much savings are you going to make?" he said. The company may be better off holding the parts and consuming them or scrapping it.

"We are seeing a lot of those discussions,' said Dufoe. "We're trying to help customers with MLCCs and see what's possible for them to get for the parts. However, if a company has $5 million of parts on their books, the components may be worth only $900,000 with today's pricing," he said.

Single-board solutions: a buyer's guide to wireless

Rapid IoT growth means many projects now involve wireless connectivity. Farnell's regional solutions marketing manager, Ankur Tomar, explores some of the one-step wireless options available

Wireless connectivity is a necessity for many embedded applications as it provides easy access for the internet of things. Depending on the application, there are a range of wireless connectivity options available:

Short-range: For use in the home or office, Bluetooth and WiFi offer low power and high bandwidth. In larger installations WiFi gateways and mesh networking can extend the operational range.

Mid-range: Wireless networks such as LoRaWAN and Sigfox make it possible to access devices at ranges of tens of kilometres at a very low cost. These networks are designed to transport small amounts of data and can provide service in remote locations.

Long-range: When more widespread coverage is required, and the application can support pay-per-use billing, 2G, 3G and 4G cellular networks are an option.

Adding complexity

In the past, the development of efficient RF interfaces to enable wireless connectivity was difficult and time-consuming. High-frequency signals need delicate handling to ensure a high signal-to-noise ratio while antenna design can greatly impact performance. In addition, wireless systems need to pass stringent tests that determine whether the system will interfere with other users, even in bands that do not need a specific radio licence, such as the 2.4GHz bands employed by Bluetooth and WiFi.

Traditional single-board computers (SBCs) did not have wireless connectivity, forcing the development of custom modules, but as ecosystems around Raspberry Pi, BeagleBone and Arduino developed, ready-made modules that could be used with core SBCs were developed.

Although add-on wireless modules reduced the time associated with hardware design, they did not cut out the time associated with other aspects of wireless integration such as software development or testing to ensure compliance with regional legislation covering RF emissions.

Off-the-shelf wireless

As wireless connectivity has become more popular, SBC manufacturers and integrated hardware-software developers have taken a variety of paths to provide wireless-enabled products. Choices include integrated solutions featuring microcontrollers that incorporate direct support for wireless protocols; and modular architectures that provide a choice of wireless connectivity options for use with a common base board.

Integrated modules bring several advantages not least of which is that the complete SBC, including wireless connectivity, has been tested for compliance with RF emissions legislation. Consequently, integrated solutions can result in lower overall development time, often with smaller form factors compared to multiple boards.

There are several high-integration solutions available including the Raspberry Pi 4 Model B Computer, which boasts excellent processor speed, multimedia performance, memory and connectivity. Alternatively, the BeagleBone Black replaces the Ethernet controller of its original SBC design with 2.4GHz WiFi interface and a Bluetooth 4.1 and BLE transceiver.

For simpler designs, the Particle Photon couples a Cortex-M3 microcontroller from STMicroelectronics with a Cypress WiFi controller. The Particle Electron takes the same core processor complex and applies it to a 3G cellular transceiver to build IoT nodes that do not need a local gateway to connect to the cloud.

Modular solutions provide another route to wireless connectivity. Choose from a variety of Arduino modules, known as Shields, to add an RF interface to a base board. The Shields in the MKR family add local or wide-area wireless network connectivity and can be mounted on a carrier board such as the Genuino Zero or the Due.

Thanks to a rich portfolio of platforms that range from prototyping kits to off-the-shelf SBCs, OEMs can easily take advantage of wireless connectivity in the age of IoT without having to deal with the complexities of RF design.

uk.farnell.com

High-integration solutions such as the Raspberry Pi 4 Model B Computer can increase time to market

Prices continue to erode for 32-bit microcontrollers

Falling prices will contribute to market decline for 32-bit MCUs this year, but the market will rebound in 2020 and continue to grow for years

James Carbone

Semiconductor buyers can expect continued price erosion for 32-bit microcontrollers but declines over the next two years will be less than in the past.

Weaker demand, higher inventory levels and falling prices mean the 32-bit MCU market will decline this year but bounce back in 2020 as inventories are worked off and demand increases, especially from the automotive and industrial segments, according to industry analysts.

The worldwide 32-bit MCU market will fall from $9.8 billion in 2018 to $9 billion in 2019 because of weaker demand and high inventory levels, according to researcher Databeans, based in Reno, Nev. The 32-bit MCU market had grown in recent years because of robust demand from industrial and automotive applications and because more OEMs are opting to use 32-bit MCUs rather than 16-bit devices because prices have declined sharply for 32-bit microcontrollers.

The good news for MCU manufacturers is that the 32-bit MCU market will rebound in 2020 to $10.2 billion and continuing positive growth through 2024 when the market will reach $14.5 billion and will have a compound annual growth rate of 10 per cent, the researcher said.

"In 2017 we saw some really good growth in units," said Jim Feldhan, president of Semico Research, based in Phoenix, Ariz. Unit shipments increased 39 per cent to 12 billion units that year. Unit shipments slowed in 2018, but still grew 12 per cent to 14.1 billion. However, in 2019, 32-bit unit shipments will fall 10 per cent to 12.6 billion, he said.

"We saw some inventory build last year," and sales of 32-bit MCUs in the first quarter of 2019 were terrible," he said. However, "the inventory burn is just about over and the market will return to growth," said Feldhan. In 2020, 32-bit MCU shipments will reach 14.3 billion and continue to grow for several more years.

"We will have a good recovery year in 2021 and have almost a 25 per cent growth in unit shipments to 17 billion," he said. Positive growth will continue in 2022 when shipments will total 19.7 billion and then grow to 21.3 billion in 2023, according to Feldhan.

Demand grows from automotive

One reason for strong unit demand growth in the 32-bit MCU market is automotive. Automotive uses 8- and 16-bit MCUs, but 32-bit MCUs represent the largest portion of the auto MCU market. For instance, in the first six months of 2019, about $2.1 billion of 32-bit MCUs were shipped to the automotive industry , compared to $750 million of 8- and 16-bit MCUs, said Feldhan.

In fact, automotive accounts for 39 per cent of all microcontroller sales across all industries, according to researcher IC Insights. Thirty-two bit MCUs are used in a wide range of equipment.

"They are everywhere in computer peripherals, industrial applications, real-time operating systems, factory equipment, small office PBX systems. The list goes on," said Feldhan.

Many applications that have used 8-bit and 16-bit MCUs have transitioned to 32-bit devices because of price erosion for 32-bit microcontrollers. Thirty-two-bit MCUs now account for 59 per cent of the overall microcontroller market, while 16-bit represents 23 per cent and 4/8-bit MCUs account for 17 per cent, according to IC Insights.

Prices for 32-bit devices have been declining for years. On average, 32-bit MCUs were selling for about twice the amount of the average price for all microcontrollers in 2012, $1.76 for 32-bit versus $0.88 for total MCUs, according to IC Insights. In 2018, the average price for 32-bit MCUs was just $0.09 higher than the ASP for all MCUs, and by 2022, the difference is forecast to shrink to $0.05 as the price

By the Numbers

59%
The percentage of microcontrollers sold in 2018 that were 32-bit devices. Source: IC Insights

$9.8 billion
the size of the worldwide 32-bit microcontroller market in 2018. Source: Databeans

10%
The amount of unit shipments of 32-bit microcontrollers will decline in 2019. Source: Semico Research

13%
The compound annual growth rate of 32-bit microcontrollers sold to the automotive industry through 2024. Source: Databeans

$14.5 billion
The forecasted size of the worldwide 32-bit microcontroller market in 2024. Source: Databeans

will be $0.60 for 32-bit versus an average of $0.55 for total MCUs. In some cases, new 32-bit MCUs are being priced below the cost of 8-bit microcontrollers, the researcher said.

Because of the sharp price declines suppliers are aggressively promoting more powerful designs that are cost competitive with 8-bit and 16-bit devices, which have typically been used in consumer products and other high-volume systems, according to IC Insights.

"We have seen pretty substantial price degradation with 32-bit devices and we will continue to see that this year," said Feldhan. That trend will like continue for years although the price declines won't be as dramatic, he said. Still, lower prices will mean more equipment will transition to 32-bit MCUs, which provide "twice the compute power of 16- bit," said Feldhan. "That's important for anything connected to the Internet," because 32-bit offers security that 16-bit MCUs can't provide.

Price declines have also made 32-bit MCUs more attractive to the automotive industry, which need them for advanced driver assistance systems (ADAS), engine and transmission control, chassis and safety and entertainment and infotainment systems in vehicles .

Automotive MCUs are dominated by 32-bit designs and represent nearly three quarters of the market segment's revenue, according to IC Insights. Infotainment including entertainment and information systems, such as those retrieving digital maps, identifying locations, and other data from the Internet and satellite transmissions, is expected to account for 8 per cent, or about $530 million, of automotive MCU sales this year, the researcher said. Microcontrollers used throughout the rest of vehicles will generate 92 per cent, or $5.89 billion, of the revenue this year.

32-bit MCUs are required

"There are many more 32-bit MCUs being used in vehicles than there were five years ago," said Susie Inouye, research director and founder of Databeans. She said they are needed because vehicles are designed with more "sophisticated communication" systems that require 32-bit chips.

Bill Stewart, director of safety/ADAS at Infineon Technologies Americas Corp., said Infineon's 32-bit MCUs are used in automotive and overall transportation applications. "We do not see just one or two applications leading the adoption of 32-bit MCUs in automotive," he said. Stewart said Infineon's AURIX family of MCUs are used in mass market automotive, off-highway applications such as construction and agricultural vehicles, buses and trains, avionics systems and drones.

"The MCUs also cover a wide array of applications in the vehicle," he said. He added as customer applications become more complex and OEMs adopt security and functional safety, most vehicles will fully transition to 32-bit.

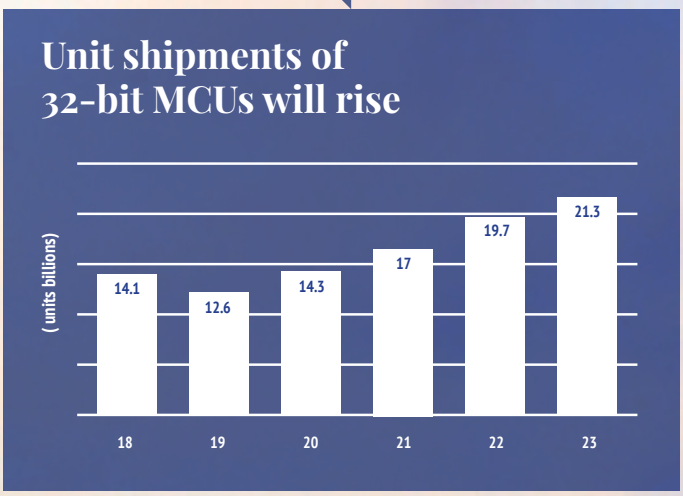
Use of 32-bit MCUs by automakers and their suppliers will grow for years. The 32-bit automotive MCU market will grow from about $2.7 billion in 2019 to nearly $5.2 billion in 2023, Inouye said. Thirty-two-bit automotive MCUs will have a compound annual growth rate of 13 per cent, the highest rate of growth of any segment. In fact, automotive is the second largest market for 32-bit MCUs.

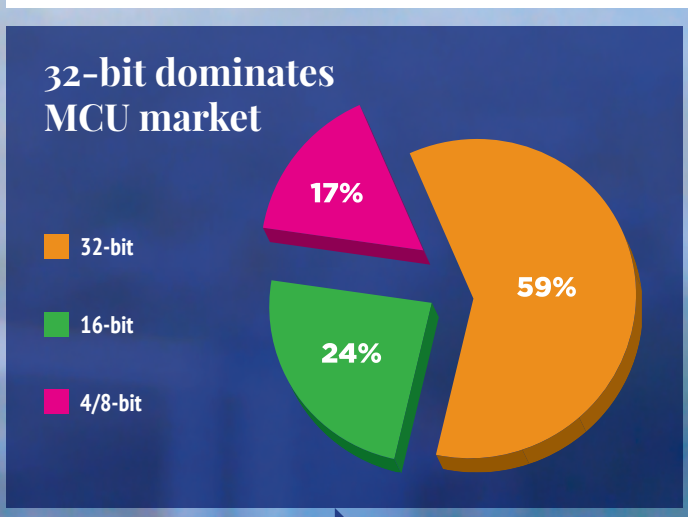
The industrial market is the biggest with sales of about $5.1 billion in 2019, which will grow to $8 billion and 2023 a compound annual growth rate of 9 per cent, said Inouye.

Stewart said there will be strong growth in the 32-bit MCU segment because of automotive and industrial applications. "We see the adoption of 32-bit in automotive and industrial applications for multiple reasons: performance, software size and support for over-the-air updates, ethernet/connectivity, security and functional safety," he said. IoT and cloud services application such as AWS and AliOS are also using 32-bit devices, he said.

There could be some consolidation in the MCU market as MCU demand grows because of the need by some companies for IP. Stewart noted there are key features which enable the success of a 32-bit product family. "For example, having the right IP to support security, functional safety and robust designs for high temperature operation and embedded flash endurance are critical. Companies either have this IP in-house or will need to decide how they can obtain it," he said.

Shipments of 32-bit microcontrollers will increase from 12.6 billion in 2019 to 21.3 billion in 2023.
Source: Semico Research





Prices have declined for 32-bit microcontrollers and they are now the largest part of the global microcontroller market.
Source: IC Insights

Smart ideas for EV charging

Standardizing the charging connection for plug-in hybrid and battery electric vehicles will increase adoption, but as Digi-Key Electronics' Rich Miron explains, EV charging still presents some challenges

Extensive use of electric vehicles could significantly reduce emissions without sacrificing the freedom of personal transport. Standardizing the physical charging connections will help consumer adoption and there are currently three charging specifications in the international standard IEC 62196-2. These include the Type 1 SAE J1772 plug, widely used in North America, and the IEC Type 2 plug, primarily used in Europe.

Make charging simple

The J1772 specification and IEC 61851-1, the global standard for EV charging electrical interfaces, specifies basic electrical signaling across a pilot connection between the charging point and the vehicle's on-board charger electronics. These interactions confirm connection and negotiate power delivery based on criteria such as available ventilation to guard against potential hazards like overheating.

To simplify the design process, TI has produced a reference design for J1772 compliant electric vehicle service equipment. It uses features in the MSP430F6736 microcontroller to facilitate control and monitoring of the pilot signal line. These include a timer module for generating a PWM signal and a successive approximation register analog-to-digital converter to read the response of the vehicle on the pilot wire.

To drive the pilot signal across several meters of cable and through the load resistance applied by the vehicle when connected, the reference design uses an OPA171 operational amplifier. The MSP430 microcontroller monitors the output of the OPA171 to detect the load resistance applied by the vehicle.

All the electrical functions of a J1772 charging interface are covered by the reference design, including: power management to generate ±12V DC and 3.3V logic supplies from the main AC line, and a TPL7407L low-side driver that manages a two-stage output relay. The design also leverages the MSP430F6736 to provide protection against potentially dangerous ground faults and to integrate power metering.

Plugging EVs into the smart grid

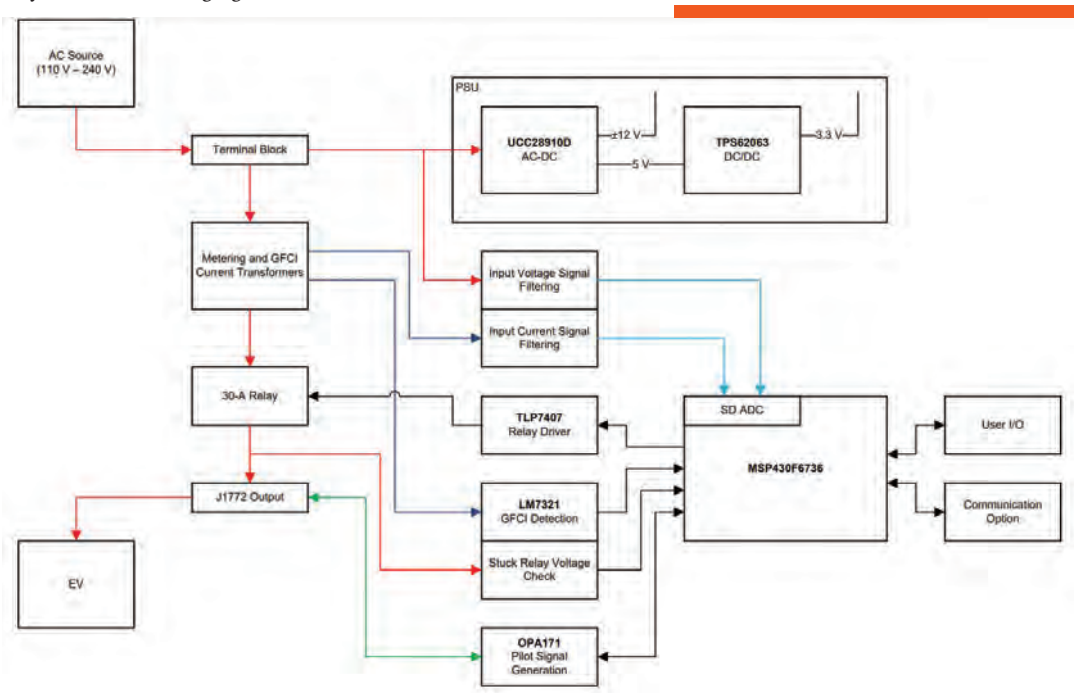
Standardizing the charging interface will go a long way towards encouraging greater use of electric vehicles, however, as the number of such vehicles increases, so too will the load on the power grid. On the other hand, if charging is managed intelligently, EVs could support active demand response programs that work to prevent excessive peak loads and could also be used as storage for surplus renewable energy. Negotiations between the vehicle and charging point utilize communication with grid management systems to determine energy capacity and tariffing.

After charging commences, communication allows the vehicle and its charge point to exchange information such as control and configuration data, access privileges, time-stamp, tariff information, customer ID and location, and meter readings.

One approach for communication between the vehicle and grid management systems uses the IEC 61850 protocol. The Fraunhofer Institute has developed a reference system using ISO/IEC 15118 and IEC 61850 standards, as well as HPGP and IPv6, for V2G communication via a smart charging station. With these measures in place, intelligent EV charging is increasingly within reach.

www.digikey.com

TI's reference design implements all the functions needed for a J1772 compliant EV charger



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Ready for the next EV milestone?

With electric vehicles now able to travel further on a single charge, the next challenge is to make EV production cheaper and easier. Component selection has a vital role to play

Next to price, the biggest problem holding electric vehicles back has always been range. With Tesla's flagship Model S sedan hitting 337 miles on a charge, that's no longer a problem. Other manufacturers are also claiming attractive numbers with GM's Chevy Bolt offering a range of 258 miles and Nissan's Leaf claiming 168 miles.

Now the race is on to mass produce in order to lower prices. Typically, most of an EV's powertrain and drivetrain are separate issues. Electric motors, transmissions, power electronics and batteries are packaged much like a fossil-fuelled car's combustion engine. The challenge for OEMs is how to integrate components to make design and production easier and more efficient and thus, more profitable. By incorporating components such as inverters and motor controllers into fewer modules, OEMs can save costs, weight, and space.

Easier assembly

Consider how easy assembly would be if the transmission, motor and power electronics were a single unit. Packaging individual electric driveline elements is complex and time consuming, whereas an integrated system has just one unit to be installed. Assembly is essentially connecting the unit to the battery and cooling circuit, which will speed up the production process immeasurably.

The main electric powertrain components consist of the battery, motor, power electronics and thermal management. Research by McKinsey notes that this increased integration in the design of electric cables connecting these components. It highlights a marked reduction in both cable weight and the number of parts in newer EVs when compared to earlier models.

Enhanced functionality

EV drivers are extremely tech-savvy, McKinsey's research also points out. To accommodate those customers and enhance their driving experience, EV manufacturers are expected to equip cars with high-tech thrills such as advanced driver assistance, connectivity and the latest advances in navigation. Touch screens are replacing buttons, too with many OEMs improving the user interface and infotainment by integrating the control of interior functions into a more central user interface, similar to a smartphone.

These advances are thanks to the incredible rise in computing power. While typical cars tend to contain decentralised and standardized engine control units, the latest EVs appear to rely on increasingly centralized computing power.

The ECU architecture can also affect weight and cost. For example, centralising may maximise wiring and sourcing efficiency through increased bundling. They require simpler protocols and fewer connections compared to multiple, decentralized ECUs. That, in turn, reduces the number of operations that could go wrong, all of which means centralised ECUs might translate to greater reliability.

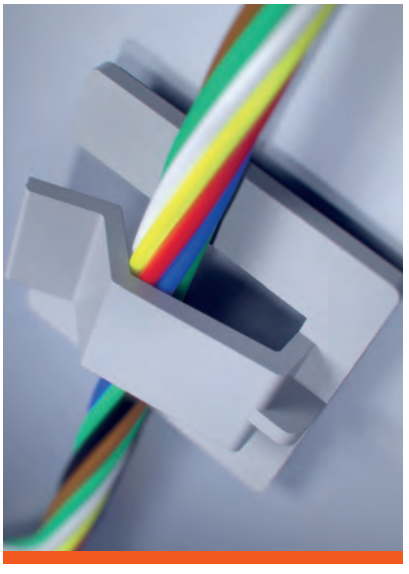
Purchasing power

For the integration of transmission technology to happen, however, traditionally separate teams will have to work together. Motor, power electronics, software and transmission components were previously designed in isolation and then connected with plugs, cables and harnesses.

Integrating systems will involve integrating teams. While the core technologies will remain the same, components will have to be redesigned. With a range of over 30,000 products for the manufacture of powertrains, fuel systems, HVAC, steering, interiors, body/chassis, brakes and electrical equipment, Essentra Components can help – from shipping plugs and fasteners, to tapes and twist ties.

With an eye very much on the electric vehicle market, Essentra also has a package of EV charging components to simplify production of charging infrastructure, such as charging stations, which demand particular public facing safety considerations.

www.essentracomponents.co.uk



Cabling is increasingly integrated in the latest EVs

Integrating systems will involve integrating teams. While the core technologies will remain the same, components will have to be redesigned

Need help with EV?

Electric vehicle charging is an exciting new sector, but it can be confusing for those involved in purchasing. Replenishh is a new initiative set to help buyers expand their expertise and tailor their BOM

If you're on the purchasing team working on an innovative EV charging project, would you know which accessories and back office products are required to meet appropriate safety standards?

That's exactly the kind of question that can be answered by Replenishh, a smart EV charging solution developed by electronic component distributor, Rapid Electronics. Established to make EV installations a more straightforward process for procurement teams as well as homeowners and electrical contractors, Replenishh builds on Rapid's EV expertise acquired over the last few years as a supplier of EV charging stations.
EV technical and specifications manager at Rapid, Jim Rugg, gives an idea of what to expect: "We felt it wasn't enough to just stock the products — EV can be a confusing new market, and there needed to be more guidance and information available, particularly for procurement teams working on installation projects. This is new technology and a 'one size fits all' approach does not work."

Sourcing smart ideas

Replenishh is described as a smart solution, but as Jim explained, this applies to more than just the end-products. He continued: "By 'smart' we don't just mean charging stations able to receive and process data, which in July became mandatory as part of the OLEV Homecharge scheme. It also represents everything about the Replenishh service.

"For example, our online configuration tool effectively maps out an EV installation, identifying how many, what type and power of charging station is best, as well as any associated back office system requirements.

"A comprehensive range of products are available from switchgear to cabling, trunking to distribution boards, and we can also co-ordinate OLEV-approved training courses and commission site surveys for prospective customers. Customers have access to special pricing, 60-day credit terms and comprehensive technical and sales support."

www.replenishh.com

Wherever you are on your EV journey, Replenishh provides a bespoke, connected solution

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	5,000	N/A	£0	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35,000	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
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	91%	50	1,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ECS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	99%	50	1,500+	Y
Epson	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	59%	50	1,500+	Y
Geyer Quartz Technology	Geyer Electronic UK Ltd	01794 329341	www.geyer-electronic.com	N	N/A	N/A	£0	100%	6	50+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	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											
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	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

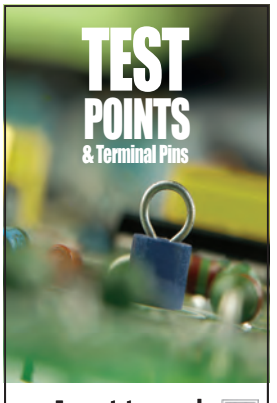
Services Sourcing

CEM

DEVICE PROGRAMMING

TAPE REELING

TEST POINTS & TERMINAL PINS



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
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
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
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 Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
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
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	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
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
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	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
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	99%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
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
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
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
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
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
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y
OBSOLESCENCE / HARD TO FIND											
	America II Europe	01462 707070	www.americaiieurope.com	N/A	1,900	$1B	£0	75%	59	500+	Y
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y
Rochester Electronics	Rochester Electronics	+44.1480.408400	www.rocelec.com	Y	299	N/A	$250		10	400+	Y
	SeSemi Electronics LTD	01264 731009	www.sesemi.co.uk	Y	2800	N/A	£100		3	12	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
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											
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	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
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
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
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
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
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
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
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
Jauch Quartz		01276 605900	www.jauch.com			£500,000	0	95	15	130	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y
Sensirion	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	N/A	50	1,500+	Y
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	70.00%	50	1,500+	Y
Apem	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	84%	50	1,500+	Y
Carling Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	87%	50	1,500+	Y

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
CHERRY	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	77%	50	1,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
E-Switch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	94%	50	1,500+	Y
Grayhill	EAO Ltd	01444 236000	www.eao.co.uk	Y	2,300	£150,000	£150	99%	6	22	Y
Grayhill	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98%	50	1,500+	Y
NKK Switches	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	94%	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	68%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	98%	50	1,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
ADDA	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	59.00%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	99%	50	1,500+	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	,300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk		2,900	N/A	£0	N/A		1,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	86.00%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
AWS Electronics Group	01782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	430	11	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	Y	Y	Y	Y	Y	Y
Axiom Manuf. Services	01495 242130	www.axiom-ms.com	£40m	SW	300	3	ISO9001, AS9100, ISO13485, ISO14001, SC21, IPC610E, BSI Kitemark, NADCAP, ISO27001	Y	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£8m	Essex/SE	95	7	AS9100 Rev D, ISO9001:2015, ISO 140001:2015, UL , CCC, IPC-610-G Class 3	Y	Y	Y	Y	Y	Y
CML Innovative Technologies (uk) Ltd	01284 714700	WWW.CML-IT.com	£12M	UK/EU/China	65		ISO9001 TS16949 UL	N	Y	Y	Y	Y	Y

Contract 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
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
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, ISO 13485, UL	Y	Y	Y	Y	Y	Y
Electrica Limited	0161 343 7575	www.electricalimited.com	£1.75m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Elite Electronic Systems Ltd	028 6632 7172	www.elitees.com	£20m	UK	230	5	ISO9001, ISO13485, UL, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721, BS EN 61340-5-1 (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 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Industrial Electonic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£8m	UK	80	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
JJS Manufacturing Ltd	01455 555500	www.jjsmanufacturing.com	£35m	Bedford, Lutterworth, (CZ)	420	3	ISO9001:2015, ISO14001:2015, IPC 610 A class 2&3	Y	Y	Y	Y	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£13.4m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
NOTE including Speedboard	01453 797580 01753 746700	www.note.eu www.speedboard.co.uk	£115m	UK/EU/China	1,050	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001-2008/IPC-A-610 Class 3/WHMA-620/ISO14001-2004/ IPC-7711/7721	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, IPC-A610 Class 3	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	£6m	SE	60	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
Tenkay Electronics Ltd	01903 855455	www.tenkay.co.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£15m	Derby	110	6	ISO 9001:2015, ISO 13485:2016, IPC 610, IPC 7711/7721	Y	Y	Y	Y	Y	Y
Trojan Electronics Limited	01792 469020	www.trojanelectronics.co.uk	£2m	South Wales	20	2	BS EN ISO 9001 2008, ISO 14001 2007	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	4	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (i.e Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-20-30	Metal PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO 9001:2008	SML	Y	4-10	Y	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2015, UL	SML	Y	4-16	Y	Y	Y	Y	Y
Daleba Electronics Ltd	+44(0)1992 510000	www.daleba.co.uk	B/M	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	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
Fineline VAR Ltd	+44 (0)1249 815 815	www.fineline-global.com	B	UK / Global	ISO9001:2015 / UL/ TS16949 / Nadcap/ AS9100/ISO14001	SML	Y	4-60	Y	Y	y	y	y
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	IS 9001:2015, IATF 16949:2016, EN (AS) 9100	SML	Y	4-16	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2015, UL	SML	Y	4-30	Y	F/R	Y	Y	Y
Photronix Group	01903 231901	www.photronix.co.uk	B	SE	ISO9001:2015, ISO14001:2004, AS9100-B, NADCAP, TS16949:2002	SML	Y	4-58	Y	F, F/R	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2008, ISO 14001, EN9100:2009, UL, JOSCAR	SML	Y	4-44+	Y	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01889 583627	www.tatecircuits.com	B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	Y	Y	Y	Y

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