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All the facts and figures to help you buy



Editor's Word



Around the world in 80 sweets

If you are planning to attend the Electronica exhibition this year, I have some excellent news for you. Not only is *Electronics Sourcing's* energy boosting Pick and Mix sweet stall back, we have chosen an international selection of treats designed to appeal to sweet toothed visitors from North America, mainland Europe and the United Kingdom.

Offering a quick 'pick me up' on your long walk, the selection is designed to provide a comforting reminder of home, regardless of how far you have travelled. So why not swing by stand C5-400 and refuel while chatting with our editorial team about the trials and tribulations of sourcing electronic components. Don't forget to eat your sweets responsibly.

If that isn't enough, step across to the *ebom.com* area of the stand where the content team will be on hand to guide you through the benefits of this new purchasing focused website. The most newsworthy feature being demonstrated at Electronica is a world-first function which allows buyers to read about new components, check stock from a range of authorized distributors, and then buy.

In addition to these two highlights, the editorial and content teams from *Electronics Sourcing* and *ebom.com* will be video interviewing a cross-section of distribution specialists for their opinions on the future of electronics purchasing. All the interviews will be available to watch on *ebom.com*.

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Industry embraces strong outlook, laments tight labor market



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

Demand for labor heats up as 2018 comes to a close and the economy continues its solid pace

Global Economy • By Victoria Kickham

Electronics industry companies will continue to reap the rewards of a strong US economy in 2019, but they will face accompanying challenges as well—most notably a tight labor market that is helping to ramp up supply chain pressures. As US unemployment hit a near-50-year low of 3.7 percent this fall, employers across all industries were feeling the crunch.

“The US economy is growing rapidly now, and we expect this trend to continue in the coming quarters, meaning that the demand for workers should not slow down,” Gad Levanon, chief economist, North America, for The Conference Board, said in a statement commenting on US unemployment data released earlier this fall. “We expect employers to more rapidly do what they have been doing in recent quarters: automate, increase working hours and pull people back to the labor force, especially young men, whose labor force participation rate [has] barely recovered yet. At the same time, the labor market will continue to get tighter, with the unemployment rate reaching 3.5 percent or even lower in 2019, accompanied by rising inflation pressures.”

Homing in on the manufacturing supply channel offers a clearer picture of what the electronics industry is up against. Earlier this fall, the National

Association of Manufacturers released its *Manufacturers Outlook Survey* for the third quarter of 2018, and employment-related concerns took center stage there as well. Despite exceedingly high levels of economic optimism in the manufacturing community (92.5 percent), most companies said the lack of skilled workers will challenge their ability to grow in the months ahead. The inability to attract a quality workforce has forced more than one in four manufacturers surveyed to turn down new business opportunities, the survey showed, while one-third said they held off on plans to hire more workers due to workforce constraints. Nearly half of manufacturers surveyed by NAM cited the workforce crisis as the number-one threat facing their business.

All of this comes in the face of a strong electronic components market, driven by strength in everything from consumer electronics to automotive and industrial sectors. Recent reports on semiconductor growth underscore the trend: Worldwide sales of semiconductors reached more than \$40 billion in August, up nearly 15 percent year-over-year, according to data released this fall from the Semiconductor Industry Association. Also this fall, industry researcher IC Insights reported that seven product categories will exceed the 16 percent growth rate expected from the total integrated circuit (IC) market this year, led by dynamic random-access memory (DRAM) at 39

percent growth. The automotive special-purpose logic market comes in second, with an expected 29 percent growth rate, followed by wireless communication application-specific analog, which is forecast to grow 23 percent this year.

“The US economy is very strong now,” Levanon said in a separate statement on employment trends. “Demand for workers is likely to continue growing rapidly but with the unemployment rate now at 3.7 percent, recruiters have their work cut out for them. They will have to bring more people off the sidelines faster. In the meantime, businesses will have to squeeze more out of their current workers, either by increasing working hours or raising labor productivity.”

The growing season

Chairman of the Electronic Components Supply Network, Adam Fletcher, reports continued revenue growth this summer, reflecting overall positivity in the global electronic components industry

Chairman of the ECSN, Adam Fletcher, was buoyant about the findings, despite acknowledging an unusual eight point fall in the book-to-bill ratio. He explained: "The decline in the B2B to 0.96.1 in August is unwelcome, however I believe that we're simply returning closer to historical reporting levels. The polynomial trend line suggests the B2B ratio is likely to remain positive into the fourth quarter of 2018."

In fact, overall bookings increased by 12 per cent compared to the same month in 2017, while total monthly billings increased by four per cent compared to the previous month and by 12

per cent when compared to the same month last year.

Slowing UK growth

Looking at the UK in the wider global context, Fletcher believes that manufacturing output is flatlining in the UK due to weaker domestic and export demand. Increasing vendor delivery times and availability of raw materials continue to be a global problem, however, as does rising input prices.

Adam commented: "Brexit is causing a lot of uncertainty in the UK, while the risk of an escalation of the trade war between the US and China is doing absolutely nothing positive for international

markets. The sales by month 'three month moving average' for all electronic components suggests continued but slowing UK growth into Q4 2018, which is broadly in-line with historical results and forecasts."

Despite the slower rate of growth, Fletcher remains positive overall, concluding: "There has certainly been a slight decline in customer sentiment from earlier in the year but overall the outlook for our domestic electronic components industry remains strong."

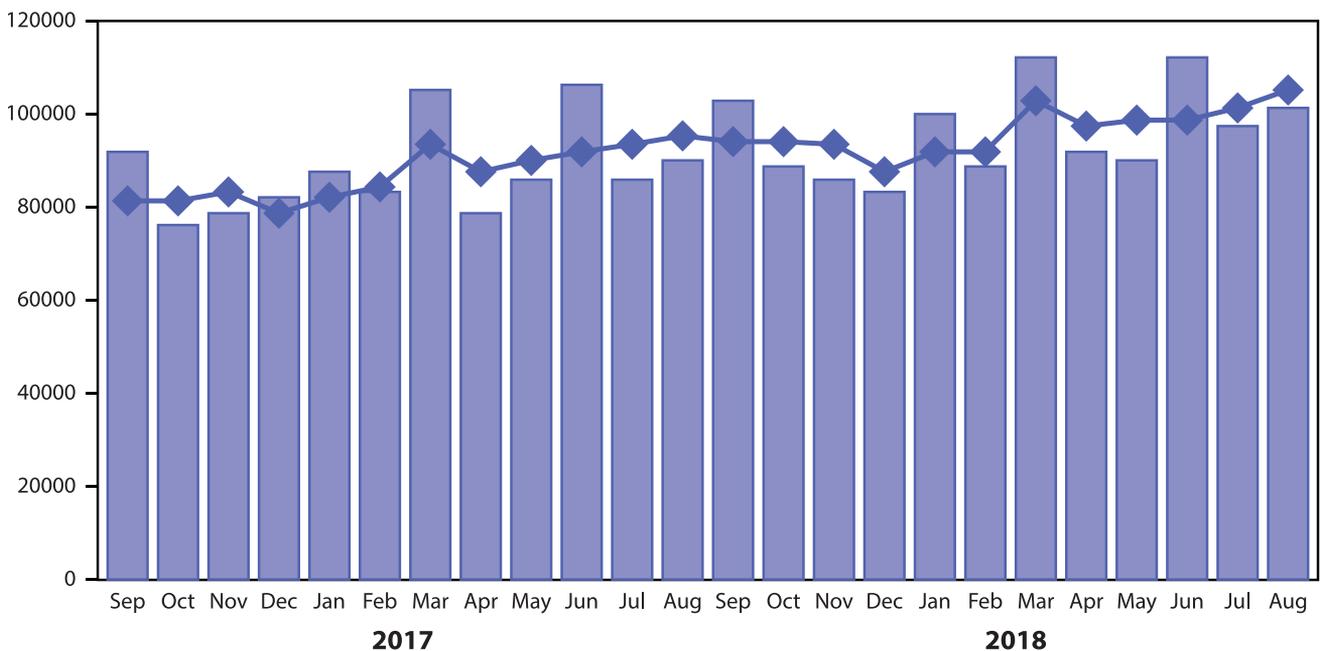
www.ecsn-uk.org



Chairman of the Electronic Components Supply Network, Adam Fletcher

The polynomial trend line suggests the B2B ratio is likely to remain positive

All Industrial Components (ie net of Semis to PC mkt)



Source: ecsn Ltd

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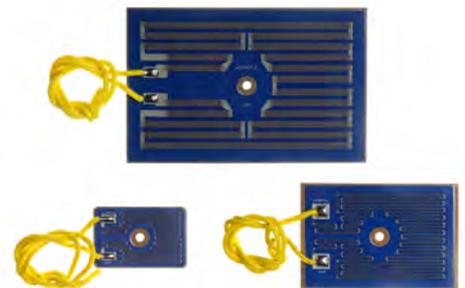
Introducing new semi technologies

Mouser Electronics reveals some of the latest semiconductor solutions it has added to its authorised portfolio of over 44,000 Texas Instruments products.

New releases include the TAS5760M/TAS5760M-Q1 stereo I²S input Class-D amplifier, suitable for use in a multitude of audio and video applications and the MSP430FR215x and MSP430FR235x embedded microcontrollers featuring a 16-bit RISC CPU, 16-bit registers and a constant generator for maximum code efficiency.

Finally, Mouser introduces the BQ27Z561 Impedance Track gas gauge, an integrated 1-series cell gas gauge featuring a flash-programmable custom RISC and SHA-256 authentication for lithium-ion and lithium-polymer battery packs.

www.mouser.com



Faster route to safety certification

TT Electronics has introduced a new series of ultra-low profile high power resistors featuring creepage, clearances and power ratings that have been assessed in accordance with UL508. This can ease the compliance burden for UL approved end users.

The new WDBR-UL series resistors are ideal for those who need to design UL approved systems containing power resistors in compact enclosed assemblies with heatsink-based thermal management. The series is said to provide a far lower volume solution than competing encased wirewound products and a faster route to safety certification.

With its ultra-low profile thick-film on steel format, the WDBR-UL series is suitable for a range of industrial applications. Nine values are available, from 12R to 150R, in five size options, with a 'stand height' thickness of less than two millimetres.

www.ttelectronics.com



More cable gland choice

Optimas Components Division is now offering a wider choice of standard and specialised cable glands. Designed to support multiple cable entry requirements in industrial and other challenging environments, the extended range encompasses different styles of seal, materials and cable retention options. Optimas Components Division can also customise glands for any application not already covered by the standard ranges.

Stock includes several well-known brands and plenty of options, including nylon and nickel plated brass products, as well as flex protect and 90-degree cable glands for flexible routing. Most designs offer specialisations, with Optimas Components Division able to supply high temperature, chemically resistant and higher strain relief variants on request.

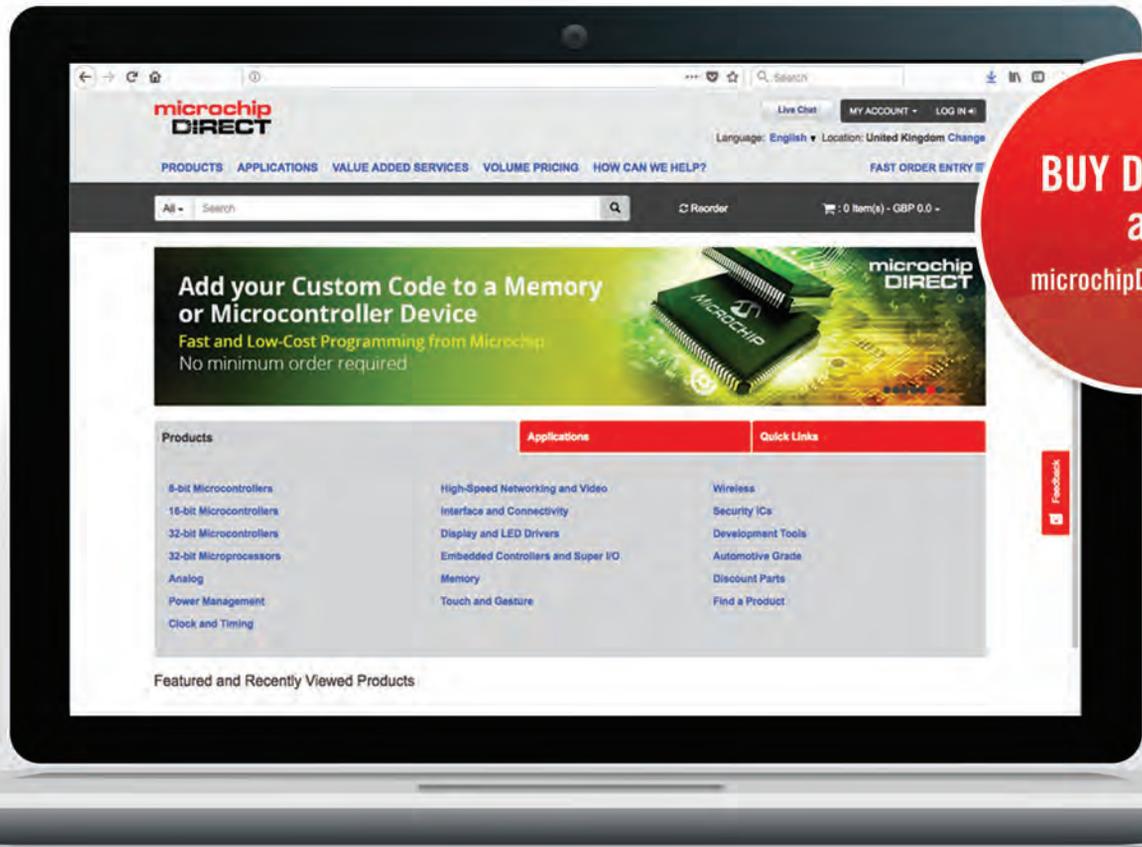
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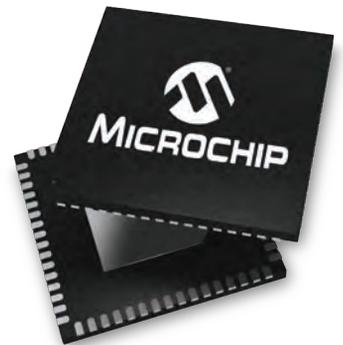


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In Brief

Enclosure experts team up

CamdenBoss has joined forces with plastic enclosure manufacturer, Smartboxx, following its acquisition of the i4innovation group. The merger combines two design teams for enhanced expertise on custom and bespoke enclosures, as well as supporting rapid timescales and increased stock holding. Accordingly, CamdenBoss has revealed a re-brand ahead of Electronica 2018. www.camdenboss.com

40 years of expertise

Relec has been supplying power conversion and display units for 40 years. From its beginnings providing aerospace components, Relec has widened its product scope and now supplies many industries in many countries, while maintaining its technical knowledge. A recent re-brand reflects these changes and makes it easier for customers to find what they need. www.relec.co.uk

Buck regulators added

Rutronik UK has added to its portfolio with new input buck regulators from Vishay. The SiC46X family features integrated high side and low side power mosfets to supply high continuous current at 2MHz switching frequency. Ideal for a variety of applications, the regulators deliver ultrafast transient response with minimum output capacitance and tight ripple regulation at very light load. www.rutronik.com

EMC test investment

TDK is building a £1M EMC test facility adjacent to its power supply manufacturing plant in Ilfracombe, North Devon. Due to open in spring 2019, the building will house an anechoic chamber for onsite EMC compliance testing in accordance with EN, CISPR and ANSI standards. TDK expects to save over £180k per year thanks to this investment. www.uk.tdk-lambda.com

Buying into reduced downtime

Inelco Hunter has announced availability of two integrated transient voltage suppressor diodes from ProTek Devices, designed to protect DC power and Ethernet lines against surge events such as switching and lightning. Both devices are compliant with IEC 61000-4-2 ESD, IEC 61000-4-4 EFT, and IEC 61000-4-5 surge standards.

The GPZ1275 is a high-power transient voltage suppressor designed to protect against long-duration switching transient threats, using a single MIL-STD-1275 device to protect DC power lines. Applications include military vehicles, heavy-duty motors and generators.

The SMP6LLC05-2P diode is designed to protect Ethernet interfaces against surge events. Ethernet uses 5V digital signals operating on a 125MHz clock, and two SMP6LLC05-2P devices can be used to protect both pairs of Ethernet lines. This provides protection in indoor, short-cable applications where ESD is the primary threat.

Managing director of Inelco Hunter, David Bushnell, commented: "Power surges can cause catastrophic failures. ProTek's surge protection devices help reduce costly downtime and protect electronic equipment against the damaging effects of transients."

www.inelcohunter.co.uk



Fast turn service targets mil-spec fibre optics

Specialist interconnection distributor, Lane Electronics, has announced a quick turnaround service for standard and custom 38999-based fibre optic cable assemblies. Designed around the Souriau Elio fibre optic system, Lane offers patch cords and jump leads as well as custom fibre optic assemblies on short lead times. Applications can include aerospace and military systems, as well as those where high data rates up to several Gbit/s are important, while at the same time providing high resistance to difficult environments.

Lane's fibre optic assembly service offers simplex or duplex cables terminated with Elio to Elio, Elio to LC or SC contacts, or any combination. These are then mated with 8D series MIL-DTL-38999 style connectors, back shells and heat shrink boots. Connectors can be supplied with one to 24 contacts in aluminium, composite, stainless steel and bronze shells. Plating finishes include RoHS compliant zinc nickel and zinc cobalt. www.fclane.com



Lighting up the LED market

Foremost Electronics has introduced the latest LED surface mount indicators from IDEC. The LH1D series of LED Spider Lights feature a slim design, said to be ideal for mounting on the surface of equipment or panels, with excellent visibility from the front and side.

According to Foremost, the surface-mount design does not affect the location of other panel components and requires only a small space behind the mounting surface. This means LH1D Spider Lights can be used in many applications that do not have space behind the panel to mount conventional indicators. Typical applications include robotic arms, product picking machines, door monitoring and other applications that require dual-colour pre-wired LED Spider Lights, rather than having to mount individual status indicators.

Key features include LED indicators in seven colours and dual-colour as standard in flat or dome designs, with three-colour illumination available in the jumbo dome model. All Spider Light LED indicators are NEMA Type 4X and IP67 rated for protection against water or oils. www.4most.co.uk



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Safe approach to EV sourcing

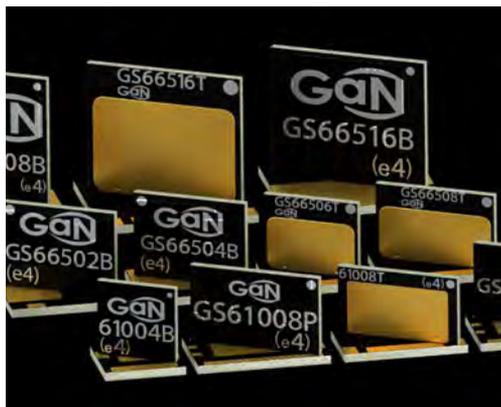
RS Components has introduced a portfolio of high-power connectors from Amphenol specifically designed for electric vehicle drive systems.

Designed as a safe and reliable solution for servicing electric vehicles, the MSD series of receptacles and plugs offers a tool-free solution for disconnecting an internal high-voltage battery pack and delivering short-circuit protection. The device uses a two-stage lever system to open the high-voltage interlock circuit prior to contact separation. All high-voltage conducting

surfaces on the receptacles are touch-proof to IP2XB.

Other options centre on the Excel-Mate range. Excel-Mate High Voltage Safety Lock plugs and receptacles cater for a variety of EV applications including power and signal interconnect. Excel-Mate HVPT series provides a reliable and economical high-voltage pass-through connection, while the Excel-Mate CCS Combo meets IEC62196-3 to enable rapid charging of EVs with AC or DC power.

www.rs-online.com



GaN gets the go ahead

GaN Systems' 100V and 650V gallium nitride transistor families are now available in Europe, Middle East and Africa from Arrow Electronics. These GaN devices boast high efficiency and small sizes, with potential opportunities in areas from data centres, electric vehicles, and renewable energy to industrial motor drives and consumer electronics.

Not only does GaN technology allow for efficient power conversion, it can result in power systems that are one quarter the size and weight they would

otherwise be, with similar efficiency savings.

Commenting on the agreement, director EMEA sales at GaN Systems, Tony Astley, said: "As demand for GaN technology grows worldwide, Arrow's extensive power team, which combines technical and commercial experience, provides the perfect platform for bringing GaN Systems' innovative technology to engineers in EMEA." gansystems.com

Maintenance audit ensures automotive quality

One year after successfully passing the Automotive Standard IATF 16949:2016 certification, Schurter has been subject to its first maintenance audit. The International Automotive Task Force audit, which will take place every three years, aims to continuously improve quality levels.

Agreed suggestions for improvement from last year's audit were consistently implemented and reviewed. During the recertification audit, new focal points for action were identified and scheduled for implementation. This further increases the reliability of processes, maintains product quality at the highest level and continuously improves cooperation with all partners, with the objective of realising 'zero errors'.

www.schurter.com/automotive

Sensing a wireless future

Farnell element14 has added Purrrmetrix sensors and gateways to its line card. Ideal for facilities and energy management applications, these wireless sensors allow users to measure, log and analyse a range of environmental variables including temperature, humidity, CO² and occupancy. Unlike traditional data logging products, no one needs to download data from the sensors; it is transmitted live to the Purrrmetrix web service.

Up to 200 sensors can connect wirelessly to the Purrrmetrix gateway, which sends data in real-time to the Purrrmetrix servers. The system is said to be flexible, allowing users to position sensors exactly where they are needed, and easy to set up. Analytical templates, including heat maps and waterfalls, allow users to see information graphically, in real-time or to replay conditions over any



timescale. The sensors have a battery life of approximately three years.

Global head of semiconductors for Premier Farnell and Farnell element14, Simon Meadmore, said: "Purrrmetrix puts the power of accurate data directly in the hands of the end user." www.element14.com



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The power of distribution

Component shortages: what's the hold up?

Managing director of REO UK, Steve Hughes, believes the electronic component supply chain faces a challenge to accelerate manufacturing capacity

Demand for electronic components is growing exponentially. Not only do we see greater use of handheld devices with their relatively short product lifecycles, there is also increased use of electronics in industries that did not traditionally use this type of technology. The rapid evolution of the automotive industry and the internet of things, for example, are two key factors that have resulted in stronger-than-expected demand for components; a demand with which manufacturers are struggling to keep pace.

Runaway demand

Like most modern electronic products, automotive systems use multi-layer ceramic capacitors. Traditional combustion engine cars can require approximately 3,000 capacitors, but as cars move from hardware driven machines to software driven machines, their infotainment, driver assistance and comfort systems require ever more components.

For example, the requirements for display systems, LED lighting, sensors and artificial intelligence features have all contributed to the inflation of components required by this market. As a

result, forecasts suggest that the number of MLCCs could rise to 22,000 in just one car in the near future.

In addition to this, annual production of electric vehicles is expected to reach 2.4 million units in 2021, compared to 409,000 in 2014. This substantial rise has been driven by new emissions regulations and incentives from governments, and it doesn't appear to be slowing down any time soon.

Similarly, IoT devices were nothing but a figment of the imagination 30 years ago, yet smart devices are now adding a further burden to an already constrained market. In fact, forecasts show that IoT devices are set to grow to almost 31 billion worldwide, understandably raising concerns among many manufacturers.

Navigating delays

As explained, nearly every industry uses electronic components and in many areas customers are double-ordering components and panic-buying to try and eliminate further production delays along the line. Unfortunately, this does not provide a suitable long-term solution.

Instead, REO UK is urging businesses to implement a more effective planning strategy and flexible ordering system for their projects. This kind of strategy can protect against any unexpected supply chain issues, such as the current shortage.

As it stands, analysts' predictions are varied, but it's expected that the shortage will continue into the early months of 2020 at the very least, so businesses need to set realistic expectations and regularly update their customers to retain good relations. This has been the approach taken by Tesla, which even now is trying to boost its production output and still generating orders.

This is not the first time there have been long delays for key components in this industry and we expect that it will not be the last, especially as buying behaviour and purchase decisions can be so unpredictable. By implementing a procedure that allows for longer lead times, purchasers will be able to better manage operations to respond effectively to fluctuating lead times in the future.

www.reo.co.uk



This is not the first time there have been long delays for key components in this industry and we expect that it will not be the last



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Specialist distributors offer in depth expertise on components

Many OEMs look to specialist distributors not just for parts, but for advice on what components are the best fit for an application



James Carbone

Distributors specialists have always been an important link in the electronics supply chain, but their importance may be growing as more electronics permeate more products and customers look to distributors for technical expertise.

Many OEMs like to purchase from specialised distributors because they have the expertise in a certain type of technology whether it is radiofrequency and microwave chips, connectors or ceramic and tantalum capacitors. This may be especially important to companies that never used electronics in their products, but now need their products to have Internet of Things capability. Often, they turn to specialised distributors because of their knowledge of the products, manufacturers and underlying technology of the manufacturers' parts.

Some specialised distributors may be very small with a limited customer base, while others have grown to be major players in the electronics supply chain by focusing on a limited number of products.

One distributor specialist is ECCO (Electronic Connector Company), based in Chicago. "The bulk of my business is circular connectors," said Bernard Gizzi, owner and president of the company. "People buy from me because I know electronic connectors and understand the nuances of connector product families," he said.

ECCO sells circular connectors to industrial, defense and aerospace, medical OEMs and electronics manufacturing services providers. It had less than \$10 million in sales in North America in 2017 and has about 900 active customer. "Fifty-five per cent of our business is with the OEMs, large and small. No customer is larger than 12 per cent of our business." The remainder of sales are to distributors, electronics manufacturing services providers and the government, he said.

"We do business with everyone," said Gizzi. Everyone from the DLA (Defense Logistics Agency) to tier 1 subcontractors to aerospace OEMs," he said.

Gizzi bought the company six years ago and company sales have increased about 30 per cent since then. "Most everyone in the industry is growing, but most of them have grown through mergers and acquisitions. Our growth has been all organic," he said.

He said sales growth is continuing. "Business has been good this year," said Gizzi. "We have never been ordering as much from our suppliers."

A special need

Gizzi said specialist distributors such as ECCO are needed with connectors because "for some reason there are just so many part numbers, so many manufacturers, so many variations and so many issues" with connectors.

"Business has been good this year. We have never been ordering as much from our suppliers"



Bernard Gizzi, president of ECCO Connector Company.

ECCO also assembles connectors and has had a "qualified connector assembly facility" for major electronic connector manufacturers for over 50 years. It is a certified 92100D, ITAR & ISO 9001-2008 certified connector assembly facility.

It assembles connectors for industrial, military and aerospace customers and offers cable and wire assembly, custom kitting and packaging, over molding and other services.

Gizzi said ECCO is one of a limited number of companies on the U.S. government's qualified product list for certain mil-spec connectors. It has a QPL connector assembly facility for Aero-Electric/Conesys, Amphenol,

Cinch and ITT Cannon.

"I am a full value-added assembler with the aerospace and defense industry, I got that certification 2 ½ years ago," he said.

Although the bulk of ECCO's business is circular connectors the distributor also sells new "rectangular connectors that are coming out that have European standards. They take different size contacts and provide power and signal in an interconnect solution," he said.

Providing product knowledge and technical expertise to customers is also key to the business of distributor specialist RFMW, based in San Jose, Calif. As its





name implies, RFMW carries radiofrequency and microwave products.

Providing solutions

"We're seeing a lot of customers that have never been in the wireless space," said Joel Levine, president of the company which was recently acquired by TTI. "When customers don't have any RF experience, we can provide a solution to them," he said.

Before the customer may have a concept for product or maybe close to finishing a new product design but aren't sure if the design of the product is complete. RFMW can work with the customer and "point them in the right direction for solutions both on the testing side of things or something they have forgotten about in the circuit," said Levine.

Levine said while he doesn't like to use the term demand creation or design in, RFMW's component engineers recommend parts for customers application.

"People come to us and say 'this is what I'm doing' and we say to them here are a couple potential solutions for your product," said Levine. "We tell them there are different ways of doing it" and make recommendations. Recommendations are based on what the customer wants. For instance, some customers

don't necessarily want parts that have the latest and greatest technology, said Levine.

"Sometimes they want stuff that they know has been around for a while and is going to continue to be around," he said.

He said RFMW's engineers will sit down with engineers at a company to work with them if that's what the customer wants. "There are customers and engineers that don't want to talk to you or want to see you for whatever reason, so a lot of collaboration concerning a design is over the web and email."

While some specialist distributors focus on a small number of components, other specialist distributors stock a wider variety of components, but also offer customers a deep understanding of those products and their associated technologies.

"I feel we offer more product knowledge on the lines we do carry, simply because we have fewer lines than bigger distributors so we spend more time learning our lines," said Mark Baker, business development manager at Integra Electronics, based in Anaheim, Calif. Integra stocks and sells capacitors, connectors, diodes and transistors, frequency control devices, inductors, LEDs and among other components.

Mark Baker, business development manager for Integra Electronics

"Our goal is to make the customer feel that they are the most important customer in the world"



Understanding product value

He said Integra has a deeper understanding of the added value its lines can bring to customers' products. "We use this knowledge to move our customer from standard product into a solution that can really fit their needs," he said. Integra spends a lot of time with customers during design "similar to the rep model," he said.

"We take our lines out into the field. We bring them on sales calls with us to the customers," says Baker. Because of this hands-on approach, customers feel they are more important to Integra than to a larger broad line distributor, he said.

He said once Integra gains the trust of a customer "it's very hard to lose the business to another larger distributor," said Baker. "We have an extremely high customer retention rate." However, Baker acknowledges that it is often hard to find the right customers for Integra. He said the distributor's "win to quote rate" is low and the company spends a lot of time to find the right customer to fit the Integra customer model. "Once we find that customer, our goal is to make the customer feel that they are the most important customer in the world," he said.

Baker added that while Integra is small, it does business with large OEMs. "Smaller OEM and

EMS customers actually buy from larger distributors. Where smaller distributors like Integra flourish is with OEMs and EMS providers that have large pieces of ongoing consistent business that requires a high level of inventory management and service," he said.

Baker noted that Integra delivers on Saturdays and can push or pull inventory "on the fly."

"We make high level executive decision in seconds to keep a customer line from going down," said Baker. Larger OEM and EMS providers know this and tend to work with smaller distributors.

He said that over the past year "not one customer line of Integra went down" although there were shortages of multilayer ceramic capacitors and other components. "OEM and EMS providers tend to use smaller distributors for the higher running items and only buy mid-level to lower production parts from larger catalog distributors," said Baker.



"We're seeing a lot of customers that have never been in the wireless space"

Joel Levine, president of RFMW

Innovation drives CM recovery

Over recent years, contract manufacturing has been in decline. Findings, however, reveal a recovery fueled by new technologies such as wireless infrastructure, as well as the continued rise of the ubiquitous smart phone

The findings published in New Venture Research's annual electronics manufacturing services report, *The Worldwide Electronics Manufacturing Services Market 2018 Edition*, make encouraging reading. Over the course of 2017, the worldwide contract manufacturing services market increased by 10.8 per cent in total revenue, resulting in a combined electronics manufacturing services and original design manufacturer revenue of \$471 billion. So after some years of decline, it seems the CM market recovered substantially in 2017.

Recovery drivers

To identify these key trends, the report examines the leading 100 EMS and ODM suppliers across 52 countries, looking at 48 product industries and more than 900 manufacturing locations. From this research, New Venture reveals the

CM market was sustained by strong demand for smart phones, which resulted in an increase in assembly revenue of \$14 billion in 2017. Other strong growth areas include wireless infrastructure, where capital spending exceeded an additional \$3 billion in orders in 2017 as carriers prepare for the next-generation 5G networks. Enterprise LAN system assembly were also strong in 2017, with cloud computing prompting demand for distributed data centers worldwide.

Thanks in part to these growth segments, the industry was profitable for the eighth year in a row, coming in at \$8.4 billion for 41 EMS public companies and 18 ODM public companies. Foxconn remains the giant of the industry, accounting for nearly half of all the money made by the EMS industry in 2017 and EMS companies

accounting for approximately 78 per cent of the total. Overall, the outlook remained positive, with only four EMS companies and two ODM companies losing money in 2017. Looking at some of the other high flyers, we see that Pegatron ranked second in net income for EMS companies at \$527 million, followed by Flex at \$320 million. In the ODM space, Quanta Computer, Delta Electronics and Qisda ranked highest in earnings.

Right-sized for recovery

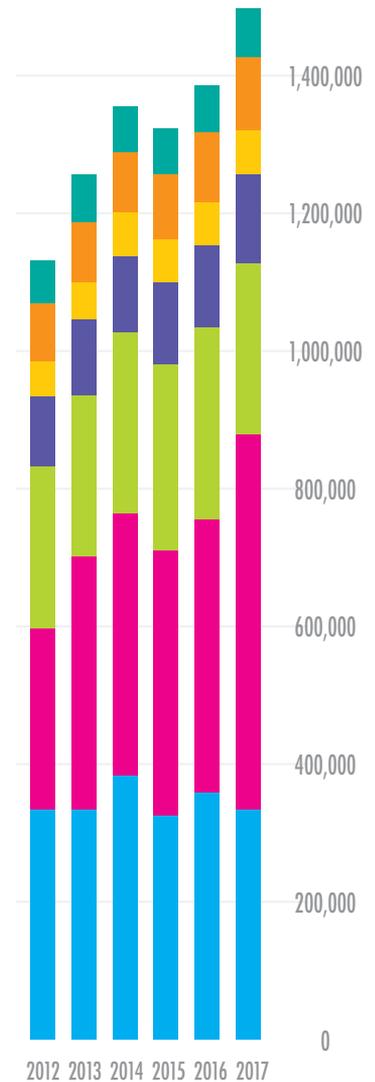
Reassuringly, plant closures were insignificant in 2017, as most companies appear to have right-sized their operations or closed facilities resulting from completed acquisitions. There were some new openings, which were clearly related to new business opportunities, while closures were driven by economic performance requirements such as right-sizing the company.

Looking to the future, it seems there's no let-up in this positive trend. Overall market demand for electronic products is projected to continue growing throughout the forecast period. In fact, New Venture Research expects overall combined market growth to be at a compound annual growth rate of 7.5 per cent over the next five years.

Communications and computer products will continue to drive the largest growth in the electronics industry. In 2022, the total industry is expected to reach \$1.7 trillion in annual assembly value, as consumption and replacement of electronic products continue, and new products stimulate demand.

In conclusion, although the trend to move price-sensitive manufacturing to low-cost regions has subsided, this will continue to impact the industry for all suppliers in the foreseeable future. Nevertheless, it seems outsourcing has become a critical element in keeping the electronics assembly industry expanding, with an ever-present goal to drive costs down each year.

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Note the increasing importance of communications when the total available market for electronics assembly from 2012 to 2017 is broken down by segment (\$B)

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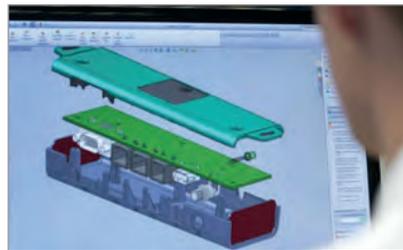
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Is manufacturing in need of a makeover?

The UK manufacturing industry is home to an ageing workforce. To attract the next generation of talent, electronics manufacturing services provider, Dynamic EMS, believes the industry needs an image update

Manufacturing is crucial to the UK but to maintain this position, it is vital to strengthen the UK's skills base and grow the number of goods made in the UK. Statistics for 2017 to 2018 show that manufacturing is rising, but as customers request higher levels of customisation, there has been a shift towards more demanding and complex system assembly, which calls for a higher level of skill. With an aging workforce and a boom in electronics manufacturing, the industry needs to bridge the talent gap.

That's why Dynamic EMS is working to promote an accurate picture of UK electronics manufacturing through science, technology, engineering, and mathematics initiatives. It aims to ensure that a career in electronics manufacturing is seen as an exciting, challenging and dynamic opportunity.

Investing in STEM

Human resources manager, Victoria Bonnar, explained: "We provide young people with an accurate view of what a career in electronics manufacturing can offer. To do this, we need to take STEM into the classroom."

According to Victoria, there is often negativity surrounding the ability and attitude of the next generation. In fact, they are just as hungry to learn and work as previous generations, but sometimes the industry is not packaged attractively enough to entice them.

Updating perceptions

She continued: "We need to overturn the outdated view of electronics manufacturing in the UK. We have invested significantly in capital equipment to streamline manufacturing and make it more efficient. In turn, we have upskilled our team. Positions opening in design, engineering, supply chain and operations, all require an understanding of STEM subjects."

Together with academia and industrial partners, Dynamic aims to create STEM educational

opportunities to support job creation, advance scientific discovery and enhance manufacturing capabilities.

Victoria concluded: "We take

every opportunity to showcase the reality of advanced manufacturing. This ensures that the next generation can see how rewarding a career in electronics

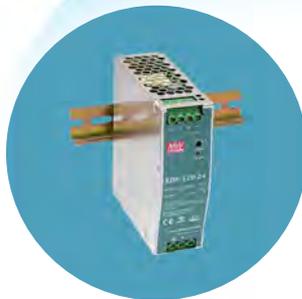
manufacturing really is. It is a dynamic environment and we want to ensure it is open to all."

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Outsource with confidence

Whether initiating a new project or switching supplier, engaging an outsourcing partner requires careful thought. Managing director at Corintech, Pete Cross reveals how to mitigate the risks

Before searching for a new manufacturing partner, it's important to define your requirements clearly. Not all CEMs are alike: they differ in capabilities, service levels and capacity. It's therefore essential to establish what volumes you intend to order, what internal procedures the supplier should operate and whether it must be within a specific geographical location.

Carefully assess all the potential risks associated with transferring processes to a new supplier. Have there been difficulties with component sourcing, an assembly process, or a quality issue that could re-occur? Spend time on this phase and develop robust plans to mitigate perceived risks.

Be selective

With requirements and risks understood, the search begins. Online search tools provide a good starting place, along with industry publications, adverts and content created by potential suppliers. Attend industry events and exhibitions to meet potential manufacturing partners in person and speak to others in your industry.

To assess the long-term security offered by prospective manufacturing partners, check the company's history and financial record. Companies House provides an online service that can help with this.

Narrow the selection by asking the right questions. Find out what quality accreditations the company holds and what manufacturing, inspection and test equipment is in

operation. Ask which KPIs are monitored and how the company performs against them. Do they manufacture locally, or offshore? Establish if there are services outside your immediate requirements and consider whether the supplier has a technology strength that might aid future development.

Prepare the ground

When considering long-term business partnerships, ensure that you meet the management team and the employees that you are likely to work alongside. Get a feel for the company's culture and consider how well it aligns with yours.

Provide potential suppliers with a detailed request for quote. Include all the details required to successfully manufacture your product including a bill of materials that identifies free-issued components and any that are manufacturer specific. Other issues to specify include: quantities, PCB artwork, encapsulation or coating specifications, mechanical assembly drawings, cable assembly drawings, programming and test instructions, any bespoke jigs or fixtures required and any specific assembly standards.

Audit prospective CEMs. This could establish how quotes and orders are handled and what purchasing procedures are followed. Identify how suppliers are qualified, what level of build standard documentation is employed and how inspection and test results are recorded. Other areas to qualify include equipment calibration, staff training and traceability throughout

the manufacturing process, down to batch, product and component level.

Ready to proceed

When all the details have been verified, it's time to establish a supply contract. This will prove beneficial to both parties. Consider contracted pricing, buffer stock agreements, supply



Corintech has a site in the UK and offices in Hong Kong

schedules and processes, returns procedures and service levels that are important to the smooth running of your business.

Apply the rule of ten with new suppliers. Manufacture small quantities at first and only increase quantities by a factor of ten. Problems in process and quality are better discovered and solved before proceeding to full-scale manufacture. A good CEM will want to ensure that procedures are in place to guarantee ongoing supply.

www.corintech.com

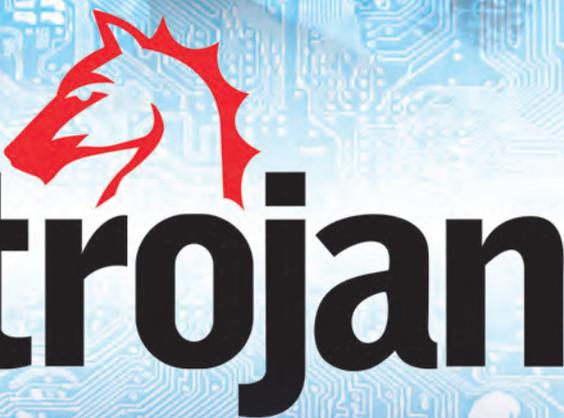


Establish whether the supplier manufactures locally or offshore



Carefully assess all the potential risks associated with transferring processes to a new supplier

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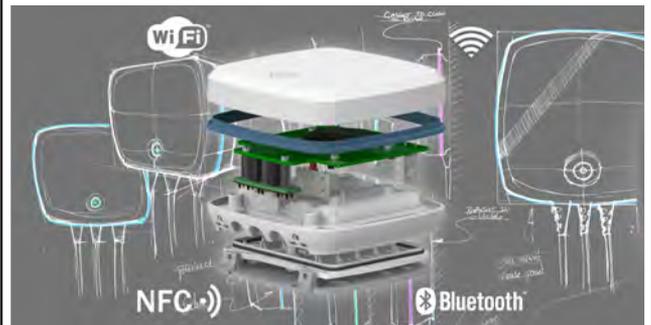


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Investment meets high mix demand

Complex and high mix PCB assemblies featuring a variety of component types are no problem for UK CEM, Gemini Tec, thanks to an investment in vapour phase reflow equipment

This year, as part of a planned £250,000 factory upgrade, Gemini Tec installed a new Asscon VP2000 fully in-line vapour phase reflow oven. The investment, which comes in Gemini Tec's 40th year of trading, will help support the company in its goal to rapidly deliver production orders for high complexity and high mix printed circuit board assemblies and products.

Uniform solder joints

Notably, vapour phase reflow technology is designed to provide significant advantages over standard convection ovens. It does

this by removing the need to create numerous custom thermal profiles for each board type produced. Instead, vapour phase reflow delivers uniform solder joints as complete PCBAs are submerged in Galden until each device has reached the optimum reflow conditions, without exceeding a set maximum temperature. The whole process is also completed within a controlled environment, which helps eliminate dry joints, voiding and inconsistencies.

Although the VP2000-210 is Gemini Tec's second vapour phase reflow oven, it is the

first of this model to be sold into the UK, making Gemini Tec the only UK-based contract manufacturer using an in-line vapour phase reflow oven of this kind.

Increased capacity

The new VP2000 oven, which was purchased from Asscon Systemtechnik Elektronik, via UK agent, Zen Production Equipment, is said to provide a marked increase in capacity for vapour phase reflow. As part of the factory improvements, it has been coupled with one of Gemini's MYcronic Synergy surface mount lines and MYcronic solder jet printers.



With the latest vapour phase reflow processes in place, Gemini Tec can confidently handle complex and high mix PCBA assemblies

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With the latest vapour phase reflow processes in place, Gemini Tec can confidently handle complex and high mix PCBA assemblies that feature ball grid array, quad flat no lead and leadless devices, all with small process windows. According to Gemini Tec, this package of complex capabilities perfectly meets the requirements of the company's growing customer base.

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Gemini Tec's new VP2000-210 vapour phase oven easily handles complex and high mix PCBA assemblies

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Scaling the waste mountain

As Europe's 'packaging waste mountain' grows, distributor Farnell element14 helps customers divert used packaging away from landfill

The European Union has some of the highest environmental standards, protecting Europe's natural resources and safeguarding the health and wellbeing of people, yet packaging waste remains

a problem. In the UK, in response to waste and recycling figures published by Defra, environmental groups are urging the UK Government to set legally binding targets. New data reveals that packaging waste recycled

in the UK dropped in 2016 and despite 71.4 per cent of UK packaging waste being recycled, the amount sent to landfill has increased by an extra 446,000 tonnes since 2013.

For businesses, the challenge is that despite an increase in recyclable packaging, the means and the structure to recycle is not always there, leading to recyclable packaging still finding its way to landfill. Commercial and industrial sectors in the UK have begun to address the level of waste going to landfill but according to the Environmental Services Association, the UK is still likely to be left six million tonnes short of waste treatment capacity by 2030. Action therefore needs to be taken to identify new opportunities to reduce waste.

Reducing landfill

Farnell element14 provides one such solution for businesses within the electronics industry. It has been working with customers across Europe for the last seven years to redirect packaging waste from its distribution operations away from landfill for recycling or reuse.

Over 250 Farnell element14 customers currently use the service, which redirects around 10 tonnes of waste each year, made up of Jecdec waffle trays and seven-inch production reels. To date, 285,000 Jecdec waffle trays and 2.1 million production reels have been returned, helping customers reduce the amount of waste going into landfill at no cost. Once reels and waffle trays are collected, Farnell element14 works with UK-based not for profit social enterprise co-operative, Enabled



2.1 million seven-inch production reels have been returned in Farnell element14's recycling scheme

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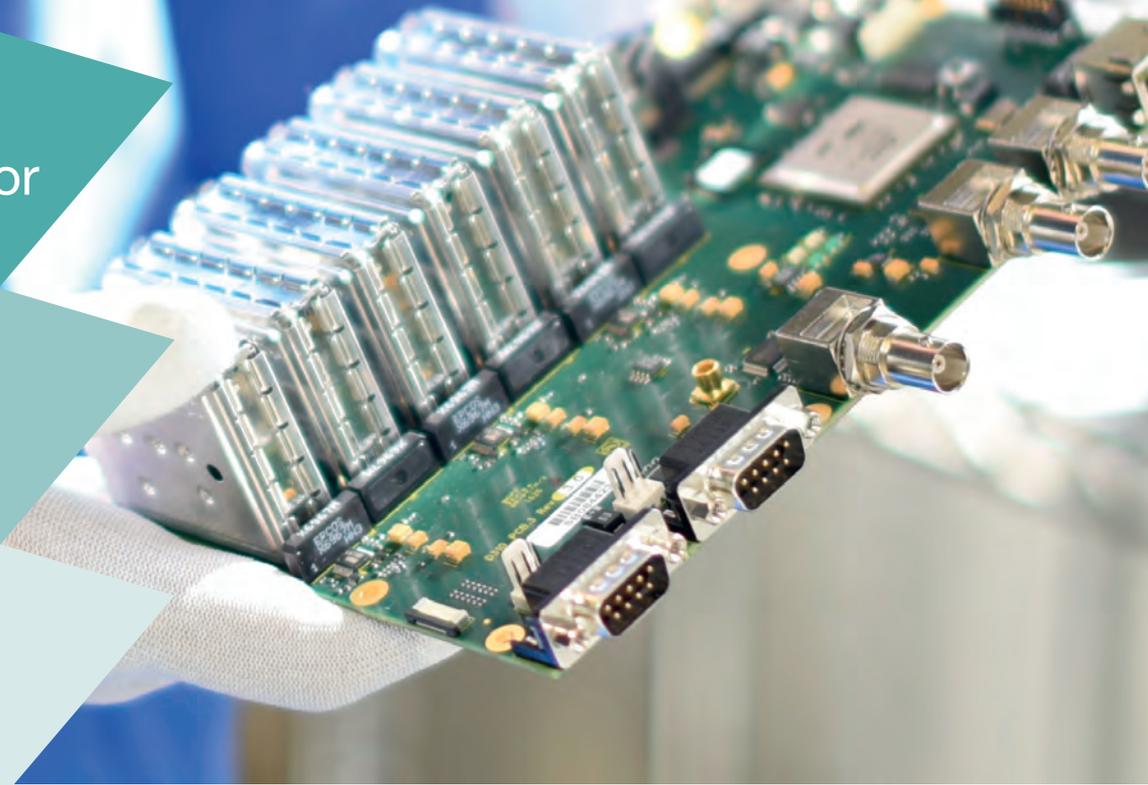
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Inspiring industry

A host of innovative solutions will be showcased by TTI at Electronica 2018, highlighting the company's complete distribution solution, from design right through to supply

TTI has supported Electronica for many years. This year it returns to Munich once again to exhibit with fellow Berkshire Hathaway company, Mouser Electronics, in Hall C3, stand 550 from November 13 to 16. Its motto for the show: 'From design chain to supply chain — your complete distribution solution.'

So how will this motto be reflected on TTI's booth and what will visitors be able to see? TTI offers broad and deep inventories of passive components, interconnect products, power and sensors, discrete and electromechanical devices. Ensuring that customers have access to the widest range of new technology devices is a key pillar of TTI's philosophy and it has invested heavily in infrastructure and inventory at its European headquarters near Munich to ensure that customers can rely on this. Even in challenging conditions where leadtimes are extending, as they are currently, TTI can support customers from stock, thanks to having foreseen shortages early and expanding stockholding significantly. The company therefore looks forward to discussing buyers' needs in detail at Electronica, where technical, logistical and commercial experts will be available to cover all product ranges.

Innovation in action

Of course, there will also be some eye-catching exhibits. As part of TTI's industrial electronics theme, it will showcase TALOS, a fully electrical humanoid robot featuring sensor-torque control in all its joints and using EtherCAT bus protocol to communicate. With its 6kg payload capacity in each

arm, TALOS is ready to tackle complex industrial production tasks.

In the transportation area, TTI will present an electric superbike by Energica that can accelerate from 0 to 100km/h in just three seconds, achieving a top speed of 240km/h. Electric vehicles of all descriptions require new types of rugged, high performance components and TTI is at the forefront thanks to authorised distribution deals with leading suppliers.

One of the highlights in TTI's defence/aerospace and space section will be the extended range of value-added services TTI offers, including QPL connector assembly and wire and heat shrink tubing and supply. These products are often subject to significant

minimum order quantities and take up valuable space while requiring specialist assembly skills. TTI aims to remove these headaches.

Sensors, too, will feature prominently, since every internet of things application — be that industrial IoT, smart building, smart home, smart office, connected auto, remote metering, home diagnostics, or wearables — begins with data capture via a sensor. TTI has amassed a wide portfolio of suppliers that cover the vast number of sensor technologies, and many of them will be on display.

Taking up 585m² of floorspace in total, TTI's booth at Electronica will be one of the largest in the show. Not only will it play host to the inspiring displays mentioned above,

but also to private one-to-one discussions where customers will be able to schedule time to discuss their very specific requirements. We are looking forward to meeting you in November!

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DEFENSE, AEROSPACE & SPACE AREA

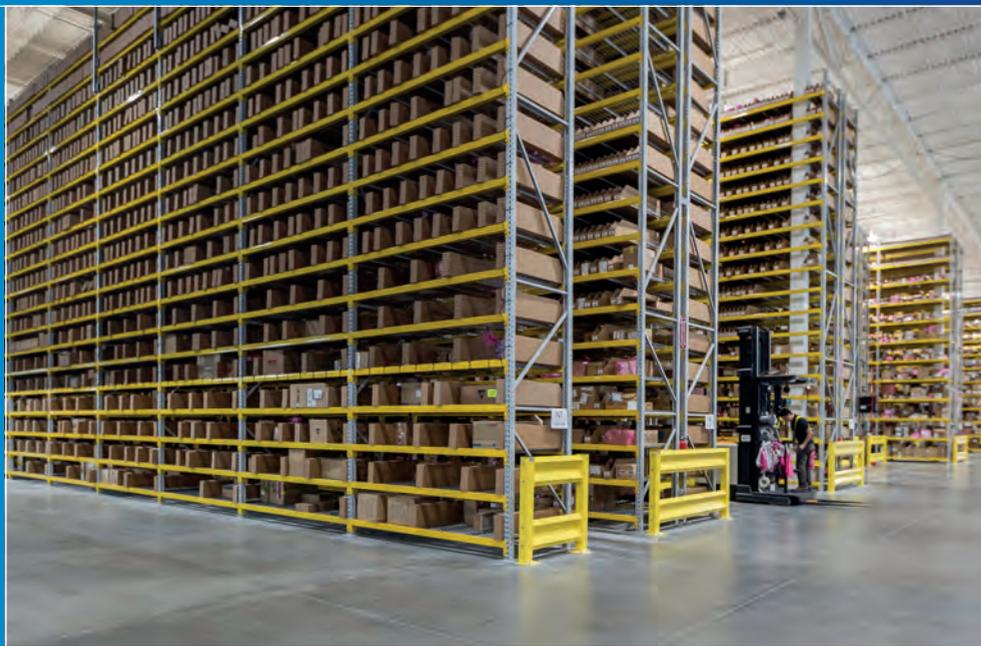
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Connectors: too simple to counterfeit?

Connectors are not normal territory for counterfeiters, but fraudulent products are out there, particularly in the high value, high reliability sectors. Aerco's counterfeit lead, Tom Peissel, explains how to avoid them

Counterfeit products have been on the rise over the past decade and the electronics industry is rife with them. Fraudsters take a cheap IC chip, remove last years' product coding and replace it with an expensive product name, a fictitious manufacture date, and create a certificate document. These three things are enough to get past most goods in departments.

Compared to the latest integrated circuits, connectors are relatively simple items, which means they are not normal territory for counterfeiters. There

are counterfeits out there however, and Aerco remains vigilant.

Refurbished connectors

The main threat in the world of connectors is inaccurate product status. High value connectors, in which counterfeiters are interested, are often designed for military, safety critical or aerospace markets and are therefore robust, tough and incredibly reliable. This means, even old connectors can look good as new after cleaning and refurbishment. Old and recycled connectors, populate the grey market and are often advertised as 'used'

or 'refurbished.' These sales are legitimate, as the buyer is aware of what is being purchased.

To increase the value of these connectors, however, paperwork can easily be falsified and manufacturers' packaging can be copied to create a genuine new appearance. Therefore, inspection of products received is crucial. Lot and date codes should always be checked against relevant paperwork. Solvent testing can be used to confirm coding is genuine, but even these tests can be beaten by clever counterfeiters.



Aerco counterfeit lead, Tom Peissel

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Compared to the latest integrated circuits, connectors are relatively simple items, which means they are not normal territory for counterfeiters

Protective purchasing

Aerco operates a robust policy to capture any fraudulent products. Protective measures start with the purchasing team, which can only place orders with companies on Aerco's approved supplier list. Any new supplier needs to provide information on their accreditations. The company name, location and the product being purchased are then run through various online databases to see if there is any negative feedback. The risk of buying counterfeit components increases the further you move away from the original manufacturer.

All products go through a goods inwards inspection process. This can include dimensional checks,

paperwork checks and even contacting the manufacturer to verify information. A test house can be used to verify products however this can be costly due to destructive testing. This is worthwhile for customers if they are using old or historic components on on-going programmes.

Several online databases provide Aerco with updates on counterfeit product and fraudulent activities. Depending on the type of alert received, a variety of protective measures are carried out. This can include verifying stock, re-evaluating the approved supplier list, or even product recall.

Avoidance as standard

Several release levels are offered, depending on customer requirements.

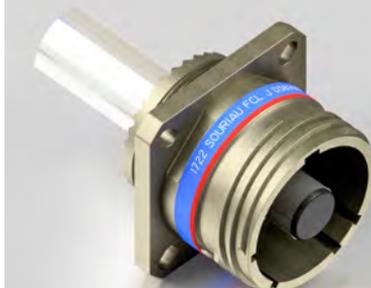
The most robust process is an 'in accordance with AS6081' release level, which triggers a process designed for aerospace customers. Product purchased in this way follows rules governed by AS6081 focused on sourcing and testing purchases made from the grey market.

In summary, Aerco's robust counterfeit policies have protected customers from the dangers of fraudulent products, but it is hard to predict what will be next for criminal counterfeiters. Everyone must stay vigilant and spread awareness amongst their respective industries. Knowledge sharing is key to protecting the supply chain, reputations, and ultimately customers.

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FIBRE OPTIC CABLE ASSEMBLIES



ACCESSORIES AND TOOLS

Future-proofing industrial environments

Electronics Sourcing asks Harting's product and applications manager, Kevin Canham, what factors purchasers need to consider when sourcing industrial Ethernet connectors both now, and in the future

Q What questions should purchasers ask when sourcing miniature Ethernet connectors?

A) The first and most important question is whether the product will suit current production processes, such as pick and place. As Harting's ix Industrial is delivered in a tape and reel format, it is ideal for mass production techniques. In addition, if the cable needs to be field-terminated, this can be achieved through insulation displacement connection.

Q What does the IP20 standard represent and what other quality kitemarks apply to connectors?

A) The International Protection standard is an industry benchmark that informs users about the level of protection a connection features against external influences. Both the ix Industrial and RJ45 are IP20 rated, meaning they are protected against medium sized foreign bodies but offer no protection against water. In addition, IC specifications provide a recognised global open standard published

by the International Electrotechnical Commission (IEC) that ensures worldwide product conformity.

Q How have socket sizes decreased and what can we expect in the next few years?

A) With the ix Industrial, Harting has reduced the PCB jack size by 70 per cent. As a result, manufacturers can use it in much smaller devices, such as routers and security cameras, as well as reducing the amount of space required by data centres. In future, Harting aims to further reduce the footprint size and



Product and applications manager, Harting, Kevin Canham

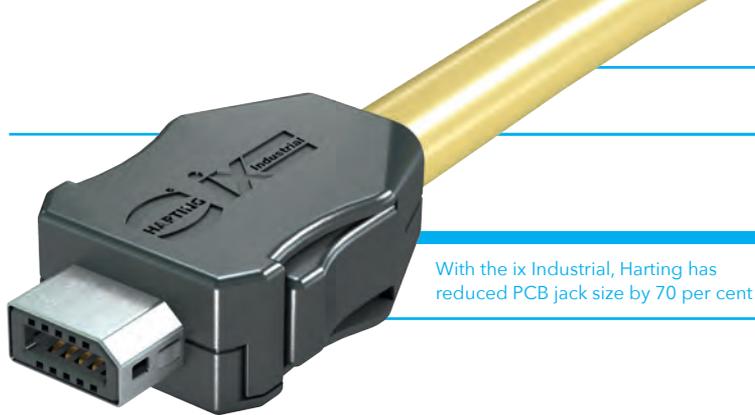
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With the ix Industrial, Harting has reduced PCB jack size by 70 per cent

introduce an IP 67/69-rated product for use in extremely tough environments.

Q What are typical applications for the RJ45 connector?

A) The RJ45 is the world's most popular connector and is synonymous with Ethernet connections in the IP20 environment. It is used to transmit data and can be found anywhere an Ethernet network is required, from routers in the home to human machine interfaces on production and assembly lines. As the RJ45 is so widely used, Harting offers ready-made cable assemblies with the ix mating face and the RJ45 connector on opposite ends in order to enable a

gradual adaptation of the new technology.

Q How are lead times holding out for this type of connector?

A) Harting's policy is to maintain immediately available stock of all class A products in a central warehouse and this is no different with the ix Industrial. This approach allows us to manage customer expectations and provide a great service.

Q Is there any other advice you would give to buyers sourcing Ethernet connectors?

A) Ensure that the connector is suited to the task and the environment in which it will be utilised. For heavy duty work Harting's Han-Modular allows users to design and combine individual modules, including data, into a single unit. Where connectors with tool-free installation are required, the PushPull and PushPull V4 Industrial are user friendly and can be supplied with IP 65/67 housings. Harting also supplies a range of RJ45 solutions, including pre-assembled system cables, device side solutions such as service interfaces and PCBs and hybrids, which offer power and data within one housing.

www.harting.com



Ensure that the connector is suited to the task and the environment in which it will be utilised



Harting's ix Industrial is delivered in a tape and reel format for mass production

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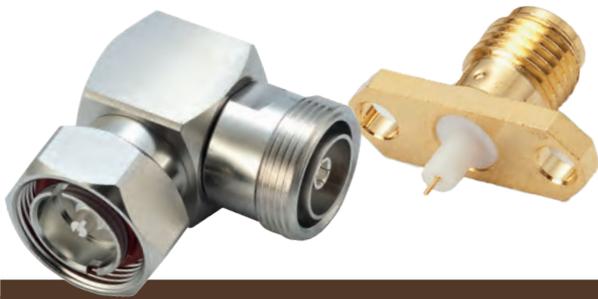
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Anti-vibration range prevents accidental disconnection

RS Components has launched a series of RS Pro anti-vibration hermetically sealed coaxial connectors for RF and microwave applications. Ideal for use in harsh environments, a key feature of the range is its screwing mechanism, which prevents accidental disconnection. Devices in the range meet vibration requirements to MIL-STD-202, method 204, condition G.

Highlights of the range include an SMPM sub-miniature push-on blind-mate coaxial connector, designed to maximise performance in compact spaces and reduce overall system weight. Devices can be mated with the RS Pro GPPO, SSMP and Mini-SMP series, and offer performance from DC up to 65GHz.

A second highlight is the extended frequency SMA range, which meets coaxial system operation requirements at 26.5GHz. The range features miniature RF connectors that offer a screw-coupling designed for use with smaller diameter semi-rigid cables.

Also included is a 4.1/9.5 connector range, ideal for high-performance mobile communication systems. Mechanical design is the same as in the typical 7/16 connector, but with more compact dimensions and a frequency range up to 14GHz.

www.rs-online.com



Power connectors meet mil-spec demand

Lane Electronics is now offering Weald Electronics' LMH series of bayonet coupling circular power connectors, designed to meet MIL-DTL-26482 requirements.

Available from stock, buyers can select a variety of shell sizes and styles, as well as many contact arrangements from two to 61 with solder contacts. The series features peak working voltages as high as 1,500V DC or AC. Maximum current rating at 85°C ranges from 7.5A for size 20, to 45A for size 8, with 13A for size 16, and 23A for size 12. All versions can be specified in a variety of RoHS compliant finishes with accessories such as J sealing glands, protective caps and screen termination.

In addition to MIL-DTL-26482, connectors are approved to IECQ-CECC spec BS/CECC 75201-003 and BS 9522 F0017.

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Configurable light pipes display status

Schurter has improved its 6600-5 series IEC outlets with availability of integrated light pipes. Applications include PDUs in data centers and other multi-distributed power applications.

PDUs often use LEDs mounted between outlets to display status. The high packing density of servers in modern data centers demands the same of power distribution units. With Schurter's appliance outlet, the integrated light pipes provide

space and assembly cost savings over conventional strip designs. Service technicians are able to clearly see which systems are working properly or respond to required maintenance. The LED triggering is configurable, wherein each state can be clearly and independently represented. An outlet could, for example, signal an outage with a red LED or a critical power consumption pattern with a yellow LED.

uk.schurter.com

6600-5



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On target for defence

An enhanced quality system, high levels of stock and the ability to assemble product on demand help NYK Component Solutions target aerospace and defence requirements

Selecting the right interconnect product with the correct specification and approvals is an ongoing challenge for companies operating in the aerospace and defence sectors. Over the past few years, NYK Component Solutions has developed its expertise, partnerships, systems and business processes to address this challenge and help companies find the right product, at the right price, and within a short timescale.

Its efforts have included the development of a new quality system, high levels of stock holding and the facilities to assemble product on demand as an approved value add distributor. Alongside this, NYK continues to develop on-line solutions to help buyers find the best product for their application.

Value add assembly

Working with Conesys headquarters in the USA and Conesys Europe in France, NYK Component Solutions has established an assembly facility approved to AS9100 Rev D for value added assembly of aerospace and commercial connectors in accordance with OEM documentation, techniques and piece parts. It is also accredited to AS9120 Rev B covering sales, logistics and distribution of electromechanical interconnect components for the aerospace, military, oil and gas markets, as well as being approved to ISO9001 2015.

This focus on quality and industry approvals is critical to building long term supplier relationships that can be trusted to deliver in demanding scenarios.

The in-house assembly of Conesys MIL-DTL-38999

series III, for example, enables NYKCS to supply a range of approved components with short lead time, efficiently meeting customer-specific needs for MIL-DTL-38999 series III. This capability is offered alongside other approved connector and interconnect products and services, such as MIL-DTL-26482, MIL-DTL-83723, EN2997, ESC10, MIL-DTL-5015 and hyperboloid contacts and connectors.

Extreme accessories

To complement the range of high-performance connectors on offer, NYKCS is also the exclusive European franchised distributor for Compaero connector accessories. These backshells, adapters, protective covers, cable clamps and other accessories are used primarily in the aerospace and defence industries.

The range covers simple strain reliefs through to submersible EMI/RFI shielded backshells designed for use in harsh environments. Protective covers used to safeguard connectors while not in use are available with an array of lanyards, eyelets and security rings for customisation. MS3057 cable clamps are available for automotive and heavy industrial markets in a multitude of finishes. This provides an alternative to product from companies such as TE/Polamco and Glenair.

One-stop-shop

Backed by agreements with Conesys and Compaero, and by NYKCS' ongoing investment into people, systems, infrastructure and products, NYK Component Solutions boasts a complete package of connectors and accessories. It aims to provide a 'one stop shop' of

qualified OEM interconnect products. Whether purchasers are looking to buy finished components or seeking a fully qualified supplier partner with access to extensive stocks and strong relationships with leading manufacturers, NYK Components Solutions could be the right connection.

www.nykcs.com



Focus on quality and industry approvals is critical to building long term supplier relationships



Submersible EMI/RFI shielded backshells are designed for use in harsh environments



In-house assembly enables NYKCS to supply a range of military approved components with short lead time

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Rail

Fibre optic splice box is rail approved

Despite the mechanical and climatic stress caused by rough conditions in industrial or outdoor areas, high quality fibre optical connections are still needed. Telegärtner offers a solution

The Rail Distribution Box was developed by Telegärtner to offer ruggedised protection in any situation. The train approved RDB distribution box offers tested reliability against vibration and shock as well as heat, coldness and humidity, making it perfectly suited for use in harsh environments.

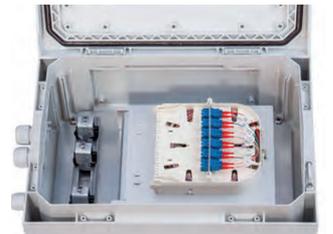
Besides its robust housing, featuring IP66 protection and UV resistance according to UL 508, the RDB also includes a hinged splice cassette, which enables easy assembly and maintenance. Different front plates are available to meet various demands, with the ability to store pigtails with all common connectors and fibres. Moreover, the splice cassette enables up to 24 splices.

Cables of different outer diameters can be fed in or out of the RDB via three cable glands. An additional adapter plate can be mounted onto the distribution box, should the RDB need to be fixed to a signal mast.

www.telegaertner.co.uk



Hinged splice cassette offers easy assembly



The splice cassette enables up to 24 splices



Cables of different outer diameters can be fed in or out of the RDB via three cable glands



Different front plates store pigtails with all common connectors and fibres

Advertorial

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This isn't business as usual

CamdenBoss take an exciting step forward, revealing a complete re-brand and expansion with enclosure design pioneers, Smartboxx.



CamdenBoss have led the e-mech and enclosure markets for 50+ years by satisfying customer requirements with professional and high-quality products.

With the recent acquisition of the i4innovation group (Smartboxx, Nuwco and Rimer Alco), CamdenBoss offer a variety of new products whilst adding to their existing ranges.

Whether customers require a standard, customised or bespoke enclosure; the merger combines two design teams with complementary capabilities, providing a service that places CamdenBoss at the forefront of enclosure design.

Together, CamdenBoss and Smartboxx strengthen their abilities to deliver limitless

solutions through innovative designs, rapid timescales, increased stock holding and competitive pricing, creating a unique customer service where each enquiry receives a guaranteed 'can do' response.

For Electronica 2018, CamdenBoss will launch their new product catalogue titled '01'.

The re-brand aims to refresh existing ideas and refocus CamdenBoss towards an exciting and dynamic future.

Visit CamdenBoss at stand 518, Hall A2 from 13th to 16th November.

To request a copy of the new catalogue, contact the CamdenBoss sales team on 01638 716101.



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Starting with the news platform, eBOM.com provides a steady stream of industry news suitable for design, purchasing and manufacturing specialists. With subjects ranging from trade agreements and product launches, to corporate announcements and events, eBOM acts as a gateway into both the eBOM Authorized purchasing portal and Virtual Trade Show.

In collaboration with ECIA, eBOM Authorized offers a facility to: check which authorised distributors are stocking a specific part number; compare the prices those distributors are

quoting; and then purchase the parts. To avoid issues of counterfeiting and obsolescence, eBOM Authorized only lists stock from authorised channels.

Branded eBOM LIVE, the growing Virtual Trade Show already features over 100 companies. Where available, each stand directs visitors to news, video, technical and contact resources. A facility to request information is also offered.

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In response to an increase in international visitors, the site now features a 'Select Language' option where users

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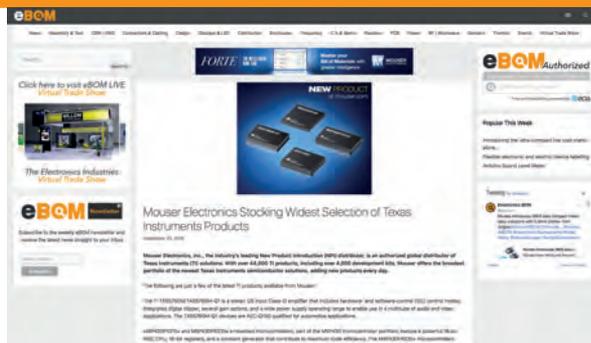
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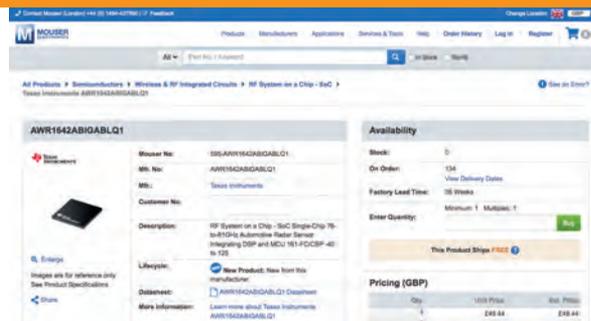
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can choose from over 100 languages. Other site improvements include Read More options on news pages and a clearer menu bar to improve navigation. The Events page lists locations where eBOM will be exhibiting.

stock, pricing and purchasing options are automatically added to product announcements originating from companies exhibiting in the Virtual Trade Show. Readers simply click the Buy Now button on the article which then directs them to the stock, price and purchasing options.

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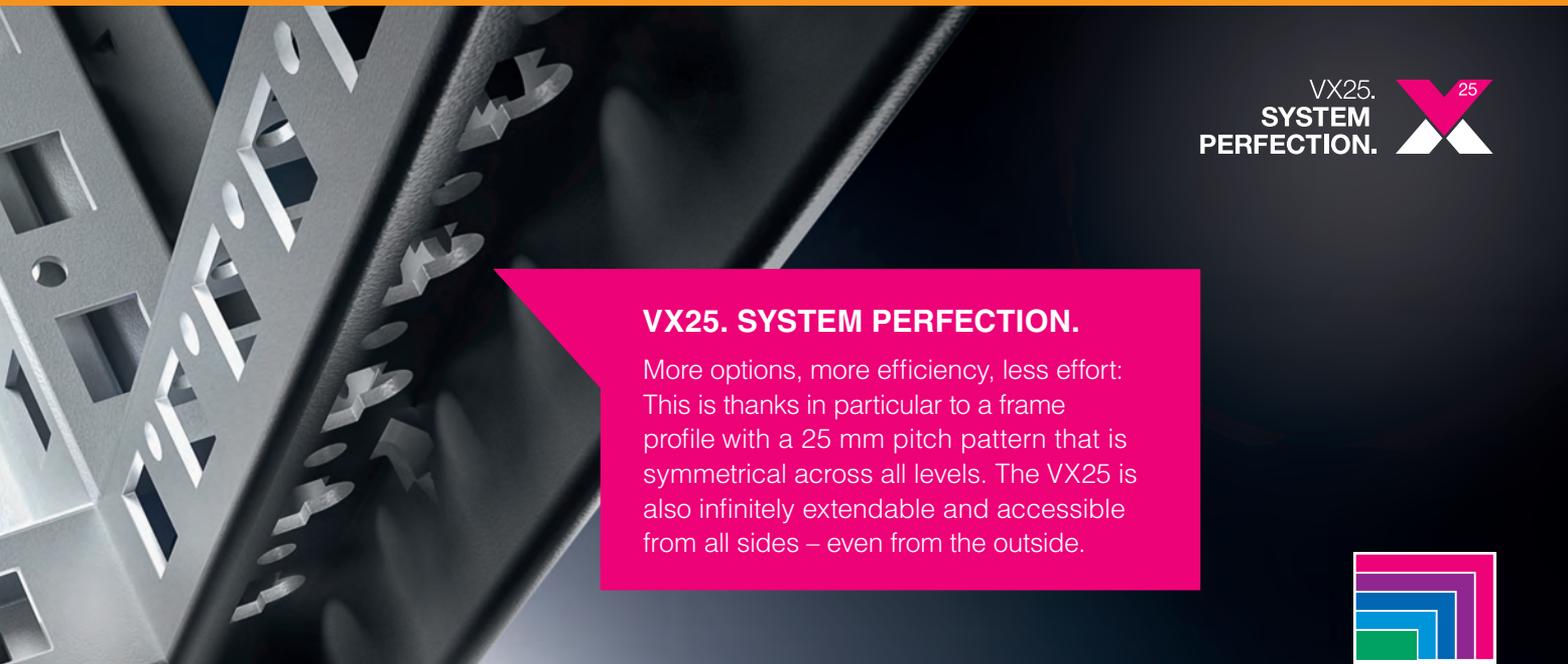
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A thirst for thermal innovation

Several new product introductions and updates of tried and tested solutions combine to demonstrate Stego's thirst for innovation in thermal management

Thanks to a constant focus on research, Stego is always looking to improve operational safety in enclosures and control cabinets

by protecting sensitive electrical and electronic applications against heat, cold and moisture. Recent introductions include the

FPI/FPO 018 filter fan series, which features an air-flap outlet technology designed to optimise cooling by allowing more air to



Stego's filter fans, convection heaters and thermostats protect sensitive electronics against heat, cold and moisture in enclosures

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The explosion protection spectrum is complemented by the long-life mechanical thermostat REx 011

pass through freely. The tool-free ratchet mount mechanism is also said to be beneficial in this series.

Another example of the Stego's innovative spirit is its second generation of in-house developed hazardous area products, designed for use in potentially explosive atmospheres. This includes the CREx 020 series of convection heaters, which promise to avoid condensate and temperature fluctuations. The explosion protection spectrum is complemented by the long-life mechanical thermostat REx 011, which boasts compact dimensions and a high response accuracy.

Finally, Stego's DC-Line focuses on industry 4.0 and associated demand for low-voltage applications. DC versions of the glare-free LED 025 light and FPI/FPO 018 filter fan have been introduced. More recently, Stego has also released four new DC devices: the DCR 030 / DCR 130 fan heater, the DCM 010 switch module, the DCT 010 electronic thermostat and the electronic hygrostat DCF 010.

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Seven tips for enclosure selection

Specifying the right enclosure is critical to the success of any new product. Here marketing director of OKW Enclosures, Robert Cox, presents seven key factors that will affect housing choice

1. The PCB

Specifying the enclosure before the printed circuit board can offer design advantages that were previously overlooked. In addition to influencing the final layout of the electronics, integrating the PCB layout to an existing enclosure can reduce machining. Not only this, choosing the enclosure before finalising component layout helps in the quest to select the smallest possible case, thereby reducing costs. In fact, struggling to find the right housing for a finished PCB can increase product size by up to 30 per cent.

By addressing the question of enclosures at the start of the design process, purchasers will enjoy a wider range of standard cases, including more specialised models, which potentially offers cost savings and the option of specifying better-quality housings.

2. Physical application

It's vital to consider how and where the electronics will be used. Will the product be handheld, wearable, desk-

based or wall mounted? Will it be installed in a rack or fitted to a DIN rail? Handheld and wearable electronic enclosures must be more ergonomic, for example, because users have greater contact with them. Desktop enclosures may also be portable and could require sloping fronts for optimum viewing and operation. Wall mounted enclosures require higher levels of protection if used in demanding environments and may need to be flush-mounted for minimum visual intrusion in sensitive locations. It's possible to specify standard enclosures to suit all kinds of applications.

3. Materials

Both plastic and metal enclosures bring their own advantages. Plastic enclosures are light, tactile, easy to assemble and offer a high-quality scratch-resistant finish. Special features such as battery compartments can be pre-moulded, saving on machining. Extruded aluminium enclosures are strong, modern looking, relatively lightweight

and have good EMC characteristics. They are easy to modify because the extrusion can be cut to the desired length.

4. Interfaces and controls

There are several factors to think about when integrating controls or human machine interface products. If the housing requires a recess for a membrane keypad, for example, is this featured as standard? Specifying non-recessed enclosures could result in costly machining.

The enclosure split-line can also provide food for thought. Many basic plastic cases feature the line mid-way between top and bottom, however, more advanced cases have an off-centre split-line to create large flat areas for mounting connectors. Some have removable end panels for easier drilling and assembly.

5. Power

The first factor to address here, is whether the

►► continued on page 46



Save time and money by selecting enclosures before fixing PCB dimensions



Plastic enclosures are light, tactile, easy to assemble and offer a high-quality scratch-resistant finish

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► enclosure requires a battery compartment or a cable connection. Plastic enclosures offer the best solution for smaller battery-powered devices, but it's important to ensure cases have a fully functioning battery compartment that will accept push-in contacts since some manufacturers supply cases with a compartment, but no battery holder or contacts.

Battery contacts must conform to DIN EN 60601 to avoid short circuits if the cells are inserted wrongly and by

law, the polarity of the cells must be clearly indicated in the compartment. Some housings even offer screw-in cradles, which allow different types and numbers of cells to be fitted to the same-sized case.

For some applications, such as medical products, a clip-on lid for the battery compartment is not suitable. Instead, the lid must have tooled access to avoid tampering. OKW ensures all new enclosures with a battery compartment feature

this as standard.

For low-voltage cable-powered devices, plastic enclosures now offer integrated cable glands that can accommodate different cable diameters. OKW's Connect enclosures, for example, can be specified with integrated cable glands at one or both ends. It is also possible to specify enclosures with integrated contacts for battery charging and data transfer between the enclosures and desk or wall station.

Fully customised standard enclosures are ready-to-use



Some housings even offer screw-in cradles, which allow different types and numbers of cells to be fitted to the same-sized case

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OKW Connect case with integrated cable gland. OKW Soft-Case enclosures with battery compartments

6. Assembly

Rapid assembly reduces production costs. Plastic enclosures are generally easier to assemble than metal ones because, being moulded, they comprise fewer parts. Also, many plastic cases feature clip-together sections that do not need fixing screws. Where fixing screws are used, they should be self-cutting screws designed specifically for plastics, with a coarse thread to reduce the risk of cross-threading. This special thread assists with regular opening and closing of the housing. Finally, for medical electronics, enclosures tend to be supplied with Torx assembly screws to prevent tampering.

7. Customisation

When it comes to specifying customised enclosures ready for mounting electronics, good standard enclosures should be quicker, easier and more cost effective to customise from day one. The wider the range offered, the better, so less work is needed. Opt for a specialist manufacturer that can offer a range of services including custom colours and materials, machining, lacquering, printing, installation and assembly.

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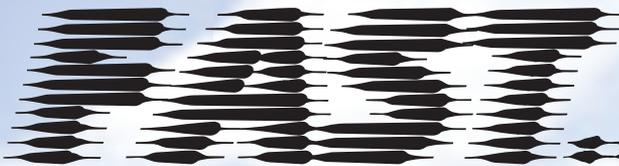
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Expect higher average prices for embedded processors

Prices will rise because more higher-cost 64-bit embedded microprocessors will be designed into electronics equipment



James Carbone

The global market for embedded microprocessors (MPUs) will grow about 5 per cent to \$77.7 billion in 2018 because of healthy demand from industrial equipment and automotive manufacturers and higher average selling prices, according to researcher IDC.

Demand for embedded microprocessors will be steady, although not stellar, through 2022 as the global embedded MPU market posts a 4.8 per cent compound annual growth rate, the researcher said.

Embedded processors are MPUs that control the functions of a wide range of electronics products including industrial equipment, appliances, vehicles and other portable and consumer electronics products.

In recent years, consumer electronics was a "huge driver of embedded MPUs but it has leveled off over the last several

years," due in part to a slowdown in demand for LCD televisions and set-top boxes, said Michael Palma, research director for IDC's semiconductors and enabling technologies group.

But there are emerging applications that may minimise the impact of sluggish consumer electronics demand. For instance, there will be greater demand for embedded MPUs in video surveillance equipment, digital signage, artificial intelligence and electronic whiteboards, said Palma.

"In the retail sector there's a lot of experimentation with new technologies with point of sale machines," which could help drive embedded processor demand, he said.

"One of the stronger areas is video surveillance," said Palma. "It is still growing although camera sales slowed down a bit last year." There is a renewed demand this

year, and "video surveillance is a significant driver of embedded processors," said Palma. "It is not only the cameras, but also the infrastructure behind the cameras on the embedded side," he said.

While the overall embedded microprocessor market will have a 4.8 percent CAGR, MPUs used in video surveillance applications will rise at a 20 per cent annual rate, according to Palma.

MPUs needed for ADAS

Automotive will become a more important segment to the embedded processor market because more vehicles will be equipped with adaptive driver assistance systems (ADAS) which are designed to make driving safer. Such systems alert the driver to potential problems. ADAS features may automate lighting, provide adaptive cruise control, collision and pedestrian crash avoidance, warn of lane departures of vehicles and show what is in blind spots.

While many automotive systems use microcontrollers, ADAS need embedded microprocessors rather than MCUs. "An image processor is critical in getting video transformed into something that can be used by the computer vision algorithm" of ADAS, said Palma. "Microcontrollers can't handle that particular workload," he said.

There are many other applications that require MPUs rather than microcontrollers. "OEMs running an operating system (OS) that requires a memory-management unit (MMU) like Linux or Android will use an MPU," said Jacko Wilbrink, director of marketing for Microchip Technology's 32-bit MPU business unit. MPUs offer higher performance, display resolution, graphics and video options and higher bandwidth communication interfaces.

"MPUs can also address much higher density volatile and

By the Numbers



\$77.7 billion

the forecasted size of the global embedded microprocessor market in 2018



\$10.50

The average selling price of the ARM embedded microprocessor in 2017



4.8%

the expected compound annual growth rate of embedded microprocessors through 2022



20%

The forecasted annual growth rate for embedded processors used in video surveillance applications



72%

The percentage of ARM-based embedded microprocessors that shipped in 2017



1-2%

The expected annual price increase of embedded microprocessors through 2022



non-volatile memories," said Wilbrink. Microchip makes embedded processors for retail, metering infrastructure, telematics and asset tracking systems.

In addition, there will be healthy MPU demand from manufacturers of digital signage and interactive whiteboards in the education space," said Palma. An interactive whiteboard combines a dry erase whiteboard with an LCD projector. The IWB is mounted on a wall or on floor stand and basically becomes a computer screen viewable by an entire classroom. The teacher controls the content either with a pointer or a hand rather than a mouse or a keyboard.

Medical devices use embedded MPUS, but "the volumes aren't that big to drive the market," said Palma.

Smart buildings are another key area that's growing that will drive some embedded processor growth, he said. "There is strong return on investment potential with smart buildings," said Palma

While sales of set-top boxes and LCD televisions have been

sluggish, that could change when 4K television becomes more popular with consumers, which will result in more sales of new televisions and set-top box, he said.

Transition to 64-bit

New and existing applications will drive demand for both 32 bit and 64-bit embedded MPUs but there will be a steady transition to 64-bit devices, according to IDC.

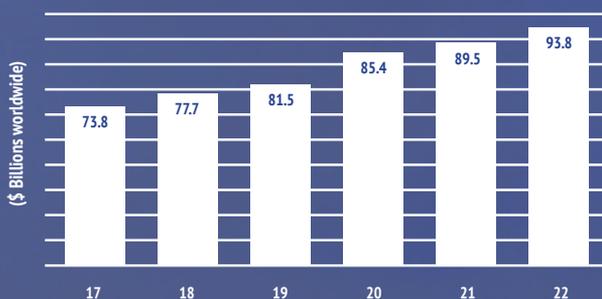
Today, most embedded applications use 32-bit MPUs. Thirty-two-bit MPUs dominate the market in terms of sales revenue and unit shipments. In 2017, 69 per cent of the global embedded MPU sales was for 32-bit processors, while 21 per cent was 64-bit, said Palma. Thirty-two-bit MPUs dominate the market in terms of sales revenue and unit shipments.

"We think by the end of 2022 it will be 58 per cent 32-bit and 43 per cent 64-bit," he said.

"The adoption of 64-bit processing in the embedded MPU market is rapidly increasing," said Wilbrink. One reason more 64-bit MPUs are needed is mobile

The global embedded microprocessor market will grow steadily through 2022 when sales revenue will reach \$93.8 billion
Source: IDC

Embedded MPUs to grow 4.8% per year



phone operating systems "are driving up the MPU performance and memory requirements and shortening product lifecycles."

With healthy if not robust demand, buyers can expect average prices for embedded processors to rise over the next several years. "So, starting this year we are expecting the price to increase 1-2 per cent per year for the next five years," said Palma. "Frankly that has been the trend for the last six years." In fact, embedded MPU prices have increased at a double-digit rate for several years, "but that's more about product mix," he said.

Some embedded microprocessors have higher tags than others. Power architecture and x86 MPUs are more expensive while ARM-based MPUs cost less. Palma said the average price for an x86 processor in 2017 was about \$99, while power architecture MPUs cost about \$48. ARM processors averaged about \$10.50 and MIPS processors cost about \$19, he said.

"Embedded MPU prices are tied to volume," said Palma. "Order volumes are the greatest thing." When a company buys more than 10 million units a year, there is a big price drop. "In the embedded space,

the first hurdle is getting to orders 100,000 units per quarter," he said.

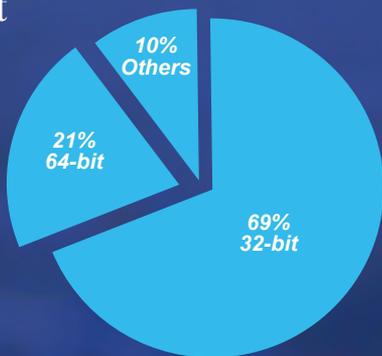
ARM MPUs dominate

ARM-based processors are the most widely used with about 45 per cent market share in sales, while x86 processors have 37 per cent market share followed by MIPS with 8 per cent and power architecture, 6 per cent. All other MPU types have 3 per cent market share.

With unit shipments, ARM is even more dominant with 72 per cent market share compared to 6 per cent for x86; 7 per cent for MIPS; 2 per cent power architecture and all others 13 per cent, according to IDC.

ARM processors use reduced instruction set computer (RISC) architecture. Because they were designed to perform a smaller number of types of instructions, ARM processors are faster, performing more millions of instructions per second than complex instruction set computing (CISC) processors. They also require fewer transistors and consume less power than CISC chips. With fewer transistors, they also have smaller die size and are used in a lot of portable equipment as well as other systems.

Most embedded MPUs are 32-bit



About 69 per cent of all embedded processors that shipped in 2017 were 32-bit devices.
Source: IDC



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This time round, Electronica aims to go beyond components, systems, applications and solutions. In addition to 17 halls, 13 forums, and four conferences, there will be significant innovations on show, providing extensive opportunities for exhibitors, visitors, employers and new talent to make contacts and be inspired. Over 3,000 companies from more than 50 countries will help provide a glimpse of the future.

Inspiration and experience

With more than 180,000m² of space, Electronica 2018

will be larger than before, with additional halls and a new layout, plus four conferences and 13 forums to facilitate knowledge exchange. Digital support for further networking between exhibitors and visitors, as well as among visitors, will be provided by Electronica Matchmaking and the new Electronica Connect tool.

Opportunities for inspiration and experience can be found in new areas: *Electronica Experience*; and *Impact — Design for a Cause*. Housed in hall C6, *Electronica Experience* will feature live demos, applications and

presentations, as well as a job market. *Impact — Design for a Cause* will look at the future influence of electronics on communication, the environment and medicine.

Visionary keynote

Touching on these themes, US social theorist, Jeremy Rifkin, will open Electronica with a keynote speech on Monday, 12 November. In his works *The End of Work*, *The Third Industrial Revolution* and *The Zero Marginal Cost Society*, he identifies current developments in the economy and society, as well as touching on the global networking of industrial



Social theorist, Jeremy Rifkin, will open Electronica 2018 with a keynote

and social processes in the Supergrid. Jeremy will also open *Electronica Experience* with a talk on Tuesday, 13 November.

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Mouser becomes first distributor to earn AS6496 accreditation

Other distributors will follow suit and become certified to the anti-counterfeiting standard



James Carbone

Mouser Electronics has become the first authorised distributor to be accredited to an aerospace industry standard designed to help stop the introduction of counterfeit parts in the aerospace supply chain.

Mouser, based in Mansfield, Texas, was accredited to the AS6496 standard after being audited by Performance Review Institute (PRI) under criteria developed by PRI, the Electronic Components Industry Association (ECIA) and aerospace OEM representatives.

The AS6496 aerospace standard sets requirements for the avoidance, detection, mitigation and disposition of counterfeit products in the authorised distribution supply chain. The international standard requires authorised distributors to have a counterfeit mitigation policy and a counterfeit electronics parts control plan.

The AS6496 standard was developed by an SAE Committee, G-19AD, comprised of representatives from authorised distributors, aerospace companies and government agencies.

Chuck Amsden, vice president of quality for Mouser, who served on the committee, said by becoming accredited to AS6496, the distributor demonstrates its commitment to providing customers with only genuine components. “We can provide full traceability to the manufacturer on everything we sell,” said Amsden, who thought of the idea for the standard after serving on another SAE committee.

Buyers and engineers concerned about counterfeit

parts can be assured that Mouser “has rigorous processes in place to mitigate the risk of counterfeit products penetrating its inventory,” he said. Amsden added besides being accredited to AS6496, Mouser is also accredited to other industry standards such as AS9100D and ISO 9001:2015 meaning Mouser provides “the highest quality components by providing traceability, risk management, process control, customer support, product availability and document control.”

Fake electronic components have been an issue in the aerospace industry—as well as other industries—for years. Bogus parts, often originating in China, have been found in commercial and military planes made by Boeing, Raytheon and L-3. More than 95 per cent of reported counterfeit issues are due to the procurement of components from distributors or brokers who are not authorised by the original component manufacturers to sell the manufacturers’ parts, according to Lockheed. Counterfeit parts can range from high-end semiconductors to lower-cost resistors, capacitors and connectors.

“Counterfeit parts got a leg hold in the aerospace industry because the mandate for saving money was more important than authenticity,” said Amsden. “So, buyers went and found parts that were cheap and before anyone knew it, they were buying them from China and over the web and they were saving lots of money,” he said. But unfortunately, some of those parts ended up being counterfeit.

First, not last

While Mouser is the first distributor to be authorised to the AS6496 standard, it will not be the last. TTI, based in Fort Worth, Texas, and parent company of Mouser, plans to get accredited.

“Mouser was the first company to undergo the audit and TTI attended to help us prepare as well,” said Kevin Sink, TTI’s vice president of quality. Sink was co-chair of the committee that developed the standard. “We plan to schedule our audit during Q4 of 2018,” he said.

Audit criteria is spelled out in the accreditation tool AC7403 which “established the objective evidence that PRI uses to ensure a company is performing in accord with AS6496,” said Sink. That evidence includes traceability of parts back to the original component manufacturer (OCM), purchases from authorised sources, control of customer returns, inventory controls that segregate any suspect material or materials from unauthorised sources in the event the distributor engages in independent distribution also, said Sink.

In the standard, there are requirements concerning an authorised distributor’s purchasing practices, according to ECIA. One provision requires the distributor to maintain a register of its suppliers, including a list of the manufacturers or other authorised distributors that provide products to the distributor for sale to customers. The list must also show authorisation status and scope. Authorised distribution is defined as



Chuck Amsden, vice president of quality for Mouser Electronics



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► continued on page 56



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▶ “transactions conducted by a manufacturer-authorised distributor distributing product within the terms of a distribution agreement,” according to ECIA. If sales are done without a distribution agreement in place, then the distributor is not performing authorised distribution and a different SAE standard, AS6081 applies. AS6081 covers independent distributors/brokers. Another part of the standard makes it clear that it is only authorised distribution if an authorised distributor buys solely from the manufacturer or the manufacturer’s authorised distributor.

Part of the standard deals with documentation requirements for military and commercial industrial components. For instance, military parts require both the manufacturer’s and the distributor’s certificate of conformance, while only the distributor’s certificate of conformance is required for commercial parts.

Handling returns

The standard also has requirements concerning how component returns from customers are handled. “Customer returns are the greatest point of risk for authorised distributors,” said Sink. “Customers occasionally return parts from other sources in error,” he said. Some of those parts could be counterfeit if they were purchased from an unauthorised source such as a part broker.

The standard requires the distributor to issue an RMA (return merchandise authorisation) if the distributor elects to accept a return. The RMA must require that the parts returned by the customer were the same parts sold to the customer.

If the distributor agrees to accept parts that it did not sell, then those parts must not be co-mingled in inventory nor sold to anyone else as authorised product.

In addition, parts returned by independent distributors/brokers must be treated as suspect counterfeit parts, according to the standard.

The customer return verification provisions specify the elements necessary to prove that the parts returned by the customer to the distributor were purchased directly from the distributor and not some other source. This includes matching the returned parts against the distributor’s traceability records, which should include date/lot codes if available. If date/lot codes are not available or don’t match, then the returned parts should be treated as suspect counterfeit parts.

Customer returned parts need to be inspected for any evidence of alteration, mishandling, improper packaging or repackaging, under the standard.

AS6496 also says that suspect, fraudulent or counterfeit parts must be quarantined pending proper disposition. The parts may be returned to the manufacturer for analysis and disposition. Confirmed counterfeit parts should not be returned to the customer and should be held in quarantine for five years, or longer if required by law.

The re-stocking provisions reiterate that suspect, fraudulent and counterfeit parts must not be reintroduced into the supply chain, restocked or returned to the manufacturer in a stock rotation. In addition, returned parts shall not be restocked into authorised inventory if purchased from non-authorised sources.

Distributors and OCMs alike must ensure that the parts returned are indeed the same parts they shipped to the customer, said Sink. “Properly controlled, this filters out even inadvertent returns of potentially suspect components,” said Sink. Distributors are also required to have a system

for controlling inventory that includes the segregation of authorised parts from unauthorised parts and the traceability of customer returned parts.

No problem with accreditation

While provisions of the standard may appear challenging, Amsden said getting accreditation “should not be difficult for someone who is been doing authorised distribution right.” Most large authorised distributors already have the necessary controls in place.

Distributors such as Arrow and Avnet and other distributors that are members of ECIA “will probably have no problem getting accreditation” said Amsden said. However, getting accredited to the standard, may require additional investment to set up records specific to purchase or return control” to show due diligence, said Sink.

He added to get accredited it may be necessary for “some awareness training would be appropriate to all employees who handle or purchase product. In most cases, distributors have goods controls, but it is not necessarily understood by a distributor’s staff how those processes also protect against counterfeit infiltration,” said Sink.

Framing their tasks around counterfeit mitigation is important to ensure every employee the auditor interacts with can respond appropriately, according to Sink.

The audit itself takes about two days and will involve 24-30 man-hours between the management representative and the various staff being audited, he said.

More accreditation likely

While Mouser is the only distributed accredited to this standard so far, “I suspect more distributors will become accredited,” said Robin

Robin Gray, chief operating officer for the Electronic Components Industry Association (ECIA)



I suspect more distributors will become accredited to the AQS646 standard

Gray, ECIA’s chief operating officer, who was a co-chair of the G-19AD Committee that developed the AS6496 standard. However, how many distributors will be accredited and how soon remains to be seen.

“It will be driven by the customer,” said Gray. The customer is the one that’s going to ask for the distributor to have the audit.” Customers include large aerospace OEMS and defense contractors such as Boeing, Lockheed, Raytheon and L-3 among many others. Distributors may find it is advantageous to become credited sooner rather than later. “One of the advantages for distributors to become accredited is once you have

it done you're more than likely not going to have multiple audits by multiple customers," said Gray. "The distributor can say 'hey I've had the audit. I've complied with the standard and here is my certificate showing that,'" he said.

Gray added, "as a distributor you can be proactive. You can have it done perhaps to forestall future customer requirements or you can wait until customers start asking for that certificate," said Gray.

One distributor that sees the value the value of becoming accredited to AS6496 is Digi-Key, based in Thief River Falls. Teri Ivaniszyn, vice president, operational excellence at Digi-Key, said the distributor is working with the ECIA and PRI to receive accreditation as part of the Counterfeit

Avoidance Accreditation Program (CAAP). CAAP is a cooperative industry effort to stop the introduction of counterfeit parts in the aviation, space, and defense industries,

"This standard has been recognized in the aerospace industry since 2014, but this is the first time we are seeing a certifying body give accreditation to it," she said. Ivaniszyn said the cost to become accredited is minimal. "There is counterfeit training for all required staff, document processes, and system capabilities are already available," at Digi-Key, she said.

AS6496 may eventually become required for distributors to do business with aerospace companies. "In the long run, we expect certification to be necessary

in order to work with top tier military/aerospace customers," said Sink. However, in the short term, authorised distributors will be given time to phase in their compliance.

To what degree the standard will help stop the introduction and proliferation of parts to the aerospace industry remains to be seen. However, by defining the processes an authorised distributor should have in place to keep suspect parts out of their inventory purchasing and customer return controls, the standard should be a useful tool in the anti-counterfeiting efforts of the aerospace industry and with electronics distributors.



Kevin Sink, vice president of quality for TTI



Customer returns are the greatest point of risk for authorised distributors

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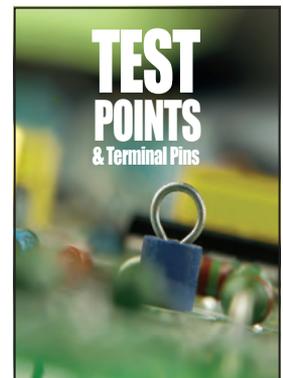
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Bosch Connected Devices and
Solutions
Bosch Sensortec
Bourns, Inc.
Brad Harrison - a Molex company
Breadware, Inc.
Bridgelux, Inc.
Broadcom Limited
Buchanan Terminal Blocks /
TE Connectivity
Bud Industries, Inc.
Bulgin
Burr-Brown (Texas Instruments)
Bussmann (Eaton)
C&D Technologies (Murata Power
Solutions)
C&K
Caddock Electronics, Inc.
Cal Test Electronics
Califia Lighting (Bivar)
Calmark / nVent
Cannon
Cantherm
Capital Advanced Technologies, Inc.
Carclo Technical Plastics
Cardinal Components
Carling Technologies
Carlo Gavazzi
Catalyst Semiconductor /
ON Semiconductor
CEL (California Eastern Laboratories)
Central Semiconductor
Cera-Mite / Vishay
CGS Resistors / TE Connectivity
CH Products
Chemi-Con
Chemtronics
Cherry Americas
Cherry Switches (ZF Electronics)
Chip Quik, Inc.
Cicoil
CII / TE Connectivity
Cinch Connectivity Solutions
Cirronet / RFM (Murata Power
Solutions)
Cirrus Logic
Citizen Electronics Co., Ltd.
Citizen Finedevice Co., LTD.
City Technology
Clarostat (Honeywell Sensing and
Productivity Solutions)
CMD (ON Semiconductor)
CnC Tech
Coiltronics (Eaton)
Comair Rotron
Comchip Technology
Comus International
Concept Technologie (Power
Integrations)
Conдор / SL Power
CONEC
Connex (Amphenol RF)
Connor-Winfield

Conxall / Switchcraft
Cooper Bussmann (Eaton)
Copal Electronics (Nidec Copal
Electronics)
Corcom Filters / TE Connectivity
Cornell Dubilier Electronics
Cortina Systems (Inphi)
Cosel
Coto Technology
CR Magnetics, Inc.
Cree
Cree Wolfspeed
Crescent
Critical Link
Crouzet
Crowd Supply
Crydom / Sensata Technologies
Crystek Corporation
CSR PLC (Qualcomm)
C-Ton Industries
CTS Electronic Components
CUI, Inc.
Curtis Industries
Curtis Instruments
Custom Computer Services
CW Industries
Cynergy3
Cypress Semiconductor
Daburn
Dale / Vishay
Datawave Wireless
DAVE Embedded Systems
Davies Molding, LLC.
Decawave
Delta Electronics
Delta Electronics / EMI
Delta Electronics / Fans
Delta Electronics / Power
Desco
DEUTSCH Connectors /
TE Connectivity
DEUTSCH ICT / TE Connectivity
DFRobot
Dialog
Dialog Semiconductor
Dielectric Laboratories
Dielectric Laboratories (Knowles)
Digi International
Digilent, Inc.
Digital View Inc.
Diodes Incorporated
Displaytech
DLI
DLP Design, Inc.
Draloric / Vishay
dresden elektronik
Dynastream Innovations Inc.
E Ink
EAO
EasyBraid/Menda
Eaton
ebm-papst Inc.
Echelon
ECS Inc. International
EDAC Inc.
Elco (AVX)
Elcon Connectors / TE Connectivity
Electric Imp
Electro Corp (Honeywell Sensing
and Productivity Solutions)
Electro-Films (EFI) / Vishay
Electronic Assembly GmbH
Electroswitch
Elna America
Embedded Artists
Emerson Connectivity Solutions
Emerson Embedded Power (Artesyn
Embedded Technologies)
EMIT
Energiizer Battery Company
Energy Micro (Silicon Labs)
EnerSys
enmo Technologies
EnOcean
EPC
EPCOS
Epos / RF360
Epson
Equinox Technologies
EREM
ERP Power
Espressif Systems
Essentra Components
ESTA / Vishay
E-Switch
E-T-A
Ethertronics
Eupec (Infineon)
Eveready (Energiizer Battery Company)
Everlight Electronics
Everspin Technologies, Inc.
Exar Corporation

Excelitas Technologies
Excelsys Technologies Ltd.
Exttech
E-Z-Hook
Fairchild (ON Semiconductor)
Fair-Rite Products Corp.
Fan-S Division / Qualtek
Electronics Corp.
Fanstel Corp.
FCT Electronics - a Molex company
FDK America
Fedco Batteries
FERROXCUBE
Finisar Corporation
FIT (Foxconn Interconnect Technology)
Flamar - a Molex company
FLEMB
FLEX
FLIR
Formica Optoelectronics Inc.
Fox Electronics
Foxconn Optical Interconnect
Technologies
Free2move
Freescale Semiconductor, Inc.
(NXP Semiconductors)
Fremont Micro Devices
FTDI (Future Technology Devices
International, Ltd.)
Fujitsu Electronics America, Inc.
Furuno (Kaga Electronics USA)
Future Designs, Inc.
Future Technology Devices
International, Ltd.
GainSpan Corporation
GC Electronics
GE Critical Power
General Cable
General Semiconductor (Vishay)
GeneSiC Semiconductor
Genuino (Arduino)
GHI Electronics, LLC
Global Power Technologies Group
Global Specialties
GlobTek, Inc.
Grayhill, Inc.
Greenlee Communications
GWConnect - a Molex company
H&D Wireless
H.G. Schaevitz, LLC / Alliance
Sensors Group
Hamlin / Littelfuse
Hammond Manufacturing
HARTING
Harwin
HDP Power
Heatron
Helium
HellermannTyton
Henkel/Loctite
Henrich Electronics Corporation
Heraeus Sensor Technology USA
Hillcrest Labs
HiRel Systems / Vishay
Hirose
Hirschmann
Hittite (Analog Devices)
HMS Industrial Networks
Hoffmann
Hologram
Holsworthy Resistors /
TE Connectivity
Holt Integrated Circuits, Inc.
Honeywell Aerospace
Honeywell Sensing and Productivity
Solutions
I/O Interconnect
IAR Systems Software Inc
ICCNextergy (Inventus Power)
IDEC
IDT (Integrated Device Technology)
II-VI Marlow
Illinois Capacitor
ILLUMRA
Industrial Fiber Optics, Inc.
Infineon Technologies
Initial State Technologies, Inc.
Innovasic Semiconductor /
Analog Devices, Inc.
Inolux
Inphi
Insight SiP
Insignis Technology Corporation
Inspired LED
Integrated Device Technology (IDT)
Integrated Silicon Solution, Inc. (ISSI)
Intel
Intermatix
Interconnect Systems -
a Molex company
Interlink Electronics
International Rectifier (Infineon
Technologies)

Intersil (Renesas Electronics
America)
InvenSense / TDK
Inventek Systems
Inventus Power
Io Audio Technologies
IQD Frequency Products
IR (Infineon Technologies)
IRC / TT Electronics
IRTOUCH Systems Co., Ltd.
Isocom Components
ISSI (Integrated Silicon Solution, Inc.)
ITT Cannon, LLC
ITT Interconnect Solutions
ITW Chemtronics (Chemtronics)
IXYS Corporation / Littelfuse
IXYS Integrated Circuits Division
IXYS RF
J.W. Miller / Bourns
JAE Electronics, Inc.
Jauch Quartz
Jinlong Machinery & Electronics
Co. Ltd.
JKL Components Corporation
Johanson Dielectrics, Inc.
Johanson Manufacturing
Johanson Technology
Johnson / Cinch Connectivity
Solutions
Jonard Tools
JRC Corporation / NJRC
JST
Judco Manufacturing, Inc.
Kaga Electronics USA
Kavlico Pressure Sensors /
Sensata Technologies
Keil (ARM)
KEMET
Kennedy Labs
Kester
Keystone Electronics Corp.
Khatod
Kilo International
Kilovac Relays / TE Connectivity
Kingbright
Kings (Winchester Electronics)
Kionix
Kitronik
Klein Tools
Knowles
Knowles DLI
Knowles Johanson Manufacturing
Knowles NOVACAP
Knowles Syfer
Knowles Voltronics
KYOCERA Corporation
Kyocera Display
L3 Narda-MITEQ
Laird
Laird - Antennas
Laird - EMI
Laird - Signal Integrity Products
Laird Connectivity
Laird Connectivity (LSR)
Laird Thermal Materials
Lantronix
LAPIS Semiconductor
Lattice Semiconductor
Leader Tech Inc.
LeCroy (Teledyne LeCroy)
LED Engin
LEDdynamics, Inc.
LEDIL
LEM USA, Inc.
LEMO
Lighting Science
Lime Microsystems
Linear Technology / Analog Devices
Link Labs
Linx Technologies
Lite-On, Inc.
Littelfuse
LMB Heeger, Inc.
LOCTITE / Henkel
Logic PD, Inc.
Logical Systems
LTW (Amphenol LTW)
LulzBot
Lumberg Automation
Lumex, Inc.
Lumileds
Luminary Micro / Texas Instruments
Luminus Devices
Luna Optoelectronics
Luxo
MACOM Technology Solutions
Macraigor Systems LLC
Macronix
Maestro Wireless Solutions
Mag-LED Solutions
Magnasphere Corp.
Makeblock

Mallory Sonalert Products
 Marktech Optoelectronics
 Marlow Industries, Inc.
 Martel Electronics
 Marutsulec
 Master Appliance Corp.
 Matrix Orbital
 MaxBotix Inc.
 Maxim Integrated
 MaxStream (Digi International)
 Maxwell Technologies, Inc.
 MCB Industrie / Vishay
 McGraw-Hill Education
 MEAN WELL
 Measurement Specialties /
 TE Connectivity
 MEC switches
 Mechatronics
 MegaChips
 Melexis
 Memory Protection Devices
 MEMSIC
 Menda/EasyBraid
 Mentor Graphics
 Metelics (MACOM Technology
 Solutions)
 METZ CONNECT
 MG Chemicals
 Micrel / Microchip Technology
 Micrium
 Micro Commercial Components (MCC)
 Microchip Technology
 microEngineering Labs Inc.
 Micro-Measurements (VPG
 Micro-Measurements)
 Micron Technology
 Micronas / TDK
 Microsemi
 Microwave Technology
 Midcom / Wurth Electronics
 Mide Technology
 Midwest Microwave / Cinch
 Connectivity Solutions
 MikroElektronika
 Mill-Max
 Mills / Vishay
 Milwaukee / Vishay
 MITEQ, Inc. (L3 Narda-MITEQ)
 MMB Networks
 Molex
 Molex Affinity Medical Technologies
 Molex Beau Interconnect
 Molex Brad Harrison
 Molex FCT Electronics
 Molex Flamar
 Molex GWConnect
 Molex Interconnect Systems
 Molex NuCurrent
 Molex Oplink Communications, LLC.
 Molex Phillips-Medisize
 Molex PolyMicro Technologies
 Molex Temp-Flex
 Molex Woodhead
 Monnit
 Monolithic Power Systems
 MPD (Memory Protection Devices)
 MPS (Monolithic Power Systems)
 Mueller Electric Co.
 Multicore / Henkel
 Multi-Tech Systems, Inc.
 Murata Electronics
 Murata Power Solutions
 Nakagawa Manufacturing USA, Inc.
 National Semiconductor /
 Texas Instruments
 Navman Wireless (Telit)
 NDK
 Nearson
 Neohm Resistors / TE Connectivity
 Neonode
 Nesscap Co., Ltd
 NetBurner, Inc.
 Newaya Technology
 Newhaven Display, Intl.
 Nexperia
 Nichicon
 Nidec Copal Electronics
 NimbleLink
 Nippon Chemi-Con
 NJR Corporation / NJRC
 NKK Switches
 NMB Technologies Corp.
 NorComp
 Nordic Semiconductor
 NOVACAP
 NovaSensor / GE Measurement &
 Control
 NuCurrent - a Molex company
 Nuvoon Technology Corporation
 America
 NVE Corporation

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

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

Sumida Corporation
 SunLED
 Sunon
 Susumu
 SV Microwave (Amphenol SV
 Microwave)
 Swanstrom Tools
 Swissbit
 Switchcraft / Conxall
 Syfer
 Synapse Wireless
 System-On-Chip Technologies
 Tag-Connect
 Taica Corporation
 Taitien
 Taiwan Semiconductor
 Taiyo Yuden
 Talemia
 Tallysman Wireless
 Talon Communications, Inc.
 Tamura
 Taoglas
 RPM / ams
 TDK Corporation
 TDK InvenSense
 TDK Micronas
 TDK RF360
 TDK Tronics (Tronics)
 TDK-Lambda Americas, Inc.
 TE Connectivity
 TE Connectivity Aerospace Defense
 and Marine
 TE Connectivity ALCOSWITCH
 Switches
 TE Connectivity AMP Connectors
 TE Connectivity Corcom Filters
 TE Connectivity DEUTSCH
 DEUTSCH CONNECTORS
 TE Connectivity DEUTSCH
 INDUSTRIAL & COMMERCIAL
 TRANSPORTATION
 TE Connectivity Measurement
 Specialties
 TE Connectivity Potter & Brumfield
 Relays
 TE Connectivity Raychem Cable
 Protection
 TE Connectivity Raychem Circuit
 Protection / Littelfuse
 TE Connectivity's Agastat Relays
 TE Connectivity's Axicom Relays
 TE Connectivity's Buchanan
 Terminal Blocks
 TE Connectivity's CGS Resistors
 TE Connectivity's CII
 TE Connectivity's Elcon Connectors
 TE Connectivity's Holsworthy
 Resistors
 TE Connectivity's Kilovac Relays
 TE Connectivity's Neohm Resistors
 TE Connectivity's OEG Relays
 TE Connectivity's Products Unlimited
 Transformers & Relays
 TE Connectivity's Q-Cee's
 TE Connectivity's Schrack Relays
 TE Connectivity's Sigma Inductors
 Teccor / Littelfuse
 Techflex
 TechNexion
 Techno / Vishay
 Techspray
 TechTools
 Telcodium
 Teledyne LeCroy
 Telit
 Temp-Flex - a Molex company
 Tensility International Corporation
 Terasic Technologies
 Test Products International (TPI)
 TEWA Sensors LLC
 Texas Instruments
 t-Global Technology
 Thales Visionix, Inc.
 Thermometrics / GE Measurement
 & Control
 ThingMagic, a JADAK Brand
 Thinextra Solutions Limited
 Thomas Research Products
 TinyCircuits
 TOKO / Murata
 Torex Semiconductor Ltd.
 Toshiba Memory America, Inc.
 Toshiba Semiconductor and Storage
 Touchstone Semiconductor
 TPI (Test Products International)
 TPK America LLC
 TRACO Power

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



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Buyers' Guide

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



**MOUSER
ELECTRONICS**



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INSTRUMENTS**

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Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ICs & SEMICONDUCTORS (continued)											
ANALOG DEVICES INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	52,308	N/A	£0	73.79%	150	3500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,500	N/A	£0	83.00%	50	1,500+	Y
Atmel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,700	N/A	£0	58.00%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
AVAGO TECHNOLOGIES US INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	16,512	N/A	£0	91.38%	150	3500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
CYPRESS SEMICONDUCTOR CORP	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	27,423	N/A	£0	92.54%	150	3500+	Y
DIGI INTERNATIONAL	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	4,355	N/A	£0	95.30%	150	3500+	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
DIODES INCORPORATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	38,292	N/A	£0	90.02%	150	3500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescal Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
FTDI	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	569	N/A	£0	100.00%	150	3500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	97%	50	1,500+	Y
Infineon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
INFINEON TECHNOLOGIES	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,850	N/A	£0	93.70%	150	3500+	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,479	N/A	£0	77.62%	150	3500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,200	N/A	£0	67.00%	50	1,500+	Y
MAXIM INTEGRATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	68,021	N/A	£0	78.22%	150	3500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
MICROCHIP TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	86,517	N/A	£0	86.12%	150	3500+	Y
Microsemi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	40%	50	1,500+	Y
NEXPERIA USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,513	N/A	£0	99.29%	150	3500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	36,258	N/A	£0	93.55%	150	3500+	Y
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	Y
ON SEMICONDUCTOR	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	87,298	N/A	£0	85.61%	150	3500+	Y
Power Integrations	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	Y
Rohm	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	Y
ROHM Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	55.00%	50	1,500+	Y
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	Y
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
SILICON LABORATORIES INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	19,667	N/A	£0	96.54%	150	3500+	Y
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	99%	50	1,500+	Y
STMICROELECTRONICS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,201	N/A	£0	97.79%	150	3500+	Y



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ICs & SEMICONDUCTORS (continued)											
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
TEXAS INSTRUMENTS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	180,012	N/A	£0	91.94%	150	3500+	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
Vishay	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.71%	150	3500+	Y
XILINX INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	8,213	N/A	£0	51.46%	150	3500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
3M	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	62,421	N/A	£0	93.42%	150	3500+	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
AMPHENOL RF DIVISION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	443,368	N/A	£0	75.92%	150	3500+	Y
Anderson Power Products	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	82%	50	1,500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
HIROSE ELECTRIC CO LTD	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,215	N/A	£0	90.98%	150	3500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
IATW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100.00%	6	38	Y
JAE Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,200	N/A	£0	32%	50	1,500+	Y
JST SALES AMERICA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	5,109	N/A	£0	84.32%	150	3500+	Y
Kycon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	99%	50	1,500+	Y
LEMO	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	65%	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	16,900	N/A	£0	75%	50	1,500+	Y
MOLEX, LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	120,034	N/A	£0	97.98%	150	3500+	Y
Neutrik	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,000	N/A	£0	99.00%	50	1,500+	Y
PHOENIX CONTACT	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	54,845	N/A	£0	99.99%	150	3500+	Y
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
SAMTEC INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	427,448	N/A	£0	99.99%	150	3500+	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y
OBSOLESCENCE / HARD TO FIND											
	America II Europe	01462 707070	www.americaieurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y



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OPTO ELECTRONICS											
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,800	N/A	£0	99%	50	1,500+	Y
VCC	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	92%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	99%	50	1,500+	Y
PASSIVES											
ABRACON LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	41,991	N/A	£0	100.00%	150	3500+	Y
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
AVX CORPORATION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	70,131	N/A	£0	89.28%	150	3500+	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
BOURNS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,314	N/A	£0	82.47%	150	3500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Coilcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
HONEYWELL MICROELECTRONICS & PRECISION SENSORS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,560	N/A	£0	89.87%	150	3500+	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	101,257	N/A	£0	91.57%	150	3500+	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
LITTELFUSE INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,517	N/A	£0	91.54%	150	3500+	Y
Murata	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	66,179	N/A	£0	99.79%	150	3500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
NICHICON	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,747	N/A	£0	96.70%	150	3500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y
Panasonic	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	154,777	N/A	£0	94.42%	150	3500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
Rohm	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	Y
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TAIYO YUDEN	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	21,540	N/A	£0	99.97%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
TT Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	32,800	N/A	£0	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	13,900	N/A	£0	99.00%	50	1,500+	Y
Vishay	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.71%	150	3500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
Würth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
WURTH ELECTRONICS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,733	N/A	£0	100.00%	150	3500+	Y



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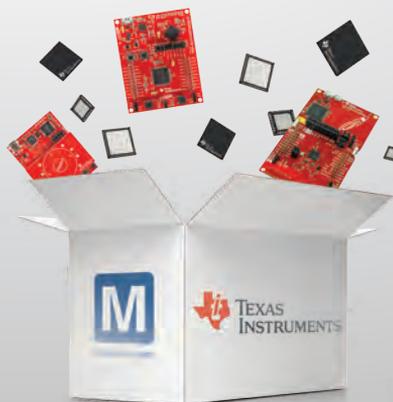
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Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
PASSIVES (continued)											
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	147,833	N/A	£0	84.31%	150	3500+	Y
POWER & BATTERIES											
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
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
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

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
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	Y	2,900	N/A	£0	N/A		1,500+	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	86.00%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

Contract Manufacturers Buyers' Guide

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

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Contract Manufacturers Buyers' Guide (continued)

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead-Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Electronic Technicians Ltd	01202 897722	www.etuk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Elite Electronic Systems Ltd	028 6632 7172	www.elitees.com	£20m	UK	200	5	ISO9001, ISO13485, UL, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Fabrinet UK	01249 814081	www.fabrinetuk.co.uk	£21m	UK/Thailand/US	210	5/31/2	AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001, ISO14001, IPC-A-610	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC-J-STD-001, IPC7711/7721, BS EN 61340-5-1 (ESD)	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 798294	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	6	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2011 ATEX, IPC-A-610 Class3	Y	Y	Y	Y	Y	Y
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iEW.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£8m	UK	80	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, (Certified IPC Trainer IPC-A-610, J-STD-001 & J-STD-001, Space Addendum)	Y	Y	Y	Y	Y	Y
JJS Manufacturing Ltd	01455 555500	www.jjsmanufacturing.com	£35m	Bedford, Luttenworth, (CZ)	420	3	ISO9001:2015, ISO14001:2015, IPC 610 A class 2&3	Y	Y	Y	Y	Y	Y
Lacon Electronic	+44 (0) 7836 338122	www.lacon.de/en	£50m	Germany/Romania	500	13	ISO9001, ISO14001, ISO13485, TS16949, OHSAS18001, VG96927, UL	Y	Y	Y	Y	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£13.4m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y
NOTE	01453 797580	www.note.eu	£100m	UK/EU/China	1,000	14	ISO9001, 13485, 14001, 18001, IPC-610 Class 3	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001-2008/IPC-A-610 Class 3/WHMA-620/ISO14001-2004/IPC-7711/7721	Y	Y	Y	Y	Y	Y
Pektron	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, IPC-A610	Y	Y	Y	Y	Y	Y
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£95m	Havant/Global	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£6m	SE	60	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
Speedboard Assembly Services	01753 746700	www.speedboard.co.uk	£12.8m	Windsor, SE	99	4	IPC610 to Class 3, ISO9001:2015	Y	Y	Y	N	Y	Y
Tenkey Electronics Ltd	01903 855455	www.tenkeyco.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£14.5m	SE	126	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£15m	Derby	110	6	ISO 9001:2015, ISO 13485:2016, IPC 610, IPC 7711/7721	Y	Y	Y	Y	Y	Y
Trojan Electronics Limited	01792 469020	www.trojanelectronics.co.uk	£2m	South Wales	20	2	BS EN ISO 9001 2008, ISO 14001 2007	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	4	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

PCB Buyers' Guide

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

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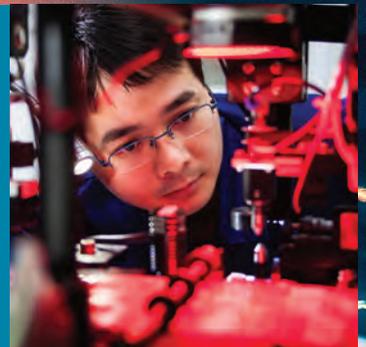
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