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ANNUAL EDITION 2020

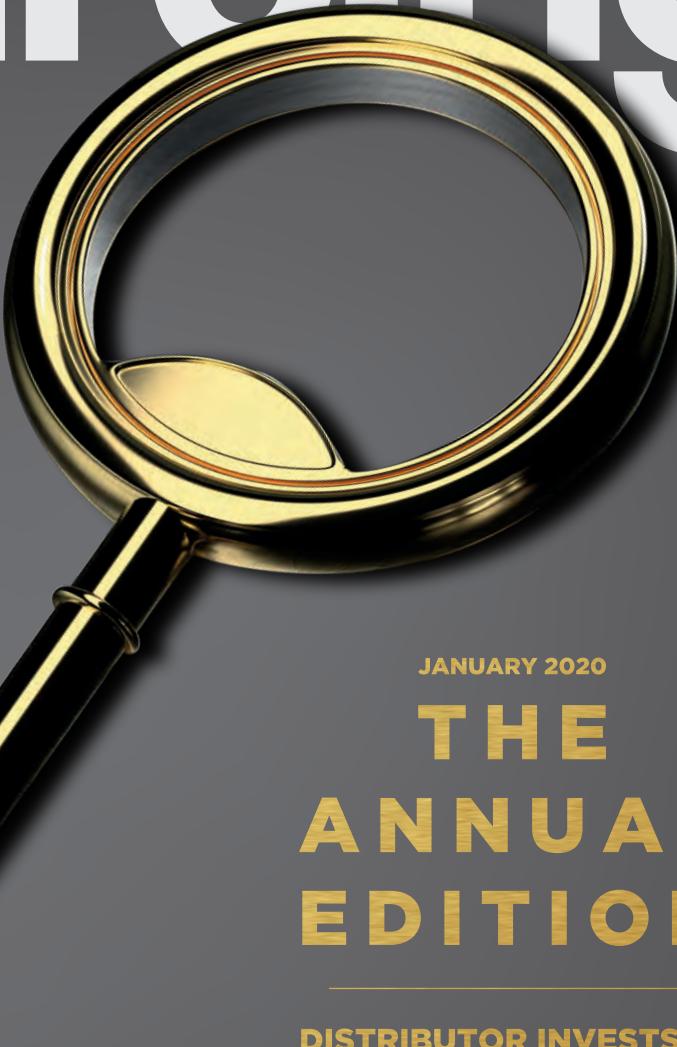
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AND MANAGEABLE

GOOD ADVICE: SHORT
AND SIMPLE

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2020



JANUARY 2020

THE
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On the cover – January 2020 The Annual Edition

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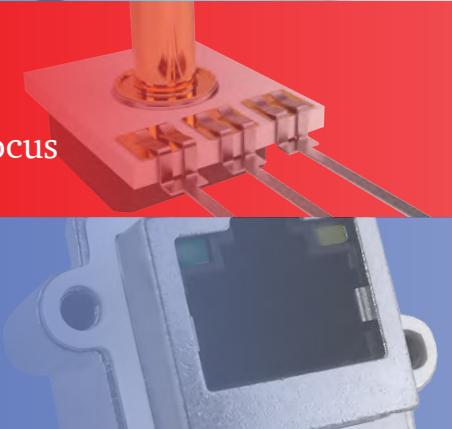
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PUBLISHING LIMITED

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Issue 175, Vol 16 No 01
Published 12 times per year
by MMG Publishing Limited
ANNUAL SUBSCRIPTION:
EU Countries £60 Rest of World £90

MMG PUBLISHING LTD
Suite 2.1-3 Warren Court, Park Road,
Crowborough, East Sussex TN6 2QX
Tel: +44 (0)1892 613400
Fax: +44 (0)1892 613402
@Electrosourcing

Printed by: Pensord Press Ltd
Electronics Sourcing is printed on
sustainably sourced paper stock
ISSN 2043-9504
© 2020 MMG Publishing Ltd



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Editor's Word



Connectors: give them the respect they deserve

I've taken to binge-watching YouTube videos. My latest excursion is a channel called DiagnoseDan. Dan diagnoses faulty cars and fixes them. What makes this interesting and useful is that Dan tends to be the customers' last hope after other dealerships and independent specialists have given up. As an engineer, watching Dan's diagnostic process is fascinating. The rule is always expect the unexpected.

The reason that I'm writing about Dan is that too often, what appears to be a faulty assembly (circuit board assembly, module, motor etc) turns out to be nothing more than a broken connector or wire. If it's not a connector or wire, it's probably a sensor.

To me this is fascinating given that one of the first engineering articles I wrote, some 30-years ago, was about automotive reliability, with the data suggesting that at the time 90 per cent of vehicle vaults were related to wiring and connectors. Somethings never seem to change.

So, as a buyer, may I suggest you give the lines on the bill-of-materials which list connectors and wiring the respect they deserve. This is even more important given that connectors are now just as likely to be carrying signals as power.

Not all connectors and wires are created equally so take care when the thought of switching to a cheaper product looks appealing. Don't take my word for it, watch Dan at work and make your own mind up.

Jon Barrett

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www.electronics-sourcing.co.uk

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ELECTRIFICATION DRIVING CHANGE



Charging ahead with green EVs

UK manufacturer, Convert, has secured an order to design and produce cable assemblies to power all terrain quad bikes for Aspire Engineering, a specialist in sustainable engineering solutions. Aspire will convert the quad bikes, which are run on petrol/diesel into a 100 per cent electric vehicle for quad bike company, EcoCharger Quads.

Set to produce assemblies for 100 quad bikes a year, Convert will manufacture 28 cable assemblies for both two-wheel drive and four-wheel drive quad bikes. The cable assemblies vary in complexity and wire size and support two applications; one is the main control system and the other is to support the connection of the batteries to run the bike via the control system motor.



Distributor invests in component life extension

Specialist distributor, Charcroft Electronics, has extended its in-house value-add engineering capabilities. In addition to existing manufacturing capabilities, Charcroft has created a new department of engineers to address bespoke manufacturing projects. Along with investment in a new facility, this enables the team to work on prototypes and development and extends the storage available for stocks.

With design support available from its team of engineers and technical specialists, Charcroft can offer life extension to parts by helping to manage process obsolescence. The company's previous offering of custom passive assemblies, flying lead options, printing and labelling has now been extended to include additional capabilities such as specialist technical solutions, design support, low production volumes and prototype builds.

www.charcroft.com

The quadbikes have been sold to end users all around the world and have also been bought by the National Trust and RSPB as they are environmentally beneficial and animal friendly thanks to the low noise level.

Director of Aspire Engineering, Ian Briggs, commented: "Convert's attention to detail when it comes to the design and manufacture of cable looms and harnesses is second to none. It's great to be involved in a project that champions green transport."

www.convertltd.co.uk



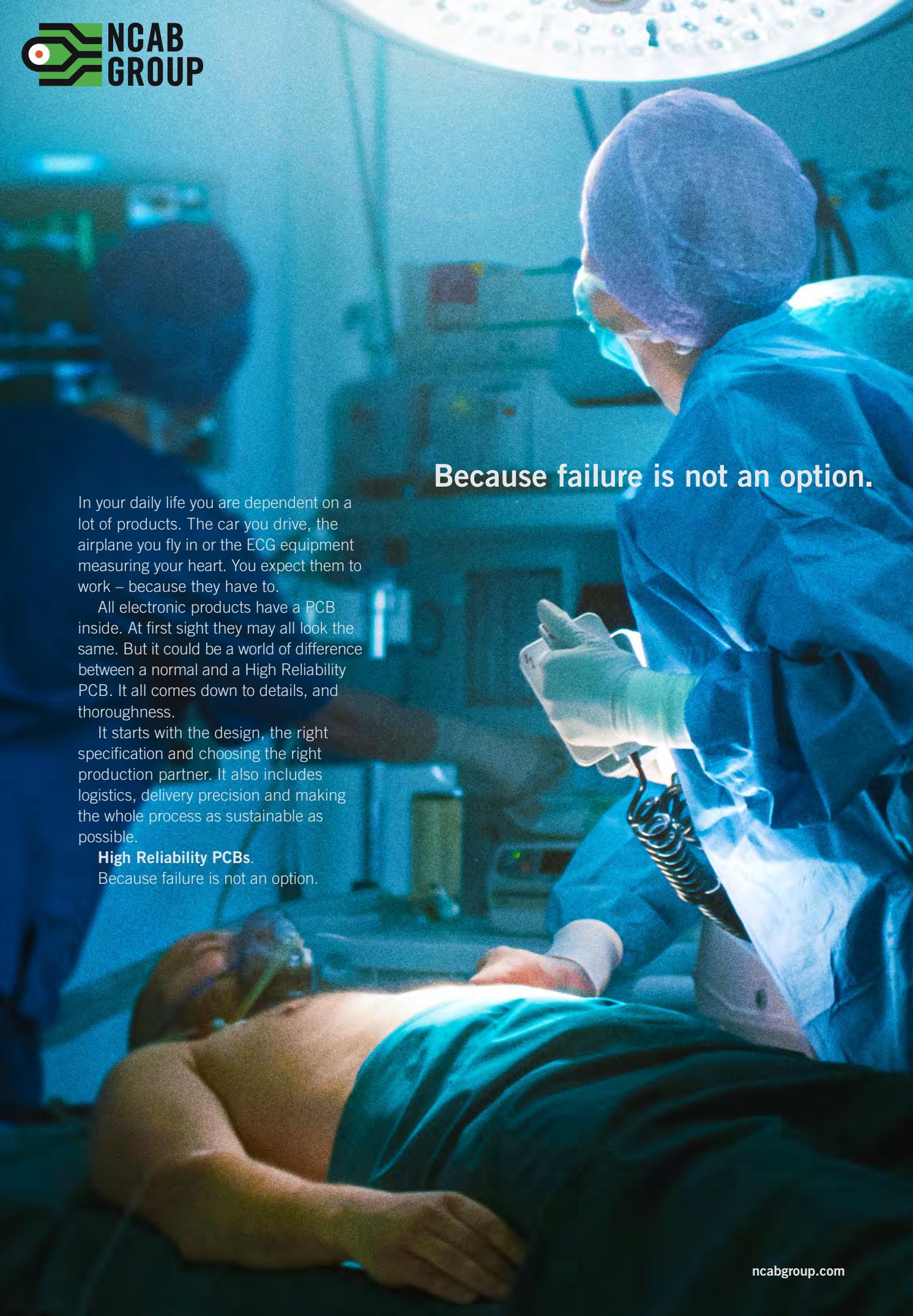
Agreement delivers the perfect price tag

Rutronik and Chinese manufacturer of Bluetooth technologies, Shenzhen Minew Technologies, have entered into a worldwide distribution agreement. By adding Minew's products to its range, Rutronik can now offer a selection of beacons and e-paper displays for pricing and product information.

The agreement adds interesting options to Rutronik's existing range of Bluetooth 5.1-based modules with integrated antennas or IPEX antenna connectors. It also provides excellent procurement logistics due to the expanded network of warehouses and the ability to purchase additional products from a single source, from small sensors to large servers.

Director product marketing embedded and wireless at Rutronik, Bernd Hantsche, said: "Minew already has an excellent reputation in Asia, especially with beacons and price tags. Since all its products are also approved for use in Europe and America, we want to help Minew increase its profile globally."

www.rutronik.com



Because failure is not an option.

In your daily life you are dependent on a lot of products. The car you drive, the airplane you fly in or the ECG equipment measuring your heart. You expect them to work – because they have to.

All electronic products have a PCB inside. At first sight they may all look the same. But it could be a world of difference between a normal and a High Reliability PCB. It all comes down to details, and thoroughness.

It starts with the design, the right specification and choosing the right production partner. It also includes logistics, delivery precision and making the whole process as sustainable as possible.

High Reliability PCBs.

Because failure is not an option.

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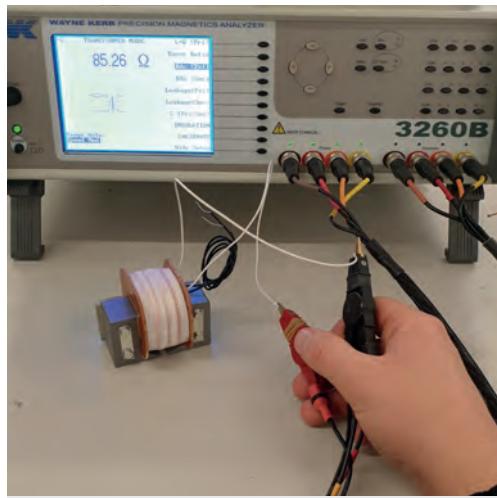
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Investment extends high power transformer offering

UK manufacturer of transformers and other wound components, SIGA Electronics, is to invest in its Bedfordshire site, increasing manufacturing capacity and broadening the range of magnetic solutions it can offer.

SIGA has invested in a larger bobbin winding machine, which can wind heavier gauge wire and copper strip, allowing it to offer larger transformers with a higher current carrying capacity and higher power ratings. SIGA has also purchased a precision magnetics analyser to enhance the speed and throughput of its quality control process.

www.sigatransformers.com

One-stop smart-factory shop

RS Components has expanded its range of products from factory automation manufacturer Festo to include over 17,000 individual items. The new introductions span Festo's most popular pneumatic and electrical device families, including cylinders, actuators, valves and pneumatic air preparation products.

Significantly, RS will now be able to offer many of Festo's latest technology releases, such as VUVS pneumatic solenoid valves and SOOE and SOOE photoelectric sensors. These laser and LED opto-electronic sensor product lines include diffuse sensors with background suppression, through-beam sensors, retro-reflective sensors, retro-reflective sensors



Hub set to ignite IoT growth

Sensor City, a global hub for the development of sensor technology and rapid prototyping, has launched a new initiative to support businesses with challenges relating to internet of things implementation. The initiative, which is aimed at supporting UK businesses to design, develop, and implement sensor and IoT technologies, will provide access to technical expertise and laboratory facilities.

Primarily aimed at scale-up businesses, membership is available in three different package options: the Network package for businesses that want to create a wider network of experts and collaborators, the Technical package for businesses looking to progress their product development and prototyping using Sensor City's lab facilities, and the 360° Growth Package, which combines the two.

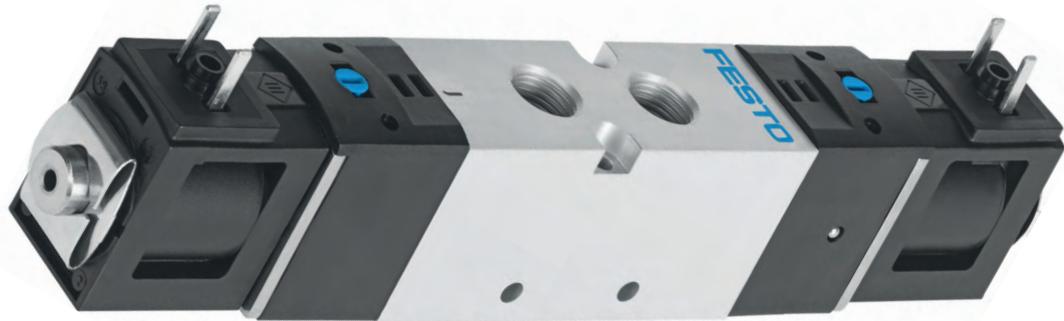
The initiative also sees the launch of Sensor City's new 2020 Guide to IoT Adoption, containing expert advice, tips and guidance for businesses looking to realise their IoT projects.

www.sensorcity.co.uk

for transparent objects, and laser contrast and distance sensors. They are suitable for a variety of object detection tasks, especially in confined spaces.

Vice president of industrial automation and control at RS, Kristian Olsson, said: "The 10,000+ new products we have added to our Festo range represent a major expansion of our factory automation and smart manufacturing capability. As a one-stop Festo shop, we can offer machine builders over 17,000 devices from a single supplier, saving them both time and money."

uk.rs-online.com/web



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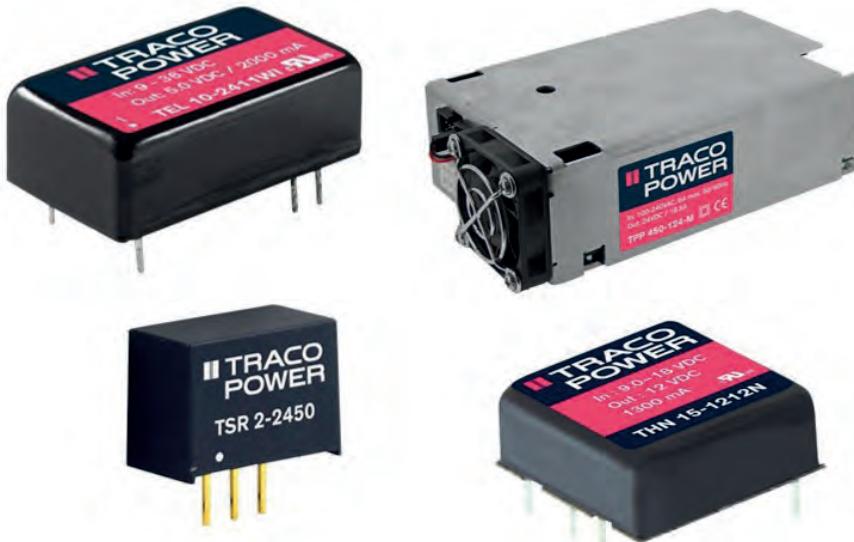
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Rugged power products for next day delivery

Farnell is now shipping new products from Traco Power with all models available in low order quantities for customers building industrial, medical and automotive designs. Customers in Europe can also receive Traco Power products with next day delivery.

The range includes industrial and medical DC/DC converters from one to 300W, AC/DC PCB mounted converters as well as AC/DC open frame and enclosed DIN-Rail power supplies from five up to 1000W. These products are most commonly used to develop control and automation applications as well as medical devices, transport systems and IoT applications that require high reliability, miniaturised design, a wide operating temperature and maintenance-free application.

Traco Power's rugged DC/DC converters are ideal for transportation applications, from door openers and communications equipment to the control of drives, brakes, switches and signal systems. These products can also be used for applications exposed to harsh and dangerous environments.

Global head of IP&E at Farnell, Simon Meadmore, said: "We have close to 3,500 Traco Power products in stock and support customers with 24/7 technical support and next day delivery."

www.farnell.com

Group has cabling all tied up

FS Cables will now be part of a Cables and Cable Accessories Group at Diploma. The new CCA group, which will combine the management of Cablecraft and FS Cables, is expected to provide an enhanced service offering.

Having acquired Cablecraft and subsequently FS Cables, Diploma's controls businesses supply specialised wiring, cable, connectors, fasteners and control devices for a range of technically demanding applications.

Smartphone buyers choose AMOLED

More than 50 per cent of smartphones sold worldwide in 2023 will employ active-matrix organic light-emitting diode display technology, up from about 30 per cent in 2019, according to IHS Markit Technology.

Due to their advantages in flexibility, image quality and power consumption, AMOLEDs are rapidly claiming market share from the incumbent display technology in the smartphone market, TFT-LCD.

Senior director, small-medium displays at IHS Markit Technology, Hiroshi Hayase, explained: "With the global smartphone business mired in a state of saturation, sales growth has stalled. As a result, smartphone brands began to focus on 5G models to drum up sales. However, with 5G constrained by limited service deployments, the brands have shifted their focus toward improving the appeal of these devices by offering models featuring AMOLED technology."

All the major smartphone brands have offered high-end models equipped with AMOLED displays in 2019. As a result, AMOLED shipments to the smartphone market are expected to total 486 million units in 2019, despite a one per cent decline in overall smartphone display shipments for the year. Total AMOLED shipments are forecast to rise to 825 million units in 2023.

www.ihsmarkit.com

CCA group managing director, Mark Taylor, said: "It's very much business as usual for both FS Cables and Cablecraft. By bringing the businesses together, sharing market knowledge, best practice and expertise, we will increase our potential to further improve our product offerings, service levels and operational performance. Customers from both companies will also benefit from access to specialist cabling and cable accessories from a single source."

www.cablecraft.co.uk

Easy access to custom magnetics

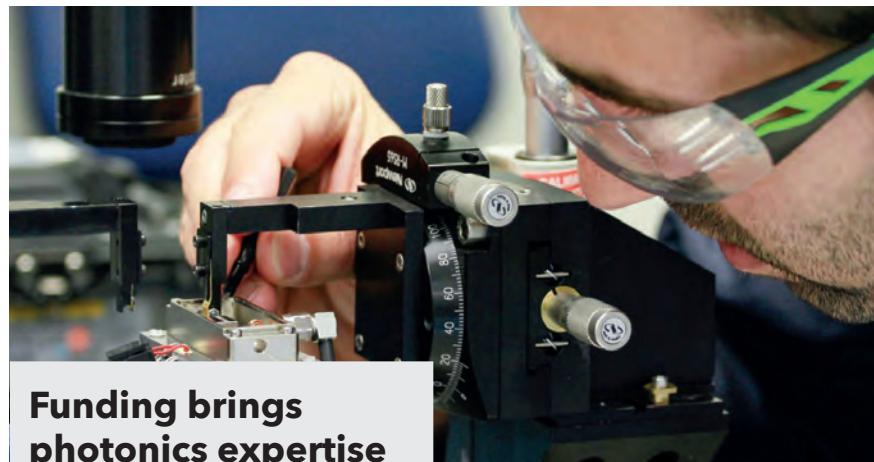
Acal BFi has added Champs Technologies to its magnetics portfolio, thereby strengthening its range to include high efficiency, low profile planar transformers and inductors. Products in the range are designed to reduce space requirements and leakage inductance while increasing power density and overall performance.

The Champs range is backed by Acal BFi's expertise in supporting customers with transformer and inductor design. Services range from initial concept, through to selecting and trialling technologies, up to the creation of prototypes and production samples.

Operating in ten countries across Europe, Acal BFi enables customers to quickly access local support with an in-house team of engineers offering a range of services for magnetic component design and production.

Chief executive officer at Champs Technologies, Harold Eicher, said: "With Acal BFi's focus on customised and specialist components, we have found the ideal partner to support our customers across Europe. Their magnetics portfolio, backed by in-depth expertise in creating custom components or tailoring products to an application's exact specifications, adds significant value and gives customers a great advantage."

www.acalbfi.com



Funding brings photonics expertise

Under a funding programme created to encourage foreign owned companies to expand and relocate in Torbay, the region's EPIC lab and clean room facilities could see interest from US-based electronics and photonics companies.

The Invest in Torbay 'soft landings' package offers foreign owned SMEs up to £10,000 to relocate all or part of their company to Torbay. TDA is working with several foreign owned companies to support investment and in February, will attend the Photonics West trade show to develop further relationships with US photonics clusters.

EPIC centre director, Wayne Loschi, said: "EPIC is a brand new centre which provides over £1m of specialist equipment within its prototyping suite,

including both wire and die bonders and a scanning electron microscope. EPIC also has a dedicated ISO7 classified cleanroom, purpose-built labs and modern offices for lease."

Investment development manager at TDA, Jason Buck, added: "The Torbay region has strengths in robust and resilient photonics and microelectronics. This is built on experience in the aerospace, military and marine sectors which are also key regionally. The capabilities within the region will drive development of sensors and systems for autonomous vehicles as well as technologies to meet the increasing global demand for bandwidth, content storage and data consumption."

www.investintorbay.com/soft-landings
www.tda.uk.net



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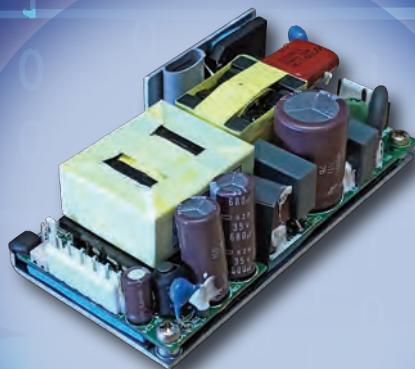
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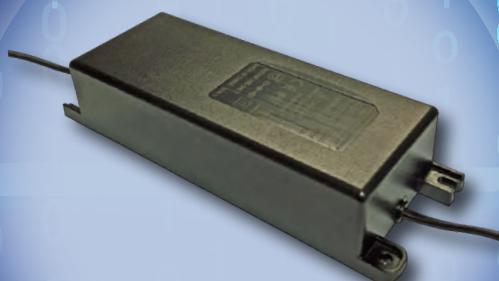
High Density DC-DC from
50 Watts to 600 Watts



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Don't let a part number hold you back

Buyers in search of specifications beyond standard datasheet values can take advantage of Rhopoint Components' diverse range of customisable electronic components and sensors

With a selection of over 25 brands and several new product ranges added to Rhopoint Components' portfolio in 2019, the company has taken steps towards serving the ever-growing demand for customised solutions in the electronics industry.

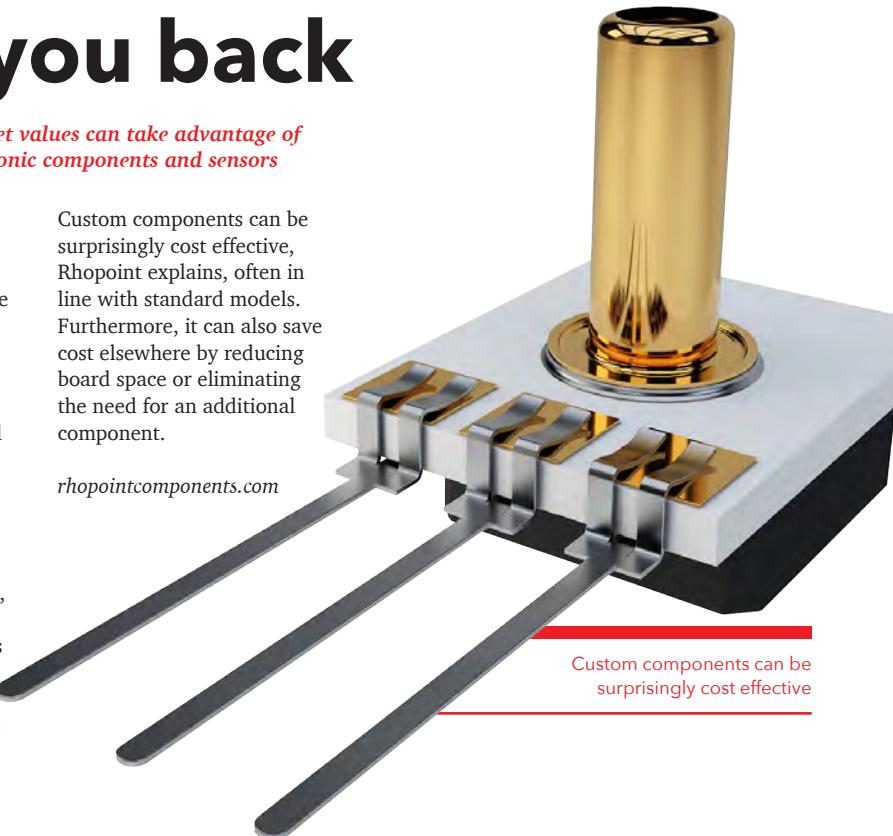
Quite simply, size matters. Designed-in components must fit the allocated space while providing the exact specification required. Off-the-shelf products cannot satisfy this demand – the choice is simply insufficient and using a close-enough part often means a compromise elsewhere.

Rhopoint Components represents selected manufacturers who can satisfy this market shift while still serving those industries where flexibility and high quality remain important such as medical, scientific instrumentation, and oil and gas, to name a few.

Whether buyers are looking for an unusual package, resistance value, tolerance beyond the datasheet values, or specialist terminations, Rhopoint Components offers a solution. Customisation is an option for most of its passive and active electronic components as well as pressure, temperature and liquid level sensors.

Custom components can be surprisingly cost effective, Rhopoint explains, often in line with standard models. Furthermore, it can also save cost elsewhere by reducing board space or eliminating the need for an additional component.

rhopointcomponents.com



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 **RHOPOINT**
COMPONENTS

A small key that will open a large door

With a commitment to providing the highest quality electronics manufacturing services, UK CEM, Key-Tech Electronic Systems, aims to prioritise customer service and satisfaction in everything it does

Keen to tailor a service model to meet customers' technical and commercial requirements, Key-Tech has recently invested in a second surface mount line using the latest placement equipment from Yamaha. Described as 'best in class', the new Z:LEXYSM20 system can place components as small as 03015 or as large as a 100 by 28mm high connectors with a placement accuracy of $\pm 0.025\text{mm}$. Following this investment, Key-Tech can place up to 120,000 components per hour between its two SMT lines.

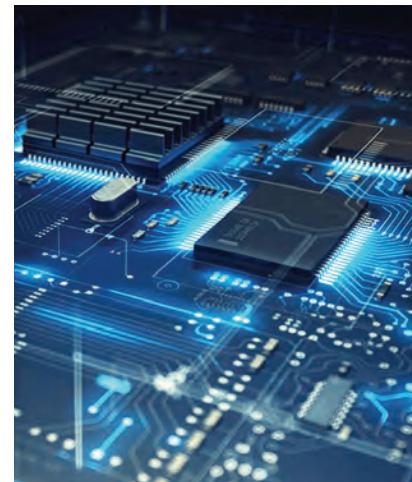
Operating across diverse markets including oil and

gas, rail, medical, security and military, the company boasts over 25 years of experience, backed by investment in technology. This enables support for PCB assembly and electronic product build throughout the complete production life-cycle, from prototypes, to volume production, box build and test.

To this end, Key-Tech maintains a fully accredited quality management system that ensures it uses approved processes and procedures in every area of the business. The company is BS EN ISO 9001:2015 certified and aims to carry out all workmanship

to the highest quality standards with all staff training now based around IPC610, J-STD-001 and IPC 620.

These capabilities see the company able to take on some interesting jobs, including PCB assembly of boards up to 20 layers, double sided, through hole and surface mount PCBs, as well as boards up to 650mm in size. Fine pitch and BGA fine pitch work is supported by various inspection and test technologies including AOI, x-ray and visual inspection, as well as high voltage, soak, flying probe and functional test.



Key-Tech has recently invested in a second surface mount line

As an experienced and diverse contract electronics manufacturer, Key-Tech is happy to offer a no obligation quotation.

www.key-tech.co.uk



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Good advice: short and simple

With the Brexit fog clearing, chief executive officer at Anglia Components, Steve Rawlins, explains why a short and simple supply chain will minimise disruption risks—whatever the cause

Now that we're sure to leave the EU at the end of January what do purchasers need to do to secure their supply chain? Here is my clear prediction for 2020: if there is disruption ahead, it will be down to the weather not because of Brexit.

One of Anglia's biggest advantages has always been that we hold all our inventory on shore here in the UK. It's there, instantly accessible to UK customers whatever the weather, the delays at customs, or the terms of any Brexit deal. We are currently holding a historically high level of inventory, meaning that we might well continue to have inventory when others don't.

Better still, for customers using the Anglia 80/20 inventory management system, this inventory can actually be held at their site. We have been offering customers the opportunity to hold increased levels of inventory at no cost, as the Brexit saga unfolded over 2019. This additional inventory is still invoiced as it is used, eliminating any call on the customer's financial capital. Once confidence returns, it can simply be consumed as required or returned to the Anglia warehouse.

Minimise supply risks

Truthfully, Brexit is one, but not the only, factor exposing the risks of extended, complex supply chains especially when operating on a 'just in time' basis. Centralised European warehouses are in the distributors' interests rather than the customers', allowing them to reduce the

overall level of inventory that they hold. The risk that this creates is all on the customer's side—and is especially severe for UK customers. While it is still possible to ship overland from these warehouses to much of Europe, for the UK, next day delivery means airfreight, which is inherently more vulnerable.

Whatever the market, it is important to maintain transparency. We are open with our customers and publish live inventory levels and lead times on Anglia Live. We can give the best support to customers that are similarly transparent with us, sharing forecasts and where possible committing to scheduled orders. As a privately owned business, Anglia maintains high levels of inventory in proportion to the size of our business and where customers have particular needs, we will increase holdings of critical devices.

We've been coping with shortages and occasional disruption to the supply chain for as long as I've been in the industry and there is no reason why 2020 should be different from any other year. The best way of dealing with any disruption that does occur is to keep your supply chain short, simple and manageable and Anglia is in a great place to help. Have a prosperous New Year.

www.anglia.com

The best way of dealing with disruption is to keep your supply chain short, simple and manageable



Innovation indicates a bright future

CML Innovative Technologies Ltd have been designing and producing lighting solutions for over 80 years. Its optical expertise helps meet complex customer requirements from a variety of industries

With the ability to offer both standard and customised products, CML Innovative Technologies creates lighting solutions for a variety of sectors, including automotive, aerospace, marine, telecoms, petrochemical, gaming and medical. CML's flexibility and programme of continuous improvement helps ensure innovation continues.

Commercial manager Roger Neal explained: "Demand for customer specific indicators and illuminated push buttons has grown significantly in the last 12 months. Reacting quickly to the needs of our customers for both standard and bespoke solutions

with innovation, technical awareness and unrivalled levels of communication has helped ensure that the growth experienced has not compromised delivery lead times. The uncertainty of Brexit and other economic uncertainties globally have highlighted the need for rapid response to customer needs."

Operations manager at Harness Master, Kevin Woodbine, commented: "We approached CML with a brief to provide an indicator solution suitable for both indoor and outdoor applications in a harsh mining environment. CML

interpreted the requirement perfectly and samples were quickly provided that fully met our expectations."

CML's operations manager, Kevin McInerney, added: "Fifty years of meeting automotive industry demands has enabled us to develop lean manufacturing processes and systems that we can apply to other industries. With a stable, flexible, multi-skilled workforce, CML can respond to rapidly changing customer demand with a 'right first time' philosophy."

www.cml-it.com



CML panel mount LED indicators combine the latest technology with proven mechanical and optical expertise



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www.cml-it.com



Overcoming supply chain challenges

Availability bottlenecks look set to continue into 2020 but strong supplier relationships and plenty of market expertise mean contract electronics manufacturer, FermionX is confident

One of the main challenges for the electronics industry in the UK throughout 2019 has been managing supply chains effectively whilst dealing with component shortages.

FermionX senior buyer, Sheena Taylor, explained: "For over a year, there have been bottlenecks in component availability because the supply chain is taking time to catch up with increased demand. The growth of IoT, electric car manufacture, Brexit, global trade disputes and challenging economic times have all contributed to these shortages."

Despite this, Sheena is optimistic for 2020, saying:

"There has definitely been an easing of component supply over the last few months and this looks set to continue into 2020. Increased reshoring, companies just getting on despite Brexit delays and political uncertainty and our long-term relationships with suppliers have all helped. We only use approved vendors to ensure no counterfeit components enter our production cycle and the relationships we have built over the years with our suppliers help support this."

The FermionX team finished 2019 on a high winning 'Best Overall Business' alongside a highly commended in manufacturing and 'Best

Medium Sized Business' award from the company's local Chamber of Commerce.

Managing director, Dan Crothers, explained: "Being recognised in our local community and being able to play a leading role on a local, national and global level has been an incredible end to the year."

What is certain is that contract manufacturing in the UK will continue to face significant challenges into 2020 with market and supply chain uncertainties. The strategic supply chain measures FermionX has in place ensures it is well placed to support customers

through the challenges and opportunities in 2020.

Dan concluded: "FermionX is looking forward to building on our success this year through our manufacturing and global product brands and we have some exciting plans moving into 2020 to ensure we continue to support our customers' growth."

www.fermionx.com



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Investing in process assurance

With new component technologies constantly emerging, it's vital to keep up with acceptance and process standards. Advanced Rework Technology is helping companies do just that with investment in new training facilities

Training in the electronics industry has gone from strength to strength over recent years as companies see the benefit of training staff to understand the latest technologies and acceptance and process documents in this ever-changing industry.

For this reason, ART UK has spent considerable time researching and recruiting new technical trainers to join the team. With a larger custom base in mainland Europe, ART is also proud to announce the opening of Advanced Rework Technology Europe, Leading Edge Training, Bergamo, Italy. As always, ART can train at its sites but is also happy to supply all materials and equipment necessary to train at customer's facilities.

Thanks to continued success over the last few years, ART felt that expanding into Europe was a natural progression in aiding the industry with its consultancy and training needs. A great team is now in place at the new site in Italy, making ART one of the best IPC approved training centres in the world.

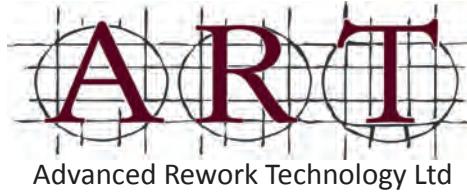
The move is backed by an expanded course portfolio, with ART becoming certified to conduct the Enhanced Certified Interconnect Design, CID+ courses. This makes ART UK one of only two global IPC training centres that can offer all of the IPC training courses.

To accommodate its expanded course list and consultancy services, ART UK has moved into a new purpose-built 10,000ft² facility in Witham, Essex, with dedicated training rooms to suit the type and style of course being conducted.

The new facility is equipped with up to date soldering and rework equipment in the fully ESD compliant practical training rooms as well as modern interactive multimedia teaching equipment

designed to help students learn in the best possible environment.

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Delivering specialist sourcing support

Independent stocking distributor and sourcing specialist, Globe Electronics, is growing fast thanks to a history of supporting customers by stocking devices and locating difficult to find electronic components from a wide range of partners and suppliers.

In the last twelve months the company has added several franchised lines to complement its existing portfolio of supported component manufacturers. This includes wireless and resistive products from Aurel and a broad range of film capacitors from CRC New Energy.

As a small business, Globe

describes itself as being large enough to handle all kinds of purchasing requirements, yet with small company principles that remain focussed on personally supporting customers. Facilities in Camberley, Surrey see the company ideally placed to work with any site in the UK, but also provide easy access to locations in Europe.

Aiming to provide the best solution to your component sourcing problems, Globe Electronics is keen to make a positive difference to your component spending.

globeelectronics.co.uk

Switches deliver a history of reliability

EECO switches and keypads are used in many industrial sectors including medical, communications, security and transport. Some of its thumbwheel switches are made to military specifications and, in fact, the company still gets orders for replacement switches to match those made in the 1970s and 1980s.



Alongside its switch line-up, which includes thumbwheels, strip switches and micro-dips, EECO also supplies custom made elastomer keypads, switched membrane keypads and elastomeric connectors. The company supplies switches

made in the USA by EECO Switch of California, which has been making electro-mechanical switches since 1947. The keypads are made in Taiwan by a group associated factory, for which it is a UK agent.

www.eecoswitch.co.uk

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Elastomer Keypads are made to your own design, any size, shape and colour with legend protection enhancements.

Membrane Switches are a self contained printed keyboard which offers low cost and high reliability. They are custom designed, thin and flexible. They are available with tactile/non tactile feedback, surface embossing, backlit legends, silver or carbon tracking and RFI or EMC shielding if required.

Elastomeric connectors made from silicon rubber offer an economic and reliable solderless connection. They are widely used on digital screens, home electrical goods and communication equipment.

Ask about our Value Added Keypad Assemblies

Electronic quality and innovation

As a leading partner for passive electromechanical components, Schurter Electronics specialises in providing fuses, circuit breakers, connectors, EMC filters and input systems. The company is part of the global Schurter Group; an international innovator and manufacturer of electronic components and input systems and is certified to global standards. It offers solutions to various sectors including aerospace, medical, industrial and agriculture.

With a strong focus on providing safe, clean power, Schurter's aim is to make the interface between human and machine ever easier. Based on customer requirements, Schurter Electronics develops,

manufactures and provides value added services over a professional network of worldwide affiliates and distributors.

www.schurter.co.uk

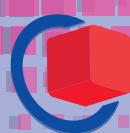
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NÜRNBERG MESSE

Turning your vision into reality

As part of a large group, Display Technology combines local component inventory and optical bonding facilities, to enable offerings on all types of display and touch screen assemblies

Thanks to its evolution, Display Technology delivers a diverse range of products and deep expertise. Established in 2001, the company became part of the Fortec Group in 2016 before acquiring Display Solutions in 2018 for access to an even greater product range and an enhanced skillset. As part of a large group, Display Technology boasts strong financial stability and the ability to source any component, satisfying 100 per cent of display and touch screen assembly requirements.

Sales manager, Paul Hooper, explained: "One of our key

benefits is that we have a European optical bonding facility which, coupled with our extensive range of local component inventory and evaluation kits, enables us to rapidly design, prototype and manufacture complex, reliable and robust display assemblies."

A specialist supplier of display assemblies, Display Technology offers high end products in low to high volumes, serving a wide range of customers, particularly those with high performance products or robust outdoor applications.

One notable product is Infinite Touch, Display Technology's projective capacitive touchscreen solution designed to provide a unique finished product. By optically bonding the touch sensor to the rear cover glass, Display Technology creates a true flat touch feel, similar to that of modern day smart phones. The company can laminate touch films from 2.2 up to 32in on a standard or customised cover glass, which can be modified in an infinite number of ways.

Some of Infinite Touch's features include edge to edge 'TrueFlat Glass'

PCAP technology, rear ceramic screen printing for corporate branding, product names and user interface icons, and a range of glass options, including low ion, anti-reflective, anti-glare, chemically toughened, and Gorilla glass.

What's more, because Infinite Touch has a bespoke option, users have the freedom to create a touchscreen to fit exacting requirements. Using VacuBond technology, Display Technology can optically bond the touchscreen to your chosen TFT display unit.

www.displaytechnology.co.uk

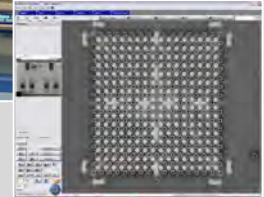
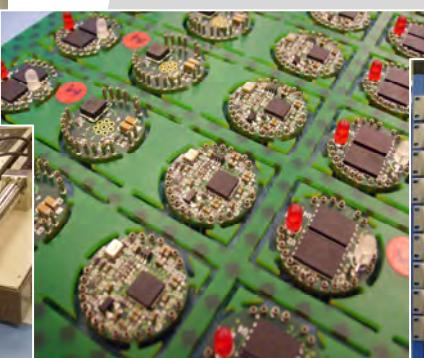
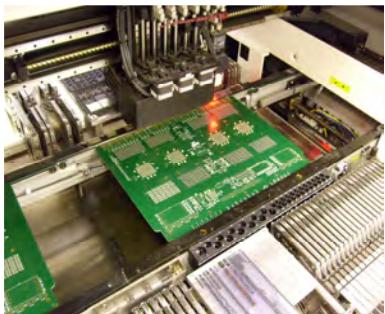
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**Electronic Manufacturing
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Why purchasers are demanding traceability

Vice president, operational excellence at Digi-Key Electronics, Teri Ivaniszyn, explains why provenance in the electronic components supply chain is vital for purchasers and distributors alike

Today's culture demands greater transparency from brands than ever before. Whether it's food, beauty, automotive, or electronic components—customers want to know where their products are from and what they're made of. They also want to know more about the companies they support—their operating procedures, the way they treat their employees and their commitment to sustainability. At Digi-Key, we share this desire for transparency, and when it comes to our suppliers, we demand the same level of information that our customers do.

What is traceability?

Information provided by manufacturers such as date codes, lot numbers, or serial numbers, enable anyone throughout the supply chain to trace components back to the original equipment manufacturer (OEM) should anything go wrong. Within the electronic components industry, traceability is quickly becoming a bigger focus than ever before.

Firstly, in an era where competition is stiff and gaining consumer confidence is vital, traceability is critical to protecting a brand's reputation. If a product is recalled or a malfunction occurs during testing, being able to trace the issue back to the manufacturer accurately and quickly can save customer trust and maintain a company's reputation.

In addition to bolstering a brand's reputation, sourcing traceable products can also save companies a considerable amount of money. If any faults arise

with a product, the OEM or subcontractor can get a recall notice out quickly—reducing legal costs and mitigating profit loss. Defects with genuine products can also be quarantined much easier than with counterfeit parts.

Demonstrating authenticity

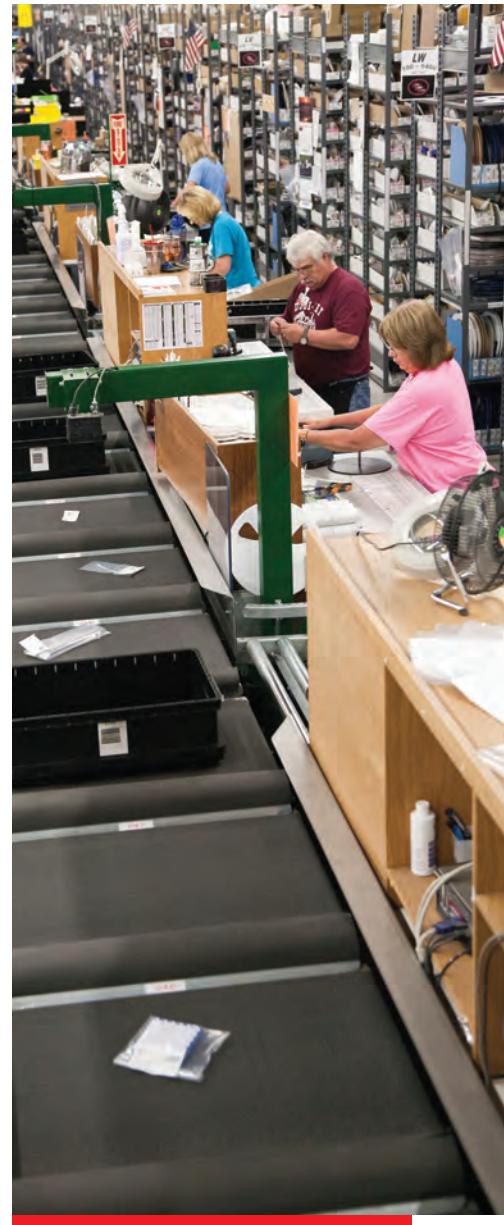
As the demand for traceability continues to grow, so does Digi-Key's commitment. We only buy direct from our 800-plus franchised manufacturers in order to ensure the component is new, authentic, and fully warrantable under the direct supplier. This also ensures that accurate, up-to-date technical information is readily available. For each of our more than 8.2 million components, Digi-Key holds documentation valid for 10 years that proves the traceability of the part and its authenticity.

In addition, Digi-Key has been certified to the Counterfeit Avoidance Accreditation Program. This proves our counterfeit controls have been verified by an external auditing company and ensures components are compliant to aerospace standard AS6496. Digi-Key also has controls for disposition, inventory control, receiving, and customer returns verification developed to adhere to the AS6496 counterfeit avoidance certification. In the event that suspect or confirmed counterfeit product is identified in the supply chain, Digi-Key has processes in place to quarantine the product, and report the findings to the supplier, relevant customers and appropriate authorities.

We also maintain the ISO 9001:2015, which certifies the purchasing, warehousing and distribution of electronic components to original equipment manufacturers and/or customer specifications. In other words, not only do we pursue transparency in our components, but also in our business practices and customer service.

Here at Digi-Key we're excited about the growing dialogue around traceability and the greater demand for authentic products. We look forward to continuing to equip purchasers across the globe with products that are 100 per cent traceable—from prototype to final product.

www.digikey.co.uk



Inventory controls and returns verification processes adhere to the AS6496 counterfeit avoidance certification

Looking for ceramic PCBs?

Increasing demand for microelectronics, high frequencies and environmental resistance mean ceramic PCBs are growing in popularity. DK-Daleba offers a variety of ceramic substrate solutions

With production facilities in the UK and in the Far East, Hertford based DK-Daleba offers global PCB manufacturing resources. Ceramic PCBs are part of this offering and thanks to recent advances in production techniques, ceramic PCBs are now a viable option for many PCB designers.

Ceramics are a popular laminate for PCBs, for example, thanks to increasing demand for microelectronics, high frequency, high thermal conductivity, even at 350°C, a low coefficient of thermal expansion and resistance to UV and chemicals.

DK-Daleba also offers various ceramic substrates including the popular alumina oxide (96%), a naturally excellent electrical insulator with strong thermal properties. The thermal conductivity of alumina is not as high as aluminium nitride, but it is noticeably higher than the best performing metal clad PCB materials with a thermal conductivity in the region of 24W/mK. Another variant of this is Al203 99.6% which has a higher thermal conductivity, in the region of 29W/mK. Aluminium nitride (AlN) has an even greater thermal conductivity of 180W/mK.

For those using a copper track, the available solder resist/ident/surface finish options are much the same as conventional PCBs. If silver is used, a clear/glass solder mask is available. Gold plating can also be used in certain applications where the silver pads require protection.

Utilising this expertise, DK-Daleba is happy to work with customers to satisfy requirements for ceramic PCB production.

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Ceramic PCBs are part of this offering and thanks to recent advances in production techniques, ceramic PCBs are now a viable option for many PCB designers

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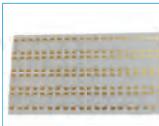
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Open minded buyers stand to benefit

With electronics technologies evolving all the time, isn't it time to rethink outdated purchasing procedures, asks Retronix?

For a market dominated by technological advancements, the electronics sector is also an industry with some outdated ideas. There is a seam of 'but that's how we have always done it' running through a lot of companies that doesn't allow them to take advantage of new services and options that their more open-minded competitors have.

Retronix has seen this firsthand and it is understandable to a degree. The 'if it's not broken why fix it' and 'too much of a risk' attitude does have a place, but not if it is at the expense of progress, cost savings and delivery dates. Most companies will have some procedures that were written, for example, 10 years ago that they have not reviewed since then. And for an industry that is always advancing, that seems rather counterproductive.

Review outdated procedures

Decisions are made on past errors and procedures written to ensure that these errors never happen again, which is correct. However, as technology progresses and new ideas emerge, those procedures need to be reviewed. Everyone in a company will know a handful of things that are just never considered as an option due to history and possibly a previous costly mistake.

For many companies, one of these 'written in stone' ideas is: 'thou shalt not reclaim components from PCBs.'

Often, this is based on a past mistake or just a general idea that this is too risky a process. But in the current climate of allocation, long lead times and obsolescence, can you really afford to be sitting on a bone pile of

PCBs populated with the same components that the purchasing department are pulling their hair out trying to source? That is not productive for anyone.

Profit from scrap

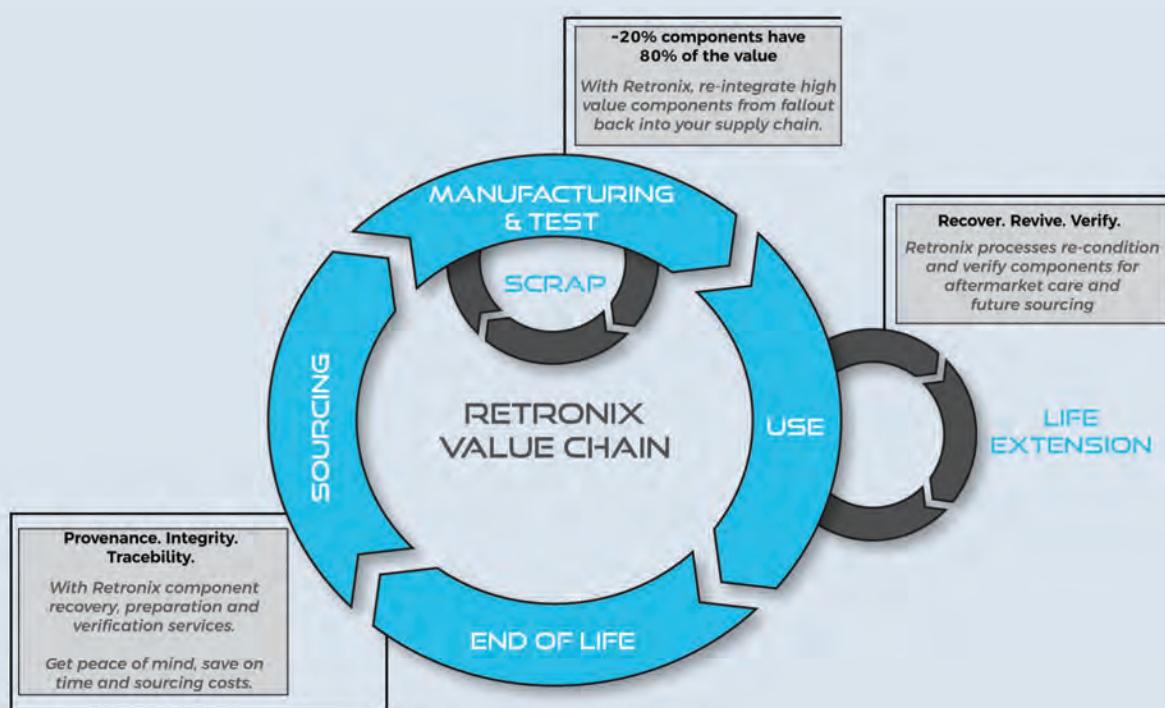
Millions of dollars of components are scrapped within manufacturing and repair/rework processes. If these components could be safely removed, and the BGAs reballled, companies could save huge amounts of money in recovered and revived high value silicon. This can provide much needed allocated components and reduce the amount sent to landfill. An added bonus is that it would also seriously damage the counterfeit industry, whose raw material supply would be reduced.

Retronix's range of services to the electronics industry offer a complete service for reclaim and re-use of components.

With the safest removal procedures in the industry, terminal re-life options, testing, x-ray and re-reeling, Retronix offers a robust service and this has seen a mindset change in many customers who have seen the benefits of these services. Their procedures no longer say no reclaim and re-use but rather list Retronix as the only approved supplier of this service. And their purchasing departments are very grateful for that!

To be part of the new mindset shift, talk to Retronix about how to help your purchasing team retain their hair during this challenging time for electronics sourcing.

www.retronix.com

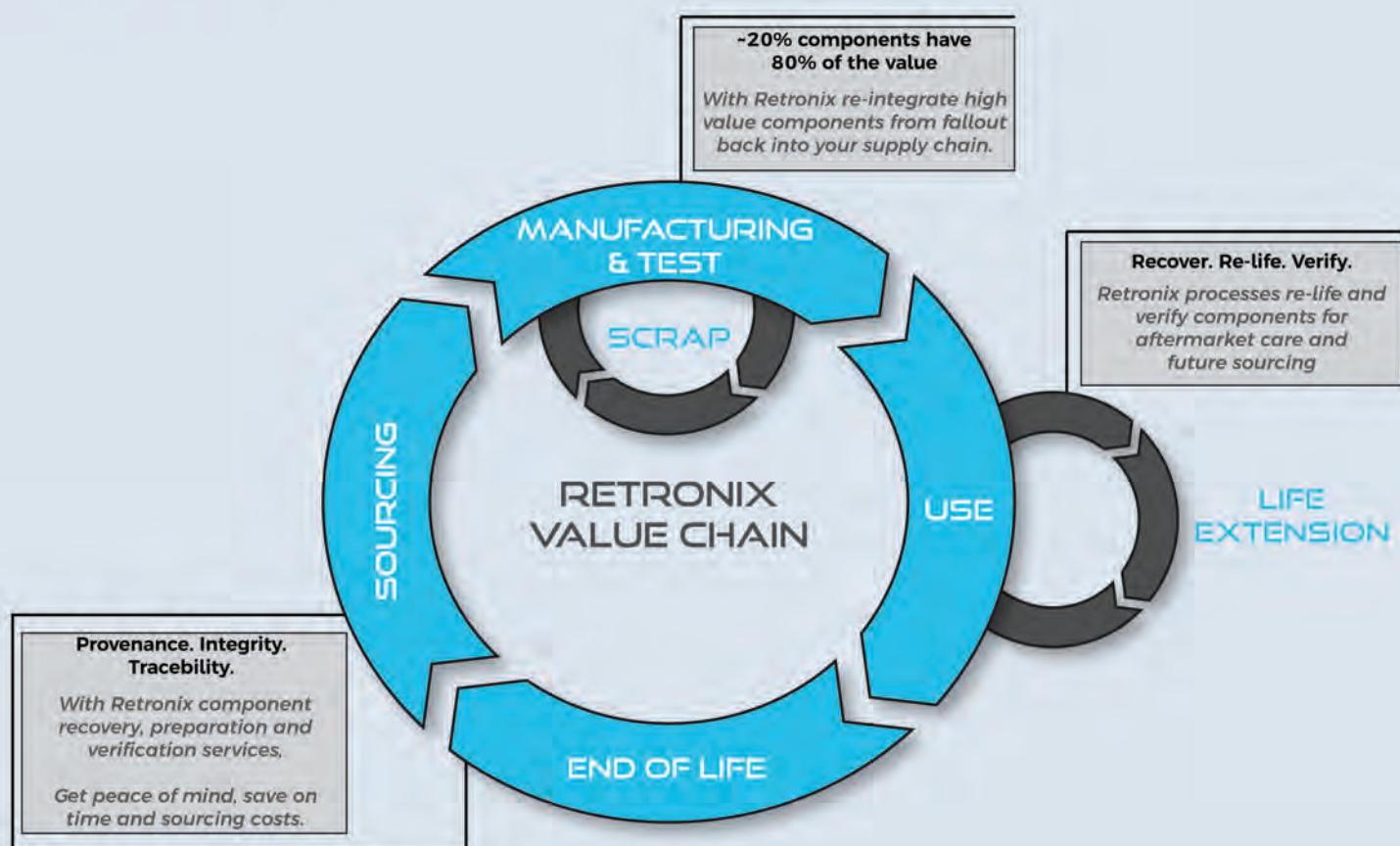


“For a market dominated by technological advancements, the electronics sector is also an industry with some outdated institutional ideas.

There is a seam of “but that’s how we have always done it”

”

TIME FOR A MINDSET CHANGE



Our wide range of services to the electronics industry allow us to offer a complete & robust service for reclaim and re-use of components. With the safest removal procedures in the industry, terminal re-life options, testing, X-Ray and re-reeling.

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Is 'industrial USB' up to the job?

Industrial USB and SD solutions are often less secure than you need them to be. Nexus' memory keys and tokens offer a robust solution

If you're looking for an industrial grade memory solution, the chances are you've looked at 'industrial USB sticks' and SD cards.

These products perform a function, and most likely can process more data than a standard USB, and more quickly too, but there's a big problem: they don't protect your embedded device from malware. And if misplaced or stolen, sensitive data can be easily transferred, either of which could be devastating for your organisation.

The disadvantages don't end there either because the

majority of industrial USB hardware doesn't last long. If a product gets used ten times a day, a typical USB connector will only last five months, which means you constantly have to buy new connectors.

So why take the risk? With Datakey®, you don't need to — Nexus Industrial Memory provides a complete system solution.

The unique connectors only mate with Datakey memory keys or tokens, and they can't be used with standard memory solutions, keeping data safe and secure. Plus,

connectors, keys and tokens are tested in the harshest environments with a Datakey receptacle built to last for 160 months, and a key for over 50 years.

Talk to Nexus to discover how Datakey can help with data logging, updating firmware or user authentication.

www.nexusindustrialmemory.com



If a product gets used ten times a day, a typical USB connector will only last five months, which means you constantly have to buy new connectors

If you need your data safe and secure, stop using industrial USB.

Industrial USB might seem like the logical way to transfer data, but if you care about keeping your data safe, it's completely illogical.

Datakey connectors only mate with Datakey memory keys or tokens, and unlike industrial USB and SD cards and tokens they can't be used with standard memory solutions, keeping your data safe and secure.

Plus, our connectors, keys and tokens are tested in the harshest environments, with a Datakey receptacle built to last for 160 months, and a key for over 50 years.

To talk to us about how Datakey can help you with data logging, updating firmware or user authentication, visit:

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- Quality-driven Distribution
- International Procurement Offices

SUPPORT



Through-Life Support

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- Obsolescence Management
- Long-Term Storage (Nitrogen Storage)



Perfect timing

Available in the UK from Rutronik, HKC has introduced a new global navigation satellite system disciplined oscillator said to offer excellent stability for 4G and 5G LTE-TDD base stations.

Part of the K-Star series, the new GNSSDO receives signals from satellites to generate a high-precision one pulse per second output. It supports concurrent reception of signals from GPS, GLONASS, BEIDU and GALILEO.

The K-Star series GNSSDO is time and frequency synchronised to UTC and provides a low-noise 10MHz reference output. It receives GNSS-signals with a sensitivity of down to -167dBm.

In addition to base stations, other applications include providing an accurate time source so energy operators can monitor energy flow of the network and finance and stock exchanges where accurate time stamping is required to trace all transactions.

www.rutronik.com



One device for accurate AC measurement

LEM's new Rogowski coils measure current up to 300,000A AC with accuracy class 0.5. The ARU range achieves IEC 61869-10 class 0.5 without the need for additional components such as resistors or potentiometers to calibrate the coil.

According to LEM, the range benefits from a patented coil clasp that eliminates inaccuracy caused by sensitivity to the position of the conductor inside the loop. This provides a robust 'twist and click' closure.

Unlike LEM's ART Rogowski coils, the ARU range can be installed outdoors as the models are compliant with UV, water, dust and ice resistance standards. The range is also ruggedised for durability in extreme environments including an operating temperature range of -40 to 80°C. An internal shield protects against external fields, improving accuracy and optimising performance for small current measurements.

Designed to offer ease of installation, as well as being thinner and more flexible than split-core current transformers, the ARU can be mounted quickly by simply clipping on to the cable to be measured. ARU coils complete LEM's AC current measurement portfolio, supporting future distribution network applications and solutions for measuring electrical parameters in the Smart Grid.

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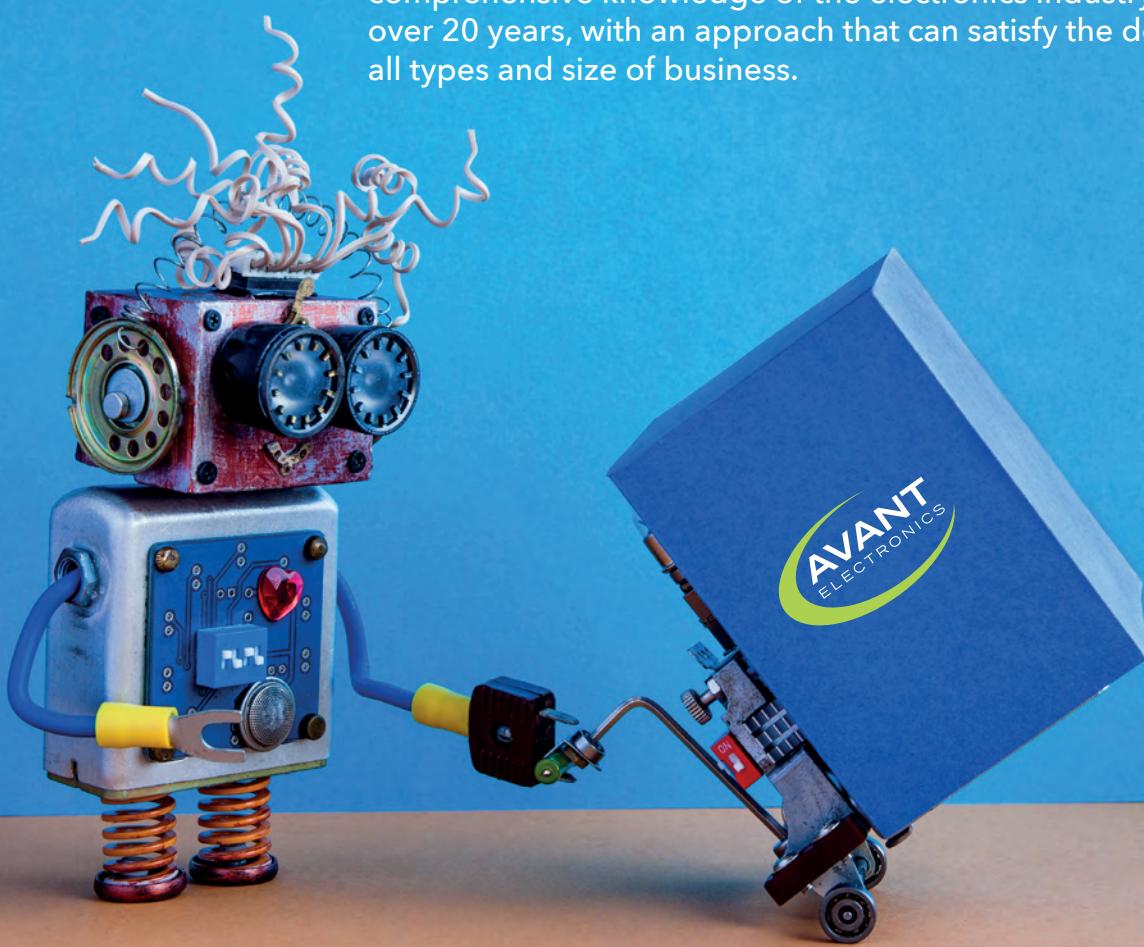
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208644

Enjoy supply chain success with the right CEM

Corintech explains how a focus on customer service, combined with technical expertise, has resulted in consistent growth for this contract electronics manufacturer

A good working relationship with your CEM provides a highly reliable supply chain. This usually goes unnoticed until something goes wrong and your project is set back as a result of supplier delays or quality issues. For over 40 years, however, AS9100 accredited Corintech has maintained an extraordinary customer retention rate, with the company putting much of its success down to its customer service strategy.

Businesses often look for a CEM with a range of experienced experts. This ensures a CEM can add value to your project, but you also need to consider the effect on communication.

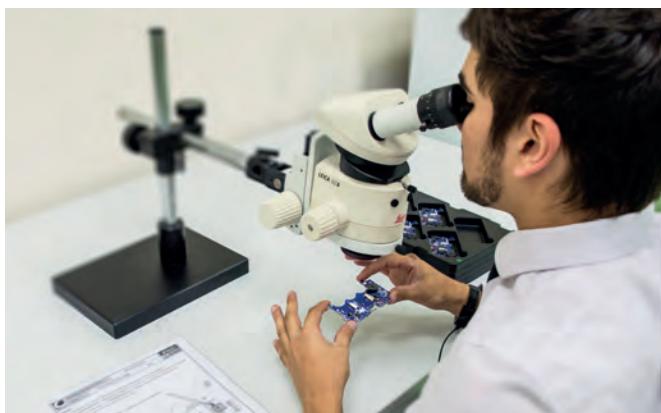
Corintech assigns every customer a dedicated account manager. Having one specific contact makes correspondence faster and builds solid working relationships. Your account manager can then utilise all Corintech's in-house expertise, ensuring clients work with the electronics experts who can add most value to a project.

Technical director at Corintech, Tim Waterman, has over 35 years' experience designing electronic products for a variety of industries. He explained: "I take a hands-on approach in the design engineering team. This is where my experience has the greatest impact, and where I can work directly with customers to ensure that we deliver products that surpass their expectations."

Corintech's operations manager, Jack Dayeh, added: "Quality and on-time delivery sit at the forefront of Corintech's strategy. Our customer service supports this by providing a single point of contact for fast communication. This facilitates rapid problem-resolution, as well as regular progress updates and logistical support."

As a result of an effective customer service strategy, backed by extensive technical expertise and a robust quality management system, Corintech customers receive exceptional quality, reliable on-time supply and a flexible service.

corintech.com



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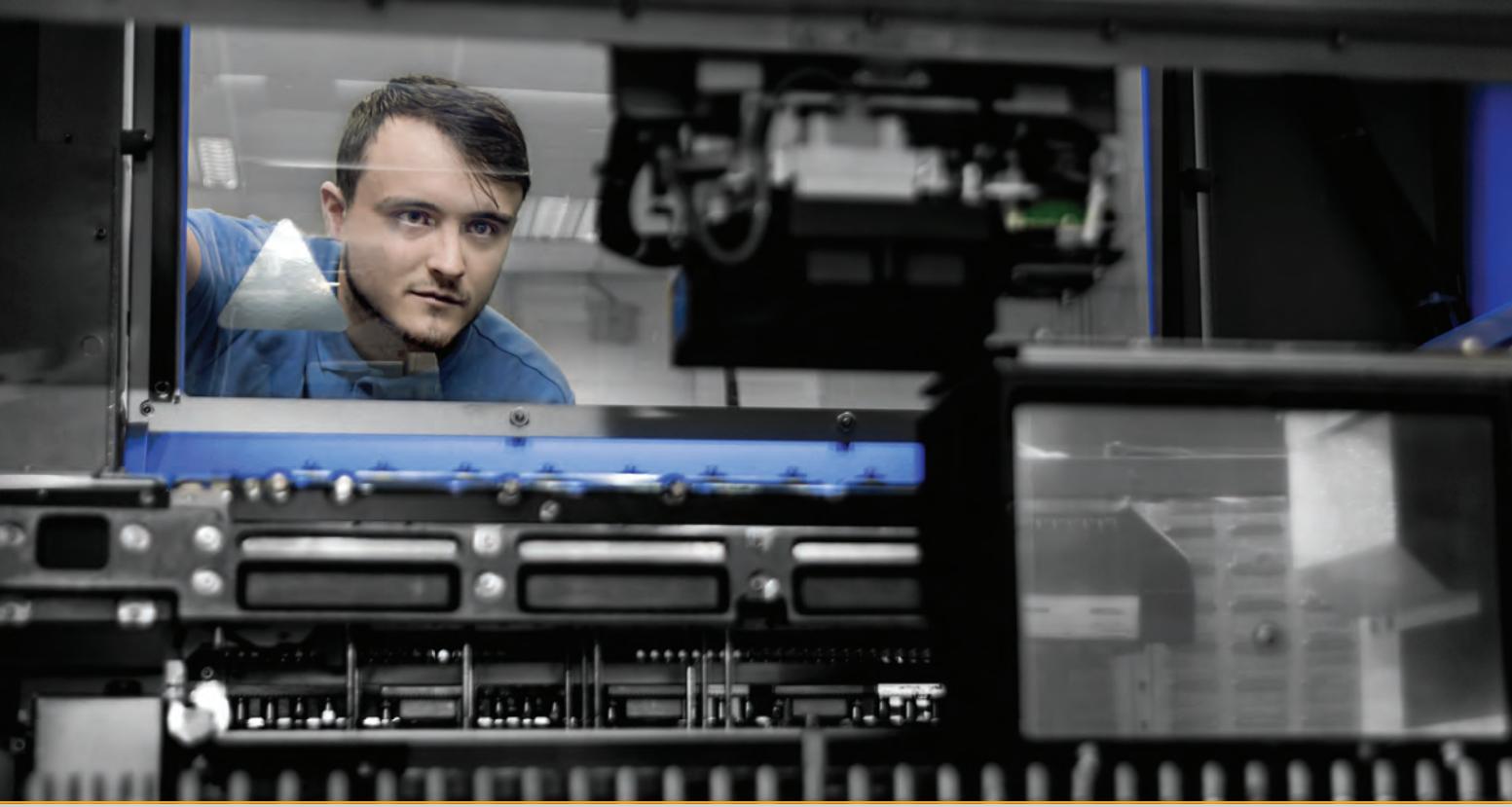
*Our long term stock agreements are non-cancellable but we will always endeavour to help you with any challenges you have regarding changes in customer demand. Agreements can be renewed.



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RFQ portal simplifies CEM sourcing

Now in its 40th year, Wilson Process Systems continues to invest in growth with a simpler way to request contract manufacturing quotes and new assembly equipment

Having returned a 10 per cent upturn in business in the past 12 months, WPS is pleased to report that its tried and tested strategies have helped the company perform well in a challenging marketplace. And the team are not short of new ideas to capitalise on this growth.

WPS sales manager, Steve Cooke, identified a gap in the CEM market, drawing on his experience in the component distribution market where on-line portals enable customers to make enquiries for costs and component availability without the need for personal interaction.

Simple CEM quotation
His intention was to make a similar system available to CEM customers to simplify the PCB assembly quotation process and make it as straightforward as possible.

Steve commented: "I had a vision of a user-friendly RFQ portal where, in just a few clicks, OEMs, engineers and purchasers can provide basic information and upload files to obtain a no obligation quote for PCB assemblies and box-builds."

WPS appreciates that subcontractor selection is based on several

key areas set by the client to establish whether the contract manufacturer will be 'fit for purpose'. This added-value service is without obligation and the company acknowledges that quoting is a vital step on the road to any engagement between customer and supplier.

WPS materials manager, Nigel Starkey, added: "I believe this is great news for buyers, simplifying benchmarking and sourcing activities. With the added confidence that WPS' experienced quotation team will always ensure best value and that fully franchised, high quality materials are being used."

The new 'Get a Quote' service is now live on the WPS website and is already getting a good reception.

To find out more about the company, potential clients can also find WPS at one of several exhibitions, with the company increasing its presence in 2020. New and existing clients can engage face-to-face at Southern Manufacturing in February, PCB Design and Manufacture Live in March and SUBCON in June.

Investing in odd-form placement

One principle which has underpinned the company since its inception is continued investment in the latest technology plant and equipment and 2020 is no exception to this. Tim and Nick Wilson visited the 2019 Productronica Exhibition in Munich in November with manufacturing director, Steve Russell, and their attention

was taken by a Universal Fuzion OF1-11 odd-form assembly machine.

Steve Russel commented: "The new machine is a great upgrade for our surface mount facility, but the added ability to machine place a full array of through-hole components including connectors, sockets, transformers heatsinks and many other components, as a fully automated process is a huge bonus in adding repeatability and assured quality for our customers."

The new machine was delivered early in 2020 together with a Soltec 7038 reflow oven and an EKRA X4 SI IPAC enabled solderpaste printer, which adds a fifth line to the company's surface mount facility and increases its surface mount capacity to almost a quarter of a million placements per hour.

www.wps.co.uk



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Cultivating smart supply solutions

Astute Electronics has celebrated 30 years in business during which time it has developed a cradle-to-grave offering comprising design, fulfilment and support. We ask what's next on this distributor's roadmap?

With its focus firmly on electronics distribution, global procurement and supply-chain management, Astute Electronics has celebrated 30 years of excellence. Astute's growth has been supported by a £5m investment in buildings and facilities, including a £1m investment in in-house counterfeit test laboratories. These resources help Astute to deliver a complete cradle-to-grave solution including design, fulfilment, and support to its ever-growing global customer base.

Since its inception 30 years ago, Astute has evolved from a flexible supplier to offering a complete supply chain solution via its e-design, safe supply, and third party logistics services.

Throughout this process, Astute has been customer-led, taking time to engage with customers about their requirements, diagnosing the vital issues together and implementing a program that will manage efficiencies, realise the best output and thus allow customers to focus on their core skills.

Building global resources

Investing in not just its facility but also its people, Astute now employs more than 180 staff across five continents, with staff benefiting from a team driven, supportive and inclusive environment that promotes self-initiative and individuality.

Trusted for three decades, Astute is proud of its reputation as a market leader in the UK. With offices in nine countries, Astute

is also strengthening its global offering, leveraging its experience, expertise and platforms to streamline supply chains and offer cost savings and efficiencies to customers worldwide.

Managing director of Astute, Geoff Hill, commented: "The last 30 years have been exciting, challenging and satisfying, and by reinvesting in the future of the business, we've bolstered our foundations for the years ahead, which is crucial to us.

"It's tremendous to be involved in the business and I'm extremely proud to have got to where we are today, but the most exciting thing is what the future holds."

2020 and beyond

As a new decade begins, Astute will look to harness its 30 years of industry experience and create its future industry roadmap. Namely, becoming the ultimate design partner and offering optimal tools and resources for the engineers in its customer base.

Astute will continue to invest in its people, nurturing a positive working environment for its staff and in an increasingly unpredictable global marketplace, including ongoing challenges such as Brexit, tariffs and sustainability, Astute will provide robust and reactive advice as global micro/macro environments evolve. This will leave customers free to maximise opportunities and streamline their supply chain.

As a knowledgeable, quality-driven expert in franchised 'hi-rel' electronics distribution, global

procurement and supply-chain management, Astute will continue to offer a more technically-focused, integrated partnership that delivers smarter outcomes for customers. Trusted by many of the world's largest, most respected defence primes, OEMs and electronics manufacturers, Astute meets everyday requirements for component traceability, design-in support, procurement and integrated logistics.

Its mission—to provide the answers that make a difference to your supply chain.

www.astute.global



Geoff Hill, managing director of Astute



It's tremendous to be involved in the business and I'm extremely proud to have got to where we are today, but the most exciting thing is what the future holds

Simplify stock with intelligent LED solutions

An emphasis on supplying tailored display solutions helps Forge address cost and performance targets with solutions that simplify assembly and reduce stock holding

With a wealth of experience at its disposal, Forge manufactures LED light solutions designed to meet cost and performance targets as well as relevant standards. The company, which was established in 1993, works closely with customers and has successfully manufactured display solutions for backlighting, instrumentation, passenger information and gaming industries.

It also aims to meet the all-important needs of the buyer with solutions that simplify assembly, reduce costs and cut stock holding requirements. The company's

interlocking seven segment display is one such example.

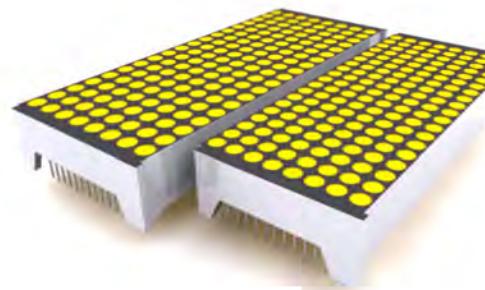
With a square pin out arrangement that accepts industry standard IDC connectors and dovetail interconnect across all sizes, the solution not only simplifies assembly, but significantly reduces the amount of investment in work in progress. The display uses high performance LED die and is available in many colour options.

If you have an application that could be enhanced with LED but you're not sure where to start, Forge can help. With 27 years

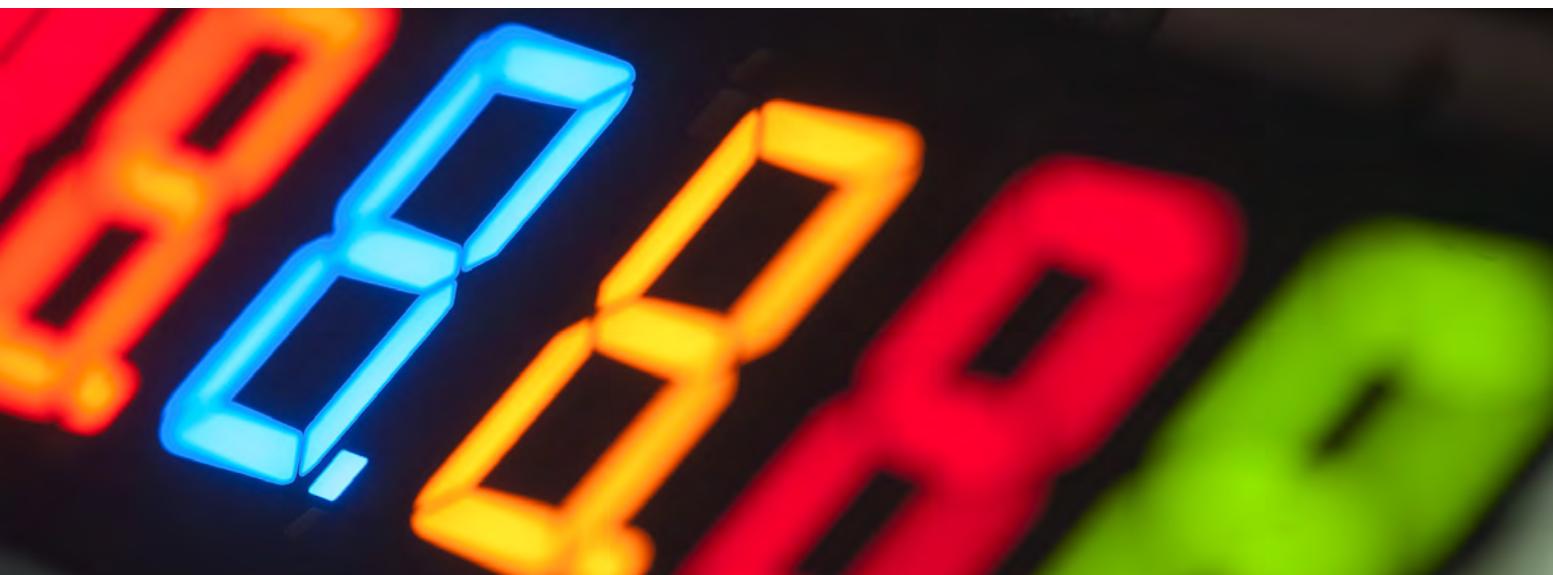
in business, it boasts the knowledge, expertise and resources to provide the clever light solution required.

In addition to expert custom capabilities, Forge's LED display range also comprises standard dot matrix and SSD displays ideal for a host of applications. Displays incorporate the latest LED chip technology in various sizes and face colour options.

www.forge.co.uk



Smart display solutions can help simplify assembly, reduce costs and cut stock holding requirements



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Spinning too many plates?

If you find that you are running out of time to keep everything going, you may need to assess whether you require assistance and identify where you need the help.

Perhaps your in-house production is running out of capacity? You may only need a small batch but think a contract manufacturer wouldn't be interested in low quantities.

Or are you struggling to get hold of unusual components? Maybe your design is still in a state of flux and could be subject to changes during manufacture or your product needs to be built by humans and not just machines.

If any of these apply, or you find you constantly put aside design work to manage current production, Just Electronics

may be able to help. Although it might not be possible to outsource everything, Just Electronics can help keep some of those plates spinning for you.

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You may need to assess whether you require assistance and identify where you need the help

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How do you solve obsolescence issues and locate hard to find parts?

The International Institute of Obsolescence Management (IIOM) has been helping companies to address the problem of obsolescence in long-life cycle industries since 1997, when the Component Obsolescence Group (COG) was first formed. Its corporate members include asset owners & operators, manufacturers and obsolescence solution providers.

The short life-cycle of electronic components, driven by consumer markets, makes sustaining of long life-cycle systems increasingly difficult, but it is not just about electronic components – globalisation and consolidation of the supply chain, supplier bankruptcy, and new regulations such as REACH affect electrical and mechanical components and equipment as well. By joining IIOM, you will be able to talk to experts from the electronics industry about how to implement obsolescence management best practice, to find obsolescence solution providers, and to recognise and develop the competence of your obsolescence experts.



International Institute of Obsolescence Management

To find out more look at our website www.theiiom.org or contact our CTO iblackman@theiiom.org

Medical equipment demands careful connector selection

Connectors for medical equipment are often tasked with meeting tough demands including steam sterilisation at elevated temperatures. ODU helps purchasers specify tailored solutions at minimal cost

Medical electronics currently counts as one of the fastest expanding sectors. Its growth is providing innovation stimuli, creating new areas of use, and increasing demand for connector systems designed to match their specific needs.

Connectors used on medical equipment must fulfil special requirements, for example, there is often need for autoclavability. This process of steam sterilisation at 134°C necessitates great care in the selection of connector and cable materials, usually leading to connectors requiring over-moulding.

Break-away solutions

As a low-cost alternative to autoclaving, ODU has developed break-away plugs for both the ODU Medi-Snap and ODU Mini-Med connector ranges at viable economic costs. Both feature mechanical coding and offer multi-contact options and custom cables. They are ETO sterilisable, DEHP free, wipe-disinfectable and 0.9 per cent NaCl resistant.

To support customers with diverse medical application requirements, ODU can also provide custom solutions. For instance, the company developed a hermaphrodite design for an inhalation device used specially for the treatment of new-borns. The ODU connector assembly provides an interface between the control-unit and the nebuliser.

Another solution was engineered for a mobile defibrillator. This uses three versions of the ODU Min-Snap PC connector with push-pull locking: a high-voltage shock transmission of up to 2.3kV and 15ms to the reusable paddles; a high-voltage shock impulse to the defibrillation electrodes, or for a four-core ECG cable; and an SpO₂ oxygen saturation sensor interface.

Supporting rapid innovation

To support ever-faster medical

equipment innovation, suppliers need to offer not only a wide range of standard products, but a fast and responsive approach when only a customer-specific solution will neatly solve the problem.

At ODU all technologies are under one roof, from design and development to volume production of connectors, cable assemblies and mechanical sub-assemblies. As ODU explains, this makes it possible to offer high



quality products at economic prices.

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R&G Technology was established to provide a specialist service to printed circuit board users, from base board manufacturers to end users.

The company offers customers a wide variety of circuit board services and solutions, carrying out work on all types of boards, from bare boards through to complete assemblies, and on all types of technologies from standard single-sided circuit boards to complex multilayer boards manufactured in exotic laminates.

R&G Technology aims to provide customers with a high quality, competitive, efficient and quick

turn service, that makes PCB repairs, modifications, conformal coating, rework, prototyping and small batch assembly viable and cost effective. The company also provides component obsolescence solutions.

Drawing on more than 20-years' experience in the printed circuit board industry, R&G technology provides customers with the most appropriate and cost-effective service available. All work is performed to IPC7711 and 7721 standards or higher or to meet our customers' requirements and specifications.

randgtechnology.co.uk

What's new



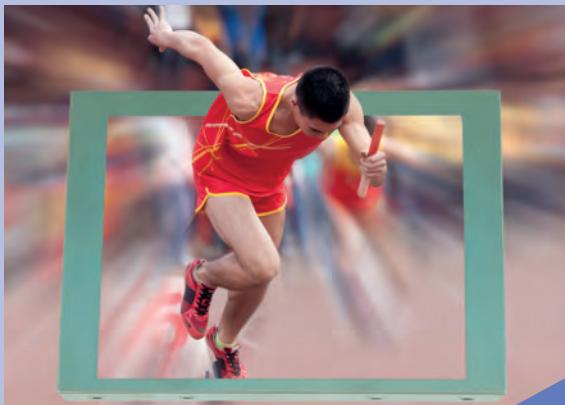
The right choice for rugged IoT

Bel Group company, Stewart Connector, is expanding its SealJack PCB mount series with a right-angle connector designed to support connectivity in internet of things devices. Ideal for non-traditional devices, SealJack connectors offer IP67 protection where water and debris could compromise signal integrity, such as in rugged computing equipment, industrial environments, medical devices and smart homes.

The single port, right-angle SealJack connector offers a sealed, compact design that can transmit 10/100 Base-T through 10G Base-T Ethernet. These IP67-rated connectors excel when electronics need to be protected from environmental conditions beyond the capabilities of standard RJ45 connectivity.

Stewart Connector products are available at Digi-Key, Mouser, and Newark.

belfuse.com/stewart-connector



Bright ideas in stock

New from RDS are two 4.3in TFT in plane switching displays from Solomon Goldentek. Wide viewing angles, excellent price performance and high brightness are just some of the claimed features, making these displays ideal for industrial use.

The GK1YMNJC1E0 has a resolution of 480 by 272 whilst the GK1W43MN1J1E0 has a resolution of 800 by 480. Supplied with a driver circuit and a backlight unit, the displays have an operating temperature of -20 to 70°C. Said to display up to 16.7M colours, these anti-glare displays are both rated for an LED lifetime of 30k hours.

www.review-displays.co.uk

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Dip into a wealth of power expertise

Complex power supply requirements are no problem for Components Bureau, which, as part of the Fortec Power Group, has access to a wealth of technical know-how

Having become part of the Fortec Group in 2019, Components Bureau is now more prepared than ever before to meet complex power needs. The move, which gives purchasers access to key brands through sister company Emtron, ensures customers can draw on a wealth of technical knowledge and experience in the power supply market provided by the Fortec Power Group.

When coupled with over 20 years of experience from Components Bureau's UK team, it's clear the company is equipped to handle complicated power supply requirements in

line with today's efficiency and technical challenges presented by industry 4.0, internet of things, medical and robotic automation.

With a warehouse in Huntingdon, UK, for fast support and a new European hub near Frankfurt, Components Bureau can offer a full service, from technical support and quotation to sample and mass production. The impressive list of brands available allows the sales team at Components Bureau to find a power supply tailored to fit the application.

The company's areas of expertise include medical supplies with a range

of AC/DC and DC/DC converters approved to the latest medical safety standards ANSI/AAMI ES 60601-1, IEC/EN 60601-3, 2xMOPP/2xMOOP, including fourth edition for EMC.

Industrial is another key sector with AC/DC and DC/DC converters suitable for all industrial electronic equipment, approved to the latest IEC62368 standards. Finally, Components Bureau's railway DC/DC converters meet EN 50155 and EN 50121-3-2 standards as well as holding fire protection EN 45545-2 approval. These DC/DC converters are designed to meet precise requirements and undergo



Components Bureau can offer a full service, from technical support and quotation to sample and mass production

harsh environmental testing including shock and vibration according to EN 61373.

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Mix and match for tailored service

From procurement and design to assembly and shipping, Nemco allows customers to select the services they need for a tailored contract electronics manufacturing solution

UK-based electronics manufacturing services provider, Nemco, continues to strengthen its offering to existing and new customers by investing in high service level provision.

Built around its core offering of PCB population, added value services such as e-mech assembly, general assembly and full product build continue to see investment in both people and equipment. Thus, Nemco's capabilities continue to grow, with yet more planned for the future.

From concept, design, prototype and new product introduction, through to volume production, Nemco

supports customers operating in demanding markets. Sectors include defence, aerospace, military, medical, laboratory equipment, scientific equipment, instrumentation and transportation.

To meet this demand, Nemco holds various accreditations including ISO 9100 aviation, space and defence; ISO14001 environmental management and the aerospace and defence supply chain standard SC21 silver award.

All services are located at Nemco's 60,000ft² manufacturing facility in Stevenage. Customers can take advantage of any mix

of services on offer, from one single service right up to allowing Nemco to handle all aspects of the product manufacturing and supply cycle from procurement, through PCB population, full product assembly, test, packaging, to shipping direct to the customers.

Supporting this offering, the Nemco team consists of procurement, design, engineering, production, test and customer liaison professionals who take great pride in the support they offer to customers.

Aiming to provide customers with a partner in contract electronics manufacturing,

Nemco prides itself in providing a broad service offering. This not only includes PCB population with six lines of SMT and conventional component placement, but also test solutions, inspection services and e-mech and box build assembly.

From automated coating to wiring looms and harnesses, Nemco offers a variety of manufacturing solutions, as well as design services and materials and supply chain management.

nemco.co.uk



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From **Prototype to Production Ready**



Visit and learn

In this article, the Electronic Component Show's business development manager Jack Pollard offer readers a sneak preview of some of the purchasing and design themed seminars

Doors open to the Electronic Component Show at 10am, 14 May 2020 at the Doubletree Hilton Hotel, Stadium MK in Milton Keynes.

The show is designed to offer electronics buyers the opportunity to meet distributors, OEMs and CEMs to discuss all aspects of current and future projects, from component lead times to managing obsolescence and improving supply chains. The event is also a perfect opportunity for engineers to explore the latest components, technology, future trends and solutions to design problems.

Running alongside the exhibition, the educational programme offers purchasing and design themed seminars. *Electronics Sourcing's* annual reader survey discovered that subjects including component anti-counterfeiting, end of life, traceability, longevity and reliability are topics regularly presented as concerns in today's marketplace.

In response to these findings, the Electronic Component Show's seminars are organised to help readers find solutions to common problems. As a taster, I am delighted to share an early preview of some of the free-to-attend purchasing and design themed seminars already scheduled. »



ECS business development manager,
Jack Pollard

- **Global component distribution: Safe supply in a volatile marketplace**

Mark Shanley, sales and marketing director, Astute Electronics

- **Component obsolescence: How to minimise the costs and risks**

Ken Greenwood, technical sales manager, Rochester Electronics

- **Avoiding counterfeit components: how to manage and mitigate risks**

Debbie Rowland, director and Kathryn Stevenson, management assistant, Charcroft Electronics

- **IoT design: An approach to designing resilient, robust and reliable secure systems**

Ian Pearson, principle applications engineer, Microchip

- **Engineering part selection and supporting a rapid prototyping environment**

Nikola Kontic, technical product consultant, Zuken

- **Security alert: Don't put your system and data at risk with USB technology**

Richard Warriow, electronics design engineer and owner of Declaration, on behalf of Nexus Industrial Memory

Full descriptions of the above seminars are available at www.electronic-component-show.com

More seminars will be announced shortly. Please register online to attend this free event via the website and I look forward to welcoming you through the doors.

SIMTEK

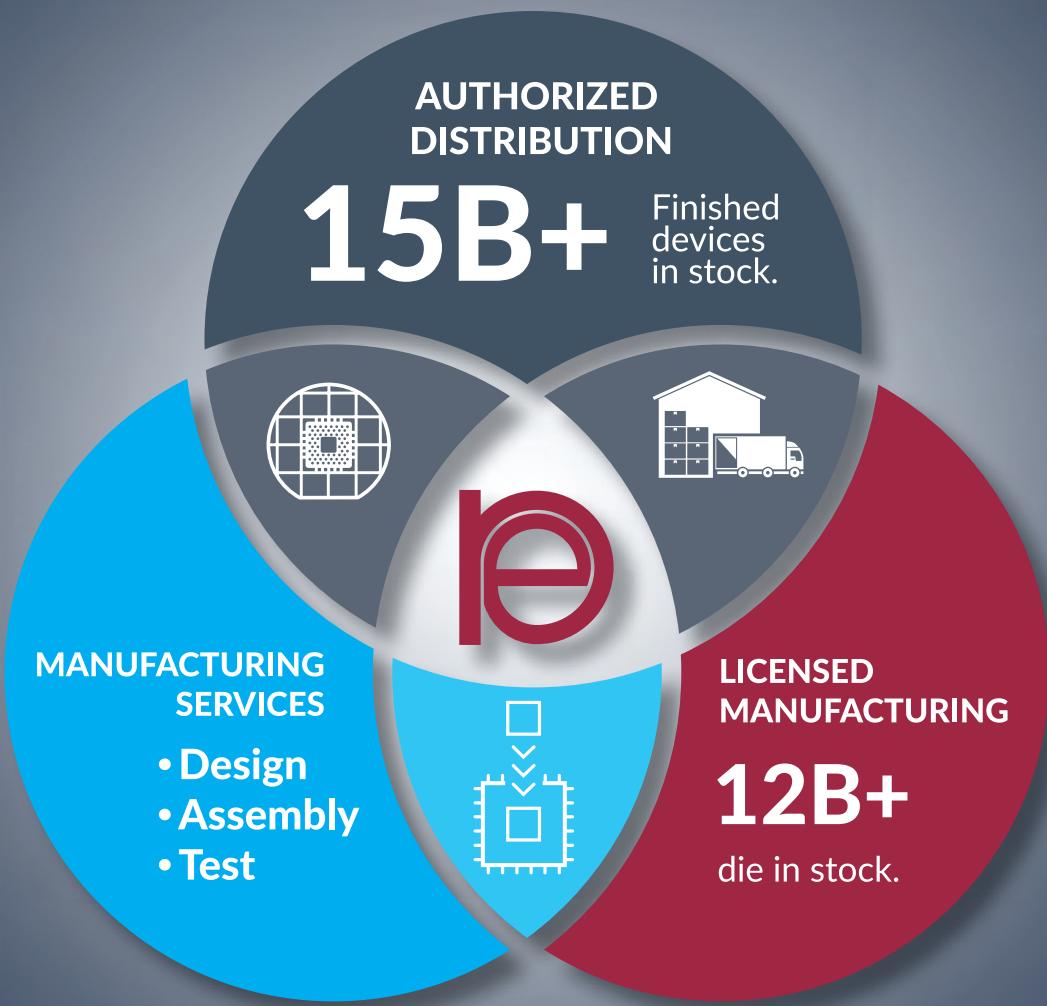
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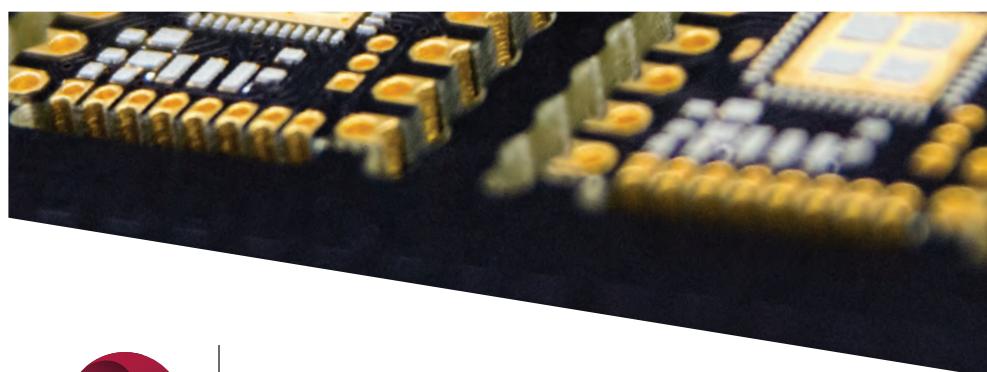
Let outsourcing take the strain of investment

One of the benefits of outsourcing manufacturing is that it removes the need to invest in expensive capital equipment. Jaltek does that for you by constantly upgrading its capabilities

To provide customers with the most up to date, efficient and cost-effective solutions, Jaltek's

technology line-up includes surface mount equipment for volume production and

a dedicated new product introduction line, all supplied by Blakell Europlacer. Iineo+



Jaltek Systems

Designing and manufacturing electronics for over 30 years

Working with Customers to create history

Jaltek is a leading electronics technology solutions provider, based in the UK, offering a comprehensive range of vertically integrated design and manufacturing services tailored to meet our customer's highly diversified business requirements.

We offer a tool box of solutions which can either be utilised as a fully integrated solution or a single service. From conceptual design, PCB layout and NPI, through manufacturing and test of PCBA's, to final product realisation, Jaltek supports products through-out their complete lifecycle.



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is a multifunction SMT pick and place platform designed to provide optimum flexibility. Furthermore the 'prototyping' and main production lines are completely compatible allowing prototypes to seamlessly transfer to volume production.

Jaltek also continues to invest in test and inspection processes. Automated optical inspection is used in addition to x-ray to check component placement. The AOI boasts advanced optics, with 3D imaging guaranteeing high levels of product quality and reliability. Investment plans for 2020 include additional test, AOI and x-ray capability and a new material requirements planning system.

Managing director, Steve Pittom, noted: "We invest in our people as well as our equipment. Our in-house training ensures all employees work to the industry's highest standards as per the Institute of Printed Circuits and we have recently taken on additional people to support design, engineering, project management and NPI. We are always working with the team to minimise waste and improve communication, in turn maximising value for customers."

Business manager, Steve Blythe, added: "2019 has been another good year, working on exciting products with new and existing customers. We have continued to increase our capabilities in line with the needs of our customers and have even equipped two dedicated manufacturing rooms to support the assembly requirements of two of our turnkey customers. As our business grows, we are committed to constantly improving our equipment and capacity to ensure we always deliver the highest service."

www.jaltek.com

Buyers face critical supply chain challenges as the new year begins

Constrained supply, diminishing sources of supply and higher than normal lead times for some components will be some key issues for buyers in 2020

Many OEM and electronics manufacturing services (EMS) providers buyers may feel that the purported ancient Chinese curse of "may you live in interesting times" applies to them as the new year begins.

While the semiconductor industry suffered double-digit revenue decline in 2019, the EMS industry grew its sales 10 to 13 per cent in 2019, the third consecutive year of double-digit growth for the industry, according to New Venture Research (NVR). While EMS providers hope that healthy sales growth will continue in 2020, buyers will face a plethora of interesting supply chain challenges and risk management issues, including the trade war with China, continuing supply base consolidation and constrained supply for some parts.

EMS buyers must also deal with rising raw material costs, the continuing problem of counterfeit parts, and plan for the possibility that

a natural disaster could stop production of key components as it did with the 2011 earthquake and tsunami in Japan and severe flooding in Thailand.

It is often the responsibility of EMS buyers to work with their OEM customers to mitigate such risks or manage those risks on behalf of OEMs.

"A key part of the service we provide to our customers is to help manage and mitigate risk throughout the supply chain," said Graham Scott, vice president of global procurement for EMS provider Jabil Circuit. "We have a systematic process to address and manage risk from geopolitical uncertainty to natural disasters to ensure continuity of supply."

One uncertainty involves component lead times. While shortages of multilayer ceramic capacitors and other components have eased compared to 2018, lead times for many capacitors,

resistors and discretes "are longer than the historical norms," according to Scott. There are several reasons including continuing supply base consolidation which has reduced the number of suppliers and could potentially impact pricing in 2020 and beyond, he said.

Rising labour costs and reduced labour-force growth in China and other traditional low-labour cost countries have contributed to supply constraints which will likely persist. For instance, China's average annual wages rose by nearly 63 percent between 2011 and 2016, according to China's National Bureau of Statistics. The impact of China's one-child-per-family policy has been a slowdown in population growth and a decline in the size of the workforce, which has driven up wages and labour costs for the electronics industry and other businesses.

China's workforce will continue to decline, according to the Chinese

government. In 2017, China had an available workforce of 900 million people but the figure will drop by 200 million by 2030, the government predicted.

Over the long term, electronics buyers must develop strategies to minimize the effect of rising labour costs. A partner that has extensive global partnerships and manufacturing footprint will be essential to attain this, according to Scott.

Higher labour costs can impact component prices and so can rising demand for certain components from smart phone and portable equipment manufacturers. Increasing demand could contribute to tight supply in 2020.

Dealing with shortages

Another key challenge for electronics purchasers is component shortages. While electronics purchasers historically have had to deal with component shortages



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caused by a spike in demand and/or lack of investment by suppliers in new capacity, more shortages are occurring because of technological transitions by component manufacturers.

Increasingly, component manufacturers of critical components are transitioning production from lower margin mature components to higher functioning, higher price components. As a result, memory ICs, discretes and some passive components that are still widely used in electronics equipment that have long product lifecycles are becoming increasingly harder to find.

One example is multilayer ceramic capacitors (MLCCs). MLCC manufacturers have boosted production of capacitors in small case sizes such as 0201 and 01005. Such parts are used in smart phones, notebook computers, handheld video games among other products. At the

same time, some capacitor manufacturers have ceased to make capacitors in larger case sizes such as 0603 or 1203. Larger case size parts are used in systems that have long product lifecycles such as industrial, medical and communications equipment.

While capacitor manufacturers may increase capacity overall, the increase tends to be for parts in smaller case sizes. Because capacitor suppliers are being more selective in the capacity investments that they make, buyers should be aware of the type of customer a component manufacturer supports.

Buyers need to work with suppliers on visibility issues to help suppliers plan and fulfill their component needs. In addition, with more mature parts going end of life, buyers need to develop strategies that guarantee continuity of supply if a supplier decides to stop

producing a needed part, according to Scott.

Trade war continues

One issue that buyers will continue to have to deal with in 2020 is the trade war and tariffs. "Rising tariffs are putting a painful squeeze on many U.S. electronics manufacturers," said Shawn DuBravac, chief economist for trade association IPC. "Many are facing supply-chain disruptions and steeper costs from the tariffs that have been imposed to date, and the impacts will grow as the trade war drags on," he said.

Randall Sherman, president of New Venture Research, added tariffs have become a significant headache and is causing redistribution of sourcing away from China." The findings of a recent IPC survey of the impact of tariffs on electronics manufacturers concur with that assessment.

Fifty-one percent of electronics companies responding to the IPC survey said they are now sourcing from countries other than China as a result of increased tariffs on Chinese imports. That means EMS buyers must work with OEM customers to find and qualify new sources of components and other production materials.

The survey also found 86 per cent of U.S. electronics companies are troubled by the higher tariffs imposed by the United States and China on each other's imports and some are investing less in the United States and hiring fewer workers as a result. More than a third of companies

report they cannot increase their prices to cover the cost of higher import tariffs due to various factors.

About 69 per cent of companies report lower profit margins as a result of increased tariffs, 21 per cent report they are reducing investment in the United States and 13 per cent say they are cutting back on hiring and/or reducing headcount, the IPC survey said.

Besides tariffs, many EMS buyers are challenged by a shrinking supply base caused by mergers and acquisitions. Buyers are feeling the impact of consolidation that has reduced the number of suppliers in the electronic components market, which has decreased parts availability. The bad news for buyers is M&A activity is continuing. In 2019 Infineon acquired Cypress Semiconductor, NXP bought Marvell's Wi-Fi connectivity portfolio, ON Semiconductor purchased Quantenna and Nvidia acquired Mellanox. More consolidation is likely in 2020.

Consolidation in the supply base will continue to reduce the industry's investments into new production, leading to further supply constraints as demand starts to return to normal levels, said Scott. Due to this increased risk, it's critical for buyers to understand the supply base and its strategic/technology direction, he said. With the increasing consolidation of supply, buyers need to make sure they have few, if any single sources for parts, which would mean qualifying new suppliers.

Another supply chain issue buyers must deal with is rising labour costs. OEM buyers involved in outsourcing decisions must review their supply chains and assess emerging geographies where costs are lower. OEMs need to balance the risk and cost of moving production and supply chains to places like Indonesia,



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Electronics manufacturing services revenue increased by more than 10 percent in 2019.
Source: New Venture Research

India, Mexico and new regions of China, said Scott.

Working with distributors

To manage supply chain risks, EMS providers often work closely with key component manufacturers to identify potential risks and develop strategies to address them. Electronics distributors are often part of material sourcing and risk management strategies of EMS companies.

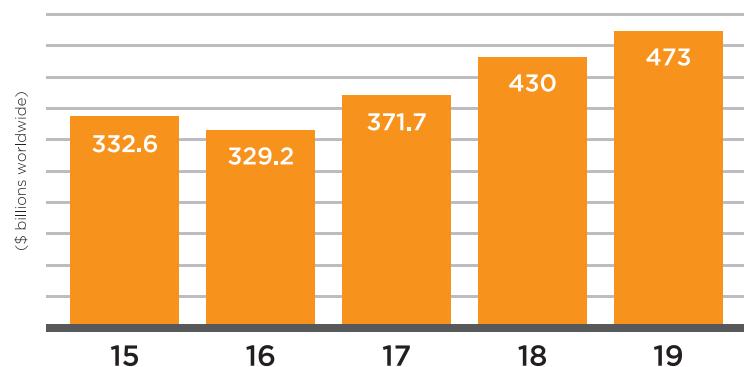
Distributors often provide inventory flexibility for EMS providers. "Since distributors typically have multiple customers for commodity items, they can shift inventory to meet customer needs," said Scott. "In addition, they can bond inventory within their warehouses to support our customer's requirements." Distributors can help EMS companies manage component obsolescence. Many have humidity-controlled facilities to store last-time buy inventory.

Distributors often support supply chain models such as consignment and vendor managed inventory (VMI) programs and distributors can manage some of the "more focused component lines," said Scott.

Many distributors have large customer bases and strong relationships with component manufacturers. "In cases where Jabil has limited transactions with a supplier, distribution plays a role in establishing a Jabil relationship with that component manufacturer," he said.

EMS providers often use distributor value added services such as parts programming, custom marking, and kitting, which are helpful in new product introduction production ramp phases.

EMS revenue rises again



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Is your BOM ready to fly?

With drone use expected to take off in various sectors, buyers are looking for smaller, lighter components. TTI is helping to meet these constraints with a robust new interconnect solution from Harwin

The environments in which drones operate are often demanding, with difficult environmental conditions, high degrees of vibration and potentially heavy shocks. There are also size and weight considerations that need to be factored in. Ensuring the successful operation of drones means that while miniaturisation is important, the constituent electronic components also need to exhibit the highest levels of robustness.

Reductions in component size and weight are of obvious benefit for drones that are themselves constrained by these parameters. Their small and lightweight construction naturally limits the payload they can carry. By designing in smaller, lighter components, drones can use these savings on more payload, as well as covering greater range before needing to be recharged.

Compact yet rugged

Harwin's high reliability connector and cabling solutions combine compactness with a rugged but lightweight construction. This enables the necessary power and data to be assured without adding any unwanted bulk to the design.

The Datamate J-Tek range, for example, provides a secure and robust connection under extreme conditions, including vibration, shock and high operating temperatures. A jackscrew design provides maximum strain relief and enables the connector to perform in the demanding environments affecting drones and other

aerospace applications. The four-finger beryllium copper contact is gold plated and capable of achieving 3A per contact.

To address the need for improved size, weight and power in aerospace applications, Harwin has also introduced a new female T-Contact to the Datamate range. It utilises a proprietary six-finger design machined from a single piece of beryllium copper. For use with the existing Datamate J-Tek housings, the T-Contact raises current capacity on the 2.0mm pitch connector range to up to 8.5A per contact. The increased number of contact points also enhances Datamate's vibration resistance to 40g for six hours. Heavier gold plating improves overall durability to 1,000 mating operations.

Reducing weight

In order to keep the weight of wire harnessing down, the Datamate Mix-Tek family can accommodate power, signal and RF contacts inside the same compact housing. The Mix-Tek range offers 3A, 20A or 40A contact options as well as multi-port 50 ohm coax contacts capable of frequencies up to 6GHz. Drones and their supporting infrastructure require shielding to ensure resistance against electro-magnetic interference. To this end, Harwin's Datamate range offers rugged aluminium alloy backshells with electroless plating compatible with both J-Tek and Mix-Tek configurations.



Drones are finding new applications all over the world

The availability of compact, lightweight and rugged connectors that support design flexibility will help push the boundaries of drone capabilities. Drones are finding new applications all over the world in a variety of sectors and no matter how related legislature develops, it seems likely that this technology will play an increasingly important role in the commercial and industrial landscape. Their adoption is limited only by the confines of human imagination.

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To address the need for improved size, weight and power in aerospace applications, Harwin has also introduced a new female T-Contact to the Datamate range





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To address the need for improved size, weight and power parameters (SWaP) in high reliability applications, Harwin has introduced the new female T-Contact to the Datamate range.

Utilizing a unique, proprietary 6-finger design which is machined from a single piece of beryllium copper. For use with the existing Datamate J-tek housings, the T-Contact raises current capacity on the 2mm pitch connector range to up to 8.5A per contact.

The increased number of contact points also enhance Datamate's vibration resistance to 40g for 6 hours. Heavier gold plating, 30-40µ", improves overall durability to 1000 mating operations. You can trust this contact for a wide range of markets and applications – including aviation, space, industrial, motorsport, defense and security.

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New products, new facility, new year

Investing in larger premises sees NYK Component Solutions able to hold more stock and deliver increased efficiencies, with additional value add solutions available too

Interconnect Solutions provider, NYKCS grew rapidly in 2019 by continuing to provide great customer service and unbiased access to a huge range of connectors and accessories from leading manufacturers. To meet these increasing demands and support the introduction of new product lines and services the company has moved to a larger facility in nearby Southampton.

The new site has three times the floor space, allowing for greater stock holding, increased efficiencies and exciting new services. 2020 is already shaping up well for NYKCS with new products, more approvals,

and additional value add distribution services planned. All of this will extend the range of services that can be offered and ensure that NYKCS continues to provide the quality of service customers and partners have come to expect.

One of the highlights of last year was signing a new franchise agreement with EMCA Electro-Mechanic. This agreement covers the company's extensive range of VG qualified connector backshells, protection caps, dummy receptacles, conductive gaskets, O-rings and custom assemblies for connector types such as D38999, 26482, 83723,

5015, VG95328, VG95234, VG96912, JN1003, CECC75-201-002 and many more. All of these are available in a range of materials with various plating finishes including EMCA's own VG 95319-1011 approved hybrid plating finish.

Online initiatives were another exciting development with the nykcs.com website adding a new interactive product configurator and a greater range of product information to help buyers find the best solution.

For customers with interconnect requirements that can't be met off the shelf, NYKCS introduced a

A new franchise agreement with EMCA provides access to a huge range of VG qualified connector accessories

new custom design service. NYKCS can provide 3D drawings and prototypes for a solution where the client retains intellectual property before proceeding to production of small or large quantities as required.

Chief executive officer, Kevin Wells, said: "2019 was a great year, but there's still opportunity for more positive change in the interconnect market. I look forward to creating better solutions for our clients underpinned by the great customer service we have become known for."

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An eye on 2020

To start the year, John Denslinger peers into his crystal ball to see how the triple impacts of 5G, IoT and the Cloud will drive growth in 2020



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

Future gazing • By John Denslinger

Usually 2020 indicates one has excellent eyesight: the natural ability to see far and near with equal clarity. Isn't foresight a wonderful gift? If only we had similar vision forecasting the coming year.

2019 might best be described as a year of retrenchment. Previous growth markets softened, new applications grabbed little attention, lead times remained extended, inventories stymied, and the book-to-bill stayed mostly negative throughout the year. Perhaps the biggest drag was the stalling out of 4G smart phone production and the demand fall-off left in its wake. 2020 looks to be another story.

For the record, I don't profess to have 2020 vision, especially the ability to see far into the second half with absolute clarity. My forecast is merely reading market conditions, applying typical component cycle trends, assessing the health of the global economy, and looking for potential roadblocks to progress. For the moment, let's assume suppliers invested in the appropriate technology, expanded their production capacity to meet increasing demand, and perhaps the greatest unknown, our industry avoids those tangential risks that hinder growth (more on this point later).

As for market conditions, look for three main drivers according to Dale Ford, chief analyst at ECIA: 5G, IoT, and 'the Cloud'. He describes it as the 'forces coming together'. I see it as a symbiotic relationship. The build out of every future infrastructure will incorporate, by necessity, all three technologies for seamless communications. Notice 5G captures most of the media headlines, but the ramp in component demand will likely not occur until late in the year. That means IoT will initially lead the way entering 2020. The demand for sensors of all types, wireless connectivity, gateways, microcontrollers, antennas, and energy enabling devices will be great. Closely following will be the Cloud. It too will

resume a major growth role in 2020 as more data centers are needed to handle massive amounts of data captured via IoT and transmitted through 5G communication networks. Processors, power management and sensors will be sought in volume. And coming back to 5G, while it may be slow coming, it will soon become the industry's tsunami. As production ramps, global demand for all components will be enormous. It may make the 4G component shortage of 2017-18 look small.

Adding further credence to this positive growth projection is semiconductors. According to Dale Ford, semis are about to start a new annualized growth cycle around mid-2020 typical of its four year trend history. That seems to fit the market conditions just described above assuring an upward path is likely.

As for the global economy, significant infrastructure build-outs will accelerate. Each will ultimately deploy all three technologies. The key deliverable driving the investment: leadership.... countries and companies seeking to establish dominant global, competitive advantages.

Lastly, I spoke of potential roadblocks and tangential risks that may stymie growth. Among those concerns are: expanded trade barriers; anti-competitive regulatory measures; cybersecurity intrusions; and disparate rules governing a free internet. Any one of these risks could negate the growth and benefit of 5G. Let's hope wiser heads prevail.

By now you might surmise 2020 should be a growth year and you would be right. But given the soft lead-in from 2019, 2020 Q1 will be flat with gradual acceleration starting mid-Q2.

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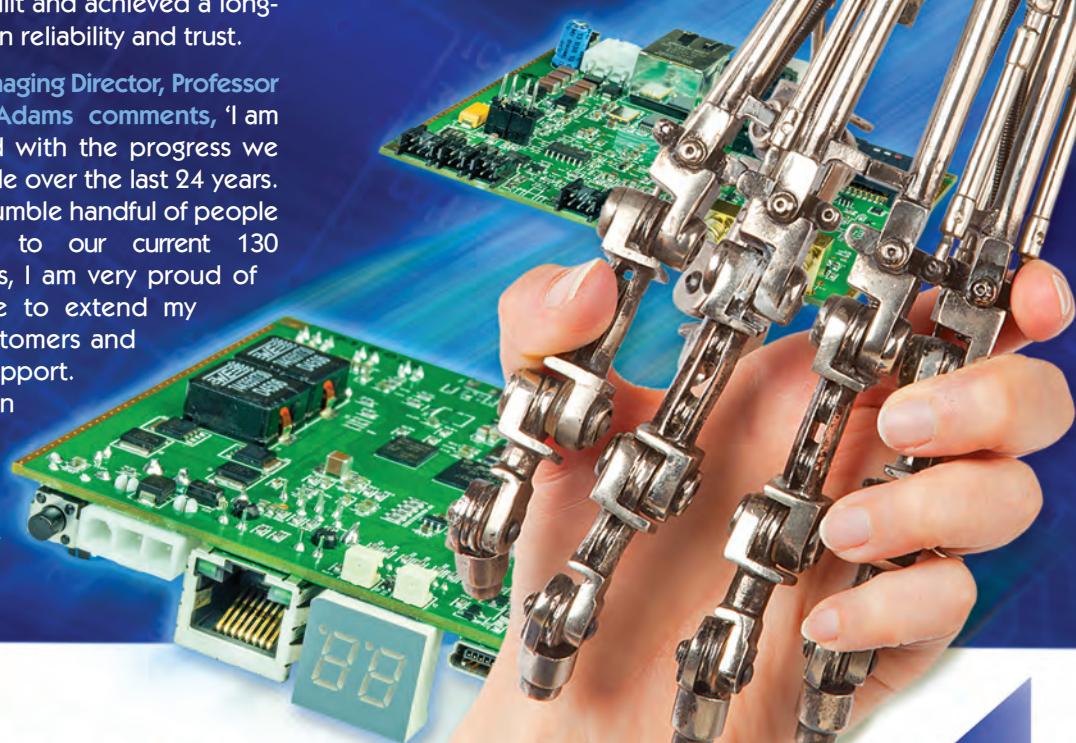
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Distributors expect a return to sales growth in 2020

Increased demand for components from industrial and defense and aerospace OEMs and their contractors, coupled with deployment of 5G networks will create greater demand for semiconductors, passives and other components in 2020



James Carbone

Distributors are cautiously optimistic that they will post single-digit sales increases in 2020 because high inventory levels in 2019 have been mostly worked off and component demand will increase after being sluggish last year.

Distributors say that component demand from industrial, transportation and defense and aerospace OEMs and their contract manufacturers will drive demand in 2020. In addition, the deployment of 5G technology is under way and will contribute to component demand for at least the next five years and most likely longer.

However, some distribution executives say that while component demand will rise in 2020, it could be impeded by slower economic growth in the U.S., China and Europe. Some executives say that a recession is possible, although not likely.

"Next year (2020), there is going to be a dichotomy," said Michael Knight, president, TTI Semiconductor Group. "On one hand there are a lot of things that will put energy into the market. On the other hand, there is this growing pessimism and fear that were going to slip into a recession, maybe a global recession. But I don't think the U.S. is going to go into a recession," he said.

Some distributors say while there

will be sales growth in 2020, it likely won't occur in the first quarter and may not happen until the second half of the year. Knight said the first half of the year would be "bumpy. I think the second half of the year will be better than the first and we will start seeing nice momentum build going towards 2021," he said.

Chris Stansbury, chief financial officer for Arrow Electronics, said "sales growth won't return until the second quarter or even beyond. Inventories have largely come down, but there's still more to come out although it is not a large amount," he said.

He said Arrow's business last year was "off across the board but we have done better than the market overall. That's most pronounced in Asia because we continue to take share from regional distributors," said Stansbury. He added while 2019 was an off year for Arrow, the distributor previously had 25 straight quarters of growth in Europe, Middle East, and Africa (EMEA) but that ended in the third quarter of last year.

Some distributors are not sure when business will get better. "No one knows exactly when the market will return to more favorable dynamics," said Alex Luorio, senior vice president of supplier development for Avnet Electronics Marketing Americas. "What we do know is that macro data, including the U.S. Purchasing Managers Index,



Michael Knight, president of TTI Semiconductor Group

"I think the second half of the year will be better than the first and we will start seeing nice momentum build going towards 2021"

or PMI, hit a 10-year low in September, and is now showing signs of improving. The most recent PMI data shows that in the U.S. the November PMI is at a seven-month high amid a stronger upturn in new orders," he said.

He added as "we look towards the new year and beyond that to a new decade, we're seeing mid- to long-term opportunities in retail and health care, and positive trends in defense and aerospace." However, with other industries such as industrial and automotive, "we still see lingering impact from recent regional slowing such as that in EMEA. "But a new decade promises new

opportunity across all of Avnet's key industries and geographies," said Luorio.

A significant impact

One opportunity will be 5G technology. Stansbury said 5G will have a significant impact on business because it will make industrial IoT "easier to access." He said Arrow has a lot of engineering capability and works with small and medium size customers on industrial IoT solutions.

"If you look at 5G deployment, it is obviously slow. I think there are also questions right now given the issues with Huawei." The Chinese company builds





telecommunications equipment including 5G networks and smart phones. The U.S. has said that Huawei's infrastructure equipment may allow China to conduct surveillance on the U.S. and there have been calls for the U.S. to prevent the use of products made by Huawei. In 2018, the United States passed a defense funding bill that barred the federal government from doing business with Huawei because of security concerns.

Nevertheless, 5G technology will drive sales as networks and new 5G smart phones are built. However, there will be much more to 5G technology than smart phones. Len Jelinek, director and chief analyst at IHS Markit Technology, said IoT is a "technology platform that will enable a lot of things beyond handsets." For instance, the low latency and low power of 5G will enable a lot more IoT applications to be developed because a lot of data can be transmitted very quickly.

"It should enable some better form of autonomous driving," said Jelinek. "My belief is 5G will definitely be an enabler and will really benefit" the component industry, not just in the short term, but for five years.

Knight agrees. He said 5G will result in strong, steady growth for a long time. "I think 5G will be the story for the 2020s. As 5G comes into play there will be many other technologies applications that get enabled by that low latency such as telemedicine, telesurgery, vehicle communications, and autonomous driving" which will drive component demand, said Knight.

That will be welcome news to all distributors, including small-volume distributors that specialise in design and new product introduction such as Mouser Electronics. Kevin Hess, senior vice president of marketing for Mouser, said the distributor is expecting high single-digit growth in 2020. He noted that Mouser has increased its number of customers and has seen a rise in the number of component orders. IoT applications, 5G and new emerging artificial intelligence applications should contribute to sales growth over the next several years.

Mouser has expanded its warehouse adding more inventory and will be well-positioned to meet component demand, he said. Extra inventory may be needed because the electronics industry often grows four times

"Inventories have largely come down, but there's still more to come out"

Chris Stansbury, Arrow chief financial officer



GDP, according to Pete Shopp, senior vice president of business operations for Mouser. "If GDP is 2 per cent that means electronics should grow 8 per cent and if we do a couple things right, we will be at 12 per cent," he said. That should be our long-term average," he said.

Solving trade issues

Shopp said if trade issues with China can be resolved and the problem of Brexit can be settled, it should lead to more economic growth and have a positive impact on the electronics industry. Shopp said that the planned exit of the UK from the European Union and the trade war and tariffs with China have contributed to lower GDP.

GDP has been reduced by 1 per cent because of Brexit and the tariffs, said Shopp. So, if these issues are resolved it will boost overall economic growth which should mean greater sales growth for many distributors because large and medium-sized distributors sell globally and not just in North America. Hess notes that North and South America used to account for more than 50 per cent of Mouser's business. "Now it's about 36 or 37 per cent. Europe is about 26 or 27 per cent and Asia the rest," he said. Mouser's business in Europe and Asia has

grown at a faster rate than the Americas with the exception of 2019. "Asia was down a little bit and Europe was relatively flat," he said.

Don Akery, president of TTI Americas, said the distributor was expecting mid-single-digit growth in 2020. "We have seen a few weeks where the bookings have been surprisingly strong," he said in late October.

"Five to seven percent growth is where we expect it to be next year. Mil-aerospace is a big part of our business," said Akery. And that's going to be in the double digits again although the commercial air piece of it may slow down due in part to the Boeing 737 MAX being grounded.



Outsourcing: more to gain than money

Whether you're an old hand at outsourcing or new to the idea, there's much to be gained from reviewing what's on offer, explains Speedboard's Andy Thwaites

So, what's the big noise about outsourcing—everyone is either considering it, or already doing it, and to some it's old hat... but is it?

When it comes to outsourcing, you're likely to be either a seasoned veteran, having joined many years back when outsourcing was new, or you are working for an organisation now considering it for the very first time. Regardless, both parties have things to gain from assessing their manufacturing solution.

Those of us who have read many articles over the years will often stop and not read on at this point, thinking we know the market too well. However, it's a bit like utility providers. We often think we have the best in place until we look deeper and explore what gains there are to be realised in making the switch.

Why outsource?
Often the answer is to achieve better unit cost, but is this the only gain? What about flexibility and innovation? The ideal partner should be operating as an extension to your business where the solution is developed to meet your unique needs. This is referred to as an embedded service

model and often includes a 'concept to fulfilment' solution. Although some EMS companies are good at marketing this concept, this may not be the reality in practice.

To truly be an embedded partner requires significant engagement at the earliest stages of product development to support customers with their products from a design perspective. With design for manufacture, test and procurement all common buzz words, consider whether your partner offers this along with design for serviceability and sustainability.

Will it be cheaper?
Companies often wonder why pricing will be improved by 'getting someone else to do it.' The answer is that most organisations have hidden cost factors within their processes that EMS companies have simply eliminated through years of manufacturing experience. Bigger spends on components and the ability to buffer components, either at the supplier or at your EMS partner, offer not just cost benefits, but flexibility within your supply chain. Consider whether your manufacturing partner engages forecasting

and demand within your business, offering you the best solution.

Not immediately obvious, but significant is the ability to focus on product innovation. With a reliable embedded partner taking care of your supply, your team can focus on innovating and getting new product designs to market.

Who to choose?

When selecting an outsourcing partner there are various scoring methods, from weighting technical and commercial criteria to site visits and audits. However, while these are important, your working relationship will be key, focussing on communication and scalability to address your business growth.

Hopefully reading this will have given you some food for thought. Speedboard is part of Note Group, which has two sites in the UK providing all these things and more, a gateway to a global network of manufacturing sites delivering international manufacturing solutions for newbies and veterans alike.

www.speedboard.co.uk
www.note.eu



The ideal partner should be operating as an extension to your business where the solution is developed to meet your unique needs

Focus on communication and scalability for a great working relationship





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What's new



Specify sealed enclosures

Hammond Manufacturing has announced its new 1557 family of wall mount or desktop plastic enclosures. Initially available in four plan sizes, each in two heights, buyers can opt for a polycarbonate version sealed to IP68, or an ABS model designed to meet IP66. All versions are available in black and RAL 7035 grey.

Featuring rounded corners for a smooth style, the enclosures provide environmental sealing to protect housed equipment against dust and water in dirty and damp environments. The 1557 can be used as a free-standing enclosure when fitted with the supplied feet, or wall-mounted with either four visible fixings or two hidden ones.

PCB stand-offs are provided in both the lid and base. The enclosure is assembled with corrosion-resistant M4 stainless-steel machine screws, which are threaded into integral stainless-steel bushings for repetitive assembly and disassembly. The IP68 polycarbonate versions are UV stabilized for outdoor use with a UL94-5VA rating, while the IP66 ABS versions have a flammability rating of UL94-HB for indoor use.

www.hammondmfg.com

Distributor and Supplier Focus

Minimise uncertainty with continuous production

Protronix EMS believes that being agile enough to scale its business is one of the key benefits it offers customers. High performance surface mount lines allow the company to move from low volume batch production to scalable continuous production. Keeping customers' production requirements within the factory means no downtime or uncertainty from switching sites.

capacity. Although they had no intention of switching suppliers, having transferred production to Protronix EMS, they found that as well as being able to meet their increased demand in a scalable manner, they also managed to lower costs, thanks to Protronix's purchasing power, high performance equipment and self-financing business model.

On a few occasions in 2019, the company reveals that customers moved production to Protronix EMS because they had reached the peak of their existing manufacturer's

All factors that will move into sharper focus in 2020 for those selecting an electronics manufacturing partner.

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Hot new sensors in stock

UK distributor of temperature sensors, ATC Semitec, has extended its line-up of precision thermal components by adding Heraeus Nexensos' platinum sensors to its range, as of January this year.

Managing director of ATC Semitec, Robin Savin, commented: "We are delighted to include the range of Heraeus platinum sensors within our portfolio. It is a perfect fit, which complements our current range of thermistors, thermal fuses, temperature sensors and thermal cut outs.

"With our involvement across many different industries we see an increased demand for sensors at temperatures of 500°C and above. This is particularly relevant in the industrial probe

sensor, automotive and 3D printing markets.

"Thin film platinum resistance temperature detector elements are now extremely cost effective compared with other RTD sensing technologies, and due to their key characteristics of high precision, stability, repeatability and interchangeability, we see opportunities for even greater use within the UK and Irish markets."

ATC Semitec will stock Heraeus' full product line-up of platinum, and nickel RTD elements.

They join an existing line-up of innovative products from Semitec, PEPI, Asahi, TKS/Thinking Electronics, Schott and Fuzetec.

www.atcsemitec.co.uk

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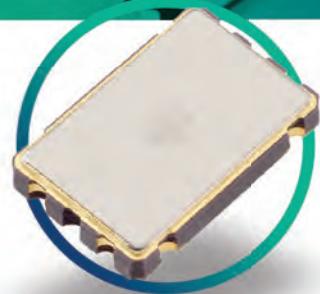
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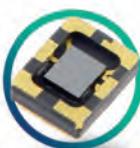
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Creating the industrial connectors you need next

As the HARTING Technology Group celebrates its 75th birthday, it continues to focus on innovative industrial connectivity, delivering the products set to feature on your BoM in the year ahead

2020 marks 75 years of the HARTING Technology Group and the 40th anniversary of HARTING UK. During this time, the company has consistently delivered cutting edge products and technological developments across a range of industries, thanks to its robust, reliable and innovative solutions. As we enter a new decade, this pioneering, forward-thinking spirit remains a key aspect of the HARTING approach.

For example, HARTING's T1 Industrial recently won the award for *Passive and Electromechanical Product of the Year* at the Elektra Awards. Industry recognition for establishing this new standard highlights the immense potential of the new technology, which can supply both data and power across a single pair of wires in an IEC 63171-6 industrial interface for single pair Ethernet.

Facilitating tomorrow's IIoT

Up until now, industrial Ethernet has only been

able to reach the control level before it needs to switch to BUS systems via gateways. SPE, via the T1, allows equipment to connect via end-to-end IP-based communications right up into the field level. As a result, Ethernet interfaces can now be integrated onto simple sensors, cameras, reading/ID devices or similar equipment.

Experts have suggested that SPE will be one of the key technologies that significantly shapes the success of the industrial internet of things. The factory of the future will require high data streams and the industrial sector needs connectivity that adapts itself to ever-growing demands. This is most effectively achieved via standards that are developed and advanced through partnerships in an open ecosystem. The T1 Industrial brings Ethernet from the cloud to every sensor, thus enabling the IIoT.

Innovative aspects of the T1 Industrial include the space-saving and weight reduction

benefits attained by the move to a single pair of wires. This means the compact T1 can be easily incorporated into smaller devices. Furthermore, by reducing the amount of copper wiring required, the T1 delivers weight savings of 1.6kg for every 100m of cable used, along with cost savings.

There is immense potential in this new technology. As sensors, actuators, and network nodes can be networked and supplied with power via the T1, there are numerous applications in automation technology, robotics, machinery, and plant manufacturing, as well as in building automation and transportation markets.

Future-proofing Ethernet delivery

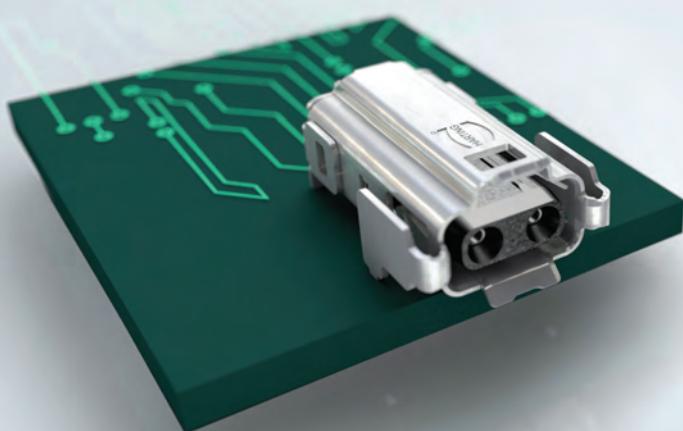
HARTING has also created a space-saving, future-proof Ethernet delivery solution to replace the traditional RJ45. The ix Industrial is a robust connector which is standardised to comply with IEC 61076-3-124. It boasts a 70 per cent smaller PCB jack,

enabling manufacturers to use it in much smaller devices and a high current-carrying capacity that supports both existing and future Power over Ethernet applications.

Just as in the past 75 years, HARTING has once again recognised the future requirements of industry and driven the development of innovative connectivity, this time with solution packages for the cloud and IIoT. As an enabler of IIoT, HARTING is transforming a technology trend into a real application solution.

To learn more about single pair Ethernet, download HARTING's free e-book, which explains the functionality of SPE and why it is perfect for IIoT and Industry 4.0.

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Smart thinking

To start the year, eBOM.com's marketing manager Amy Leary invokes some future gazing, looking at jobs, smart electronics, robotics and gender

How is the electronics engineering job market evolving?

Electronic engineering has been a widely recognised field since the 1950s. With the roots of

electronic engineering evolving in 1835 when the first relay was invented by Joseph Henry, it has developed into a high demand industry market. In this article I walk readers through the

movement of the engineering workforce and explore how it has evolved.

But who are electronic engineers? Electronic engineers

design, develop, test and supervise the manufacture of electronic equipment ranging from motors and power generation products, to mobile phones, robotics and computers. Engineering is a crucial part of electronics where the product comes together to operate efficiently. All the electronic products you see today would have been designed by an electronics engineer, regardless of whether it was physically constructed by robots or humans.

Demand for smart electronics is increasing

The more electronic products that are designed, the more that can be manufactured and sold, the more profit to be made.

Countries producing the highest quantity of electronics have the greatest demand for engineers and designers. According to Investopedia, China, Hong Kong and the US lead the global field in producing electronic products.

Maintaining its reputation for producing inexpensive consumer goods in large quantities, China contributes heavily to the electronics sector, as this is the country's most prominent export category. Smart electronics such as mobiles, smartwatches and tablets have been in high demand in recent years. The ever-changing trend of smart devices means that electronic engineers will need to be adaptable to keep up with the latest technologies. China is soon to overtake the United States as the largest economy, widely contributed to by talented electronics engineers.

Rise of the robots

When I think of what the future holds, I imagine robots serving us at restaurants, driverless cars, and robots making our clothes etc. However, this may just be the reality. According to Academy Archistar, several studies have suggested that artificial intelligence may cause job losses. One recent example comes from

continued on page 66 »

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» the University of Oxford. The study found that over 700 types of jobs are at risk of technological disruption. All told, this means that about 47 per cent of jobs are at risk because of artificial intelligence. Up to 20 million manufacturing jobs around the world could be replaced by robots by 2030, according to analysis firm Oxford Economics. However, electronics engineers may be in luck. Being an engineer takes a great deal of creativity which can unlikely be replaced by robotics.

Demand increasing for green engineering

Climate change has been a passionate topic for many people over recent years. According to Global Climate Change, the planet's average surface temperature has risen about 0.9 degrees Celsius since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Because of this, there has been huge pressure on engineers to produce sustainable products which have a positive impact for the climate. As well as this, not only is the pressure for electronics engineers to produce products that are made in an environmentally friendly way, but products that are environmentally friendly throughout their lifespan. According to Survey Monkey, 35 per cent of people are willing to spend more money on

products that are better for the environment. Engineers strive to create products which are in high demand and make people feel good about buying. Therefore, it's important that they incorporate this new environmentally friendly trend when designing products. The trend is producing products which preserve natural resources, are cost-efficient and support human and natural environments.

Gender imbalance in the work force

In this field of employment there is a significant gender disparity, with far fewer women than men working in the area. The gender imbalance in engineering has been going on for centuries. Recent statistics show that only 16 per cent of engineering and technology undergraduates in the UK are women. Also, according to Wikipedia, the salary of female engineers is 10 per cent less than male engineers. Today, it is more widely accepted to have females in the male dominated engineering work force. However, very few females pursue a career in this field.

What can I do to keep up with the ever-changing market?

I would advise electronics engineers to constantly research the latest smart devices and trends. This would be beneficial for

engineers as their products would be in higher demand. Also, customers are more likely to buy products which are positive towards the environment so I would advise taking that into consideration.

Summary

In my opinion, I think the engineering market is adapting to be more sustainable and environmentally friendly. Electronics engineers see the world in a more fragile way and therefore strive to engineer products in a way which doesn't contribute to climate change. The engineering job market is evolving to be more technical and smarter device dominated to keep up with the latest products. In my opinion, the engineering market in the future will be more robotics dominated due to the latest technology. This would be a more efficient way to produce products due to not having to pay wages etc.

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Amy Leary, marketing manager
at eBOM.com



In this field of employment there is a significant gender disparity, with far fewer women than men working in the area

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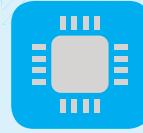
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Powerful benefits for PV purchasers

New DC/DC converters, available from TME, provide a wide range of input voltages, increasing efficiency in a whole host of applications—not least photovoltaic products

Every year, manufacturers of photovoltaic modules attempt to create more efficient solar panels using new technologies and new materials. Although in recent years they have succeeded in increasing the performance of PV systems, there is an easier way to improve efficiency. Aimtec's DC/DC AM10/15/40/45/200-NZ converters provide an exceptionally wide range of input voltage from 200 to 1,500V DC with efficiency 1.5 to two percentage points higher than the 1,000V DC converters currently available.

Furthermore, with Aimtec DC/DC converters, you can construct a simple, low-cost and smaller system of the main electrical components involved in solar energy harvesting. These solutions are beneficial because they reduce the time needed to market the product, lower the costs, and at the same time increase the efficiency of the entire system.

Global renewable energy demand

In 2015, following the UN Climate Change Conference held in Paris, an agreement was signed to reduce the global emission of greenhouse gas. It has had a positive impact on the development of ecological renewable energy sources such as photovoltaic panels and wind energy. Strong public support for green renewable energy solutions, lowered production costs and modern performance-boosting technologies are factors that will heighten demand for PV and wind energy systems.

The use of new converters improves efficiency. Currently, PV systems are designed on the basis of a model using the input voltage of 1,000V DC, which is 33 per cent lower than the 1,500V DC supported by new solutions from Aimtec. Higher voltage systems will increase the efficiency by 1.5 to two percentage points. In light of these findings, the situation has become clear: the next step in the development of photovoltaic installations must be to replace the internal components of the devices in these highly advanced systems.

Efficient energy solutions

The AM10/15/40-800xxS-NZ series of DC/DC converters aims to fill this demand. The converters provide an input voltage range from 200 to 1,500V DC, 4,000V AC isolation and built-in multidimensional protection functions that can be useful for various photovoltaic systems and other applications which require a stable and reliable power supply such as wind turbines.

Designed to stand out from the crowd, Aimtec DC/DC series converters boast a wide input voltage range, with standard output voltage of 5, 12, 15, or 24V. They are perfect for smaller and more compact devices such as inverters and monitoring systems, as well as offering several protections including input under-voltage, reverse polarity and output overcurrent protection.

This innovative DC/DC converter allows a power module in a solar array to receive an output voltage

higher than 1,000V. This is crucial, because the output voltage varies depending on the intensity of sunlight. If the output voltage is too high for a long period of time, this can lead to instability of the operating voltage, cable problems and short circuits, which in turn can cause a failure of the entire system.

The DC/DC converter scheme is based on the flyback topology thanks to the reliable pulse width modulation control system. It also uses two high voltage transistors connected in a series, as well as a power isolation. The high voltage starter is built with Aimtec's patented starter technology and has a number of built-in protections.

To simplify life for purchasers, the new Aimtec converters are complemented by a range of products that can increase the efficiency of PV systems by two percentage points. What is more, best-in-class protections guarantee safe and reliable operation. Aimtec's solution for PV systems therefore delivers huge benefits by simplifying designs, reducing costs and improving overall system performance.

www.tme.eu



New DC/DC converters allows a power module in a solar array to receive an output voltage higher than 1,000V



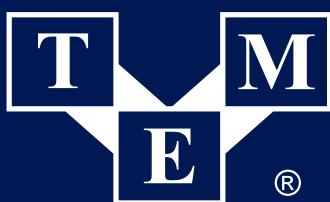
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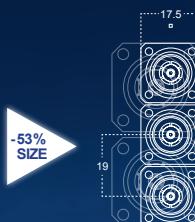
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Thousands of connector combinations available

Hitaltech has expanded its Conex-it rigid interconnect range with tens of thousands of connection permutations now available. The new range simplifies sourcing with rigid and flexible connectors available from a single source.

Customisation options include pin lengths, platings, colour, orientation and more. A connector selector tool makes it easier to find the right connector for any application.

Hitaltech managing director, Andy Fitzer, explained: "The Conex-it range is one of the UK's largest selection of rigid, board to board connectors. Manufacturers can choose from tens of thousands of components, all available with a huge variety of connection

options to give complete design freedom. Each delivers the quality clients expect from Hitaltech at low cost. And because Conex-it is our own range, we can offer the whole board-to-board interconnect package, whether it's flexible or rigid."

Despite the vast range, customisation options are surprisingly flexible. Andy added: "We can tailor pin lengths and offer special platings and insulators very easily. But we can offer far more fundamental customisation options too. Choose the shape, colour, geometry or orientation. The options are limitless which means there's always a connector for every application."

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Rise of the robots

Available in the UK from Components Bureau, the Cosel RB series power supply is suitable for small to medium size robots, due to the output voltage combinations. Features of the new RBC200F 200W open frame AC/DC power supply include two to three output configurations, with an efficiency rating up to 91 per cent.

The supply also offers 3kV reinforced isolation on channel three and an operating temperature of -20 to 70°C. The RB series comes with an optional chassis cover and a five year warranty. Purchasers can choose from a number of output voltages.

www.componentsbureau.com

Stay cool with rapid supply

With stocks in the UK and ready for conversion, DK-Daleba aims to offer a reliable source of thermal interface materials and EMC products at unbeatable prices

Backed by production facilities in the UK and the Far East, DK-Daleba is the global PCB manufacturing company behind the EMI Thermal brand that claims to offer purchasers market leading thermal interface products and market beating prices.

EMI Thermal products, available from DK-Daleba's own manufacturing facilities, are stocked and converted in the UK for fast and reliable delivery.

Thermal interface materials are thermally conductive mediums used to fill the air

gap between mating surfaces in electronic components. Filling these air voids with a TIM from EMI Thermal helps ensure reliability and performance and prevents components from overheating and becoming damaged. EMI Thermal's engineers can help customers choose from an extensive range of products to solve their thermal issues. Samples are available to help with thermal trials and then materials can be converted into bespoke pads to meet precise requirements.

DK-Daleba also provide a range of items to help with electromagnetic compatibility.

As with the TIM products, engineers are available to help customers choose the right product to solve issues and any necessary gaskets are made here in the UK.

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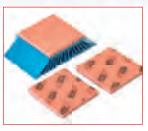
Graphite for Lighting Heat Sink



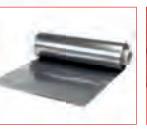
D/S Thermal Tape



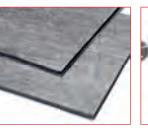
Void Filler on PCB



Void Filler on Heat Sink



Natural Graphite



Metalised Foam



Phase Change Material

Samples are available to help with thermal and EMC trials

Materials can be converted into bespoke pads to meet precise requirements.



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Streamline your sourcing process

Bringing together a cross section of the UK electronics industry, plus significant off-shore exhibitors, Southern Manufacturing and Electronics 2020 promises purchasers a productive day out

Returning to Farnborough from February 11 to 13, *Southern Manufacturing and Electronics* is an important show for the industry, bringing together a comprehensive cross-section of the UK electronics industry, plus a significant number of off-shore exhibitors from around Europe, Asia and the Far East. With the show already nearing full occupancy of the 20,000m² Farnborough International Exhibition Centre, the organisers are confident of exceeding 2019's record attendance, when 8,700 visitors passed through the doors over three days.

As a marketplace for busy sourcing professionals, the event delivers the chance to meet many top vendors from practically every branch of electronics and manufacturing under one roof.

Face-to-face component advice

Major distributors present this year include WDS Component Parts, Optimas Components, Midas

Electronics, Wurth Electronics UK, Schurter Electronics and Transfer Multisort Elektronik. Rebound Group companies, Easby Electronics, Delta Impact and Rebound Electronics, will have a significant presence at the 2020 event. Other notable names include, for the first time, Austria's CODICO, G English Electronics and Selwyn Electronics, the UK distributor of ODU Connectors, amongst many others.

Various new products will be highlighted at the show, including a rotary position sensor and CANbus LVDT from RDP Electronics, new long range radio modules and off the shelf products from RF Solutions, and numerous new products from BT2000, including PCTEL antennas, portable RF telecom scanners, AMR magnetometer ICs, Vinatech supercapacitors and carbon solutions for fuel cells.

Specialist parts include optoelectronic components and systems from Japanese firm Hamamatsu Photonics,

which will showcase a range of products including x-ray cameras and sources for NDT and light measuring devices for LiDAR applications. Connector manufacturers exhibiting include Binder, Yamaichi Electronics, Coax Connectors and Lemo UK, as well as E-tec, which will be showing interconnect solutions for the first time.

Along with components, the exhibition is also an important marketplace for production equipment such as pick and place technology from Advanced Manufacturing Systems and proprietary soldering solutions from Blundell Production Equipment. VisionAid will launch a range digital magnifiers, microscopes and inspection solutions, while other noteworthy firms include PACE Europe, Purex, Turner Electronics and test fixture specialist, Yelo.

Simplify CEM selection

Subcontract service providers are also thick on the ground, with a broad range of expertise available from

electronics design, EMC testing and PCB assembly, right the way through to full contract manufacturing support. A selection of exhibitors includes JJS Manufacturing, Merlin PCB, European Circuits, Hammond Manufacturing, Corintech and several more. Off-shore firms exhibiting include Latvian CEMS, Volburg SIA, Shenzhen X-Mulong Circuit and MV Circuit Technology.

Along with the exhibition and demonstration zones, the complimentary seminar programme is a popular feature. Two programmes run in tandem in two theatres, aimed at manufacturing and electronics respectively. Themes tackled include technology, innovation, business management, marketing and a review of present industrial law and regulations. Free access to this high-calibre technical and business know-how is yet another powerful reason for electronics professionals to attend.

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11th | 12th | 13th FEBRUARY 9.30am - 4.30pm
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The exhibition is **free** to attend, **free** to park and easy to get to. Doors open at 9.30am on Tuesday 11th February.

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Right first time, every time

With 20 years' experience under its belt, Circuit Solutions offers the agility to make changes on-the-fly with a quest for quality that ensures products are delivered right first time

Circuit Solutions' manufacturing and engineering teams have many years of experience assembling complex and diverse electronic assemblies. The company offers a broad range of manufacturing services to a diverse customer base—from conventional assembly, fine pitch surface mount assembly through to full turnkey including box build and test. Whatever customers require, Circuit Solutions has the skills to deliver.

Working collaboratively with customers, the company aims to develop a supply model that works for them. Possibly

the most critical string to its bow, however, is the agility to respond to changes on-the-fly, often working with clients at a very early stage of development.

Recognising the importance of an efficient supply chain, Circuit Solutions' procurement team boasts an in-depth knowledge of sourcing electronic components from franchise and trusted non franchise sources. One major focus is working with suppliers to bring down costs on customers' bills of materials.

Circuit Solutions is also fully aware of the importance

of 'right first time' and as a result, all products are thoroughly inspected at each stage of manufacture.

As a leading electronics manufacturing services provider, the company's quest for quality and continual improvements sees it meet ISO9001-2015, with an in-house certified trainer ensuring operators are fully trained to the IPC and J-STD standards.

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Circuit Solutions selective soldering machine ensuring quality solder joints

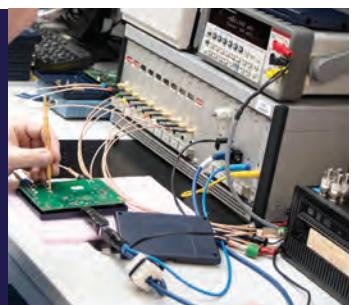


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Source custom RF cables fast

Lane Electronics has introduced a fast turnaround RF cable assembly service, providing rapid delivery of custom assemblies utilising Huber+Suhner cable and connectors

Purchasers will be interested to discover that Lane is now able to offer cable assemblies manufactured to custom dimensions, with no minimum order quantity and, it claims, delivered in record time. Products are assembled by Lane's fully trained staff, as well as being tested and documented to Huber+Suhner's stringent standards.

The availability in custom lengths and quantities makes the cables ideal for low volume production runs, project evaluation, trials and prototyping.

Prior to the launch of this service, customers have been obliged to purchase directly from Huber+Suhner. This new service allows users to buy the same product, but with shorter leadtimes.

According to Lane Electronics, the most popular applications for these cable assemblies will be fixed and mobile communications, transport including railways, aerospace and defence, test and measurement, medical and general industrial.

The assemblies are built around Huber+Suhner's RF Enviroflex and Spuma coaxial cables. The most popular

connectors are expected to be BNC, SMB, N Type, SMA and TNC, although other Huber+Suhner RF connectors can be specified as the application demands.

www.fclane.com

Show Preview

Ready to get stuck in?

The Embedded World exhibition and conference promises to help those involved in creating the latest embedded systems as they tackle demand for higher performance, mobile, networked systems

Extreme miniaturisation coupled with increasing computer performance, efficient communication of networked, often mobile systems — the developers of embedded systems have enormous requirements to meet. The reliability of electronic systems, distributed intelligence, the internet of things and solutions for future e-mobility and energy efficiency are at the top of the agenda for the embedded sector.

The Embedded World exhibition and conference in Nuremberg, running 25 to 27 February 2020, aims to address these topics. It offers the embedded community new products and innovations, as well as an opportunity to maintain and develop valuable contacts.

Around 1,000 exhibitors are presenting technology in all facets of embedded technologies, from construction elements, modules and complete systems through to operating systems and software, hard and software tools, plus services covering all aspects of embedded systems. Find out which exhibitors, products and innovations await you in the exhibitor and product database.

For added inspiration, the event also hosts two high-quality conference programmes accompanying the trade fair: the Embedded World Conference and the Electronic Displays Conference. Programme topics will be selected by an international jury of experts. Participants will not

only expand their specialist knowledge, but also find helpful ideas and solutions that they can apply directly in practice.

Find out more about the conferences at www.embedded-world.eu/program and www.electronic-displays.de/program.

To register for a free, three-day ticket to attend the embedded world exhibition and conference use the following voucher code ew20elecSourUK at www.embedded-world.de/voucher. This code can be redeemed for several colleagues, so remember to pass it on.

www.embedded-world.de/en





Semiconductor industry will recover in 2020

While the semiconductor industry will post single-digit growth in 2020, buying conditions will favor semiconductor purchasers as there will be ample capacity to meet demand



James Carbone

Buyers can expect plentiful supply, normal lead times and price declines for most integrated circuits and discretes in 2020, despite stronger chip demand and lower inventory levels compared to 2019.

While many semiconductor manufacturers have cut back on capital expenditures, there's still ample capacity for manufacturing expansion that occurred in 2018. The capacity that was added resulted in semiconductor inventory levels growing last year as shortages of some memory ICs and discretes were mostly eliminated.

Inventory levels fell back half in the second half of 2019, but there still is some excess inventory that has yet to be worked off. As a result, unless there is a huge spike of demand that continues for months, there should be more than enough supply to meet demand, especially in the first half of 2020, according to analysts. Prices for many chips should decline and lead times

should not be a problem in 2020. Chip buyers can expect price erosion for memory ICs, analog chips, sensors, optoelectronics and discretes in 2020.

High inventory levels, declining demand and lower prices resulted in worldwide semiconductor revenue falling 12.8 per cent to \$409 billion in 2019, according to World Semiconductor Trade Statistics (WSTS).

Much of the semiconductor revenue decline was due to falling sales for memory ICs and by a steep drop of chip prices in 2019, according to researcher IC Insights. For instance, the average DRAM price fell 44 per cent in 2019, resulting in a 37 per cent decline of DRAM revenue. By comparison, the average integrated circuit price fell 10 per cent, the researcher said.

The steep decline in semiconductor revenue in 2019 was due to a kind of perfect storm of events. First, demand for end products was weak,

said Len Jelinek, director and chief analyst for researcher IHS Markit. "Handsets were saturated, everyone has a PC, car sales declined" and data centers eased back on purchases of servers, he said.

Weak end equipment demand came after two years of increased capital spending and capacity expansion by chipmakers. Semiconductor fabs were optimised "and running at high volumes as end market demand slowed down," he said. "Inventories increased to high levels not only for the chip guys but through the channel," he said. As a result, chipmakers reduced prices hoping to stimulate demand. "Well, it did not work because there were only so many handsets and so many PCs and so many servers" to be built, said Jelinek.

Demand will bounce back

The good news for semiconductor companies is sales growth will return in 2020 and revenue should increase almost 6 per

cent from \$409 billion in 2019 to \$433 billion in 2020, WSTS said. Semiconductor revenue will rise 6.3 per cent in 2021.

While semiconductor demand and sales revenue will increase, it probably won't happen until the second half of the year, according to Jim Feldhan, president of Semico Research. He said declining chip industry sales will "bottom out in the March/April time frame and then things will improve, but it won't be a V-shaped recovery to start. It will be slow because we think the overall economy is going to be sluggish in 2020," he said. Feldhan forecasts about 3 per cent revenue growth for semiconductors and 8.7 per cent growth in unit shipments in 2020.

While all categories of integrated circuits declined in 2019, the trend will reverse in 2020. Analog chip sales declined 7.9 per cent in 2019, but will rise 5.3 per cent 2020, said WSTS. Memory IC revenue fell 33 per cent in 2019, but sales will increase

By the Numbers



\$408.9 billion

*The size of the global semiconductor market in 2019.
Source: WSTS*



33%

*The rate of decline of the total memory market in 2019.
Source: WSTS*



\$68.3 billion

The forecasted size of the industrial semiconductor market in 2023. Source: IHS Markit



8.7%

The expected rate of growth of semiconductor unit shipments in 2020. Source: Semico Research



\$460.2 billion

The total value of the global semiconductor market in 2021. Source: Semiconductor Industry Association



4.1 per cent in 2020. Logic sales dropped 4.3 per cent but will rise 6.5 per cent this year. Discrete semiconductors suffered just a .6 per cent decline in 2018 and will increase 3.8 per cent in 2020, according to WSTS.

The only two semiconductor categories that posted sales growth in 2019 and will rise again in 2020 were sensors and optoelectronics. Optoelectronics sales grew 7.9 per cent in 2019 and will post a 12.5 per cent increase in 2020. Sensor sales increased 2 per cent 2019 and revenue will rise 5.4 per cent in 2020, according to WSTS.

Analysts say sales growth for chipmakers will increase in 2020 because inventory levels will be lower than 2019, and demand will increase from key customers segments.

"The key drivers for the semiconductor industry will be 5G, servers, and automotive," said Jelinek. "The largest and most significant driver especially in the short-term will be the transition to 5G" because it will be an enabling technology, he said. "The smartphone will be the immediate beneficiary of 5G technology and will receive the most attention, but as 5G networks become deployed they will serve as enabling platforms

for future growth across multiple market segments," he said.

Wait until 2021

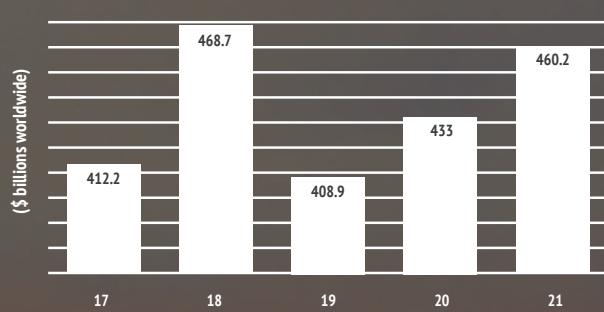
Some industry analysts say 5G will have a positive impact on the semiconductor industry, but 5G won't affect the industry too much in 2020. "It certainly will give sensors and discretes a little boost next year, but we're still early in the rollout of systems that can take advantage of the higher speeds and near instant transmissions of data through the network," said Rob Lineback, senior market analyst for IC Insights. He said 4G LTE will continue to be the dominant cellular generation for several more years.

Feldhan said that 5G infrastructure is being built "but it has not gotten the momentum to have a major impact in the market this year." There's a lot of 5G development and 5G networks are being built and there are a few 5G phones on the market today and we will see more coming out in 2020.

Feldhan noted that there are some 5G networks in large metropolitan areas. "It is a chicken or an egg thing. Service providers are starting to build 5G networks, but they don't want to do a whole buildout when there aren't really that many phones

After declining 12.8 per cent in 2019, semiconductor revenue will bounce back growing nearly 6 per cent in 2020.
Source: WSTS

Semiconductor sales rebound



out there," he said. The real impact of 5G will start in 2021 and continue through 2023.

Automotive will continue to be a driver for semiconductors in 2020 and beyond because of the proliferation of infotainment, advanced driver assistance systems (ADAS) and the development of the autonomous vehicle. However, automotive only represents about 9 per cent of all semiconductor sales. The segment will grow as a percentage of sales, but it will remain relatively small compared to other segments.

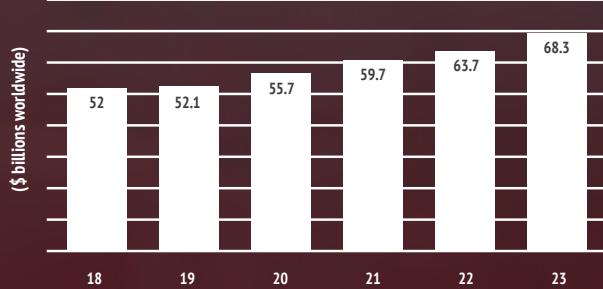
Semiconductor sales to automotive totaled about \$42 billion in 2019, according to IHS Markit. However, computer and storage semiconductor sales totaled \$145 billion, while wireless communication accounted for \$119 billion of chip sales.

Jelinek notes automotive uses a lot of mature semiconductors such as MOSFETs, and "those cost about \$.25-.30, so you are not talking about \$75-\$100 chips."

However, as more vehicles are equipped with infotainment systems, more advanced electronics and displays will be used so. "There is tremendous opportunity for growth," for semiconductors sold to the auto industry, said Jelinek. "But is it enough to swing the dial in the total semiconductor industry," asked Jelinek. "No, it isn't," he said. However, it will be a growing segment for semiconductor companies that focus on the automotive industry and for companies that are supplying ICs for infotainment, and ADAS systems.

Increased demand from 5G and automotive applications and other customer segments will result in less price erosion in 2020. DRAM tags will fall about 8 per cent, while NAND flash will increase 2 per cent. Prices for optoelectronics will decline 2.7 per cent, sensor tags will drop 3.9 per cent and the average price for discretes will decline 3.5 per cent, according to IC Insights.

Industrial semiconductor market to post steady growth



Internet of Things and 5G technology will help drive the industrial semiconductor market for the next several years. Source: IHS Markit

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	5,000	N/A	£0	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35,000	N/A	£0	67%	50	1,500+	Y
DISPLAYS & LEDs											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	91%	50	1,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ECS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	99%	50	1,500+	Y
Epson	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	59%	50	1,500+	Y
Geyer Quartz Technology	Geyer Electronic UK Ltd	01794 329341	www.geyer-electronic.com	N	N/A	N/A	£0	100%	6	50+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	100	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	67%	50	1,500+	Y

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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											
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,500	N/A	£0	83.00%	50	1,500+	Y
Atmel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,700	N/A	£0	58.00%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	97%	50	1,500+	Y
Infineon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,200	N/A	£0	67.00%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
Microsemi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	40%	50	1,500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	Y
Power Integrations	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	Y
ROHM Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	55.00%	50	1,500+	Y
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	99%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
Anderson Power Products	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	82%	50	1,500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100.00%	6	38	Y
JAE Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,200	N/A	£0	32%	50	1,500+	Y
Kycon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	99%	50	1,500+	Y
LEMO	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	65%	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	16,900	N/A	£0	75%	50	1,500+	Y
Neutrik	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,000	N/A	£0	99.00%	50	1,500+	Y
Polamco	Lane Electronics	01403 790661	www.fclane.com	Y	218	£146,000	£0	100%	6	38	Y
Positronic	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y

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
OBSOLESCENCE / HARD TO FIND											
America II Europe	01462 707070	www.americaiieurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y	
Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y	
Rochester Electronics	Rochester Electronics	+44.1480.408400	www.rocelec.com	Y	299	N/A	\$250	10	400+	Y	
SeSemi Electronics LTD	01264 731009	www.sesemi.co.uk	Y	2800	N/A	£100	3	12	Y		
OPTO ELECTRONICS											
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,800	N/A	£0	99%	50	1,500+	Y
VCC	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	92%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	99%	50	1,500+	Y
PASSIVES											
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
Coilcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TT Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	32,800	N/A	£0	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	13,900	N/A	£0	99.00%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
Wurth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
POWER & BATTERIES											
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Jauch Quartz		01276 605900	www.jauch.com		£500,000	0	95	15	130	Y	
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y

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

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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	Y	Y	Y	
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£8m	Essex/SE	95	7	AS9100 Rev D, ISO9001:2015, ISO14001:2015, UL, CCC, IPC-610-G Class 3	Y	Y	Y	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 ISO9001 2015, IATF 16949 2016	N	Y	Y	Y	Y	Y	Y	Y	Y	
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£11m	UK & Far East	72	3	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	Y	Y	Y	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	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	Y	Y	Y	
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OH+SAS18001, IPC-610-F class 3, ISO14001, ISO 13485, UL	Y	Y	Y	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, J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Elite Electronic Systems Ltd	028 6632 7172	www.elitees.com	£20m	UK	230	5	ISO9001, ISO13485, ISO27001, IP610/620 Class 3, J-STD-001, UL	Y	Y	Y	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	Y	Y	Y	
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-610, IPC-J-STD-001, IPC 7711/7721, BS EN 61340-5-1 (ESD)	Y	Y	Y	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	Y	Y	Y	
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y	Y	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	Y	Y	Y	
JJS Manufacturing Ltd	01455 555500	www.jjsmanufacturing.com	£35m	Bedford, Lutterworth, (CZ)	420	3	ISO9001:2015, ISO14001:2015, IPC 610 A class 2&3	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Key-Tech Electronic Systems	01592 597711	www.key-tech.co.uk	£5m	Scotland	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711,	Y	Y	Y	N	Y	Y	Y	Y	Y	
Nemco Limited	01438 346600	www.nemco.co.uk	£15.9m	SE	120	6	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001-2004, SC21	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Speedboard part of NOTE	01753 746700	www.speedboard.co.uk	£115m	UK/EU/China	1,050	18	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y	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/NHMA-620/ISO14001-2004/ IPC-7711/7721	Y	Y	Y	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	Y	Y	Y	
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£100m	Havant, UK/USA/Mexico/China/Malaysia	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£8.2m	SE	77	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Tenkay Electronics Ltd	01903 855455	www.tenkay.co.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y	Y	Y	Y	
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y	Y	Y	Y	
Tioga Limited	01332 360884	www.tioga.co.uk	£16m	Derby	130	6	ISO 9001, ISO 13485, ISO14001, IPC 610, 620, 7711/7721	Y	Y	Y	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	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	Y	Y	Y	

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (is Broker/Manufacturer &/or Repair)	Location	Approvals	Volume - Small/Medium/Large	Double-sided	Multi-layer 4-10/10-20/20-30	Metal PCBs	Flex / Flex-Rigid	Obstinate Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO9000: 2015	SML	Y	4-10	Y	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2015, UL	SML	Y	4-16	Y	Y	Y	Y	Y
Daleba Electronics Ltd	+44(0)1992 510000	www.daleba.co.uk	B/M	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	4-30	Y	Y	Y	Y	Y
DK Thermal Ltd	+44(0)1992 514200	www.dkthermal.co.uk	M/R	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	N	Y	N	Y	Y	Y
Fineline VAR Ltd	+44 (0)1249 815 815	www.fineline-global.com	B	UK / Global	ISO9001:2015 / UL/ TS16949 / Nadcap/ AS9100/ ISO14001	SML	Y	4-60	Y	Y	y	y	y
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	IS 9001:2015, IATF 16949:2016, EN (AS) 9100	SML	Y	4-16	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2015, IPC-A-610	SML	Y	4-30	Y	F/R	Y	Y	Y
Photronix Group	01903 231901	www.photonix.co.uk	B	SE	ISO9001:2015, ISO14001:2004, AS9100-B, NADCAP, TS16949:2002	SML	Y	4-58	Y	F, F/R	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2008, ISO 14001, EN9100:2009, UL, JOSCAR	SML	Y	4-44+	Y	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01889 583627	www.tatecircuits.com	B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	Y	Y	Y	Y

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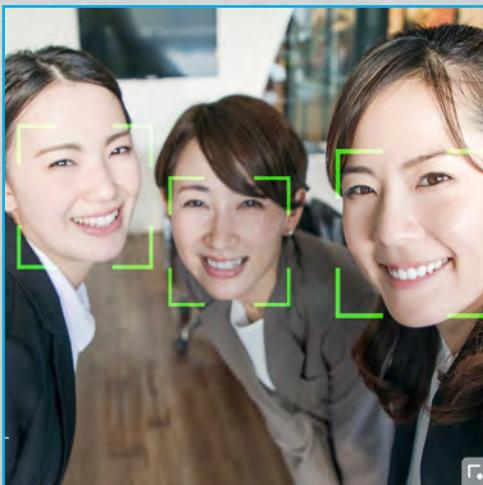
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