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ECIA MEMBER
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On the cover – June 2023

EV charging: Smaller, lighter, more powerful
page 20

Editor's Word

Retirement and rebirth

Readers of *Electronics Sourcing's* monthly leader column will be aware of my interest in demographics, particularly declining birth rates which began in the '70s and the unavoidable consequence of ageing and declining numbers of workers and consumers. This process has now started chipping away at the electronics industry.

Over the past two or three years I have witnessed an unexpected number of owners of small and medium sized electronics businesses announce their retirement. This caught me by surprise as it wasn't something I was used to. However, on investigation it's obvious.

The origins of many of today's electronics manufacturing and distribution industries can be traced back to the '70s. If early employees started in their 20s and worked their way to senior management and ownership, they will have recently started enjoying their retirement. This ties in with the number of small and medium sized businesses I've seen merge with larger organisations as part of the owner's succession plans.

If you look at the standard arc of any business there comes a point where it is either purchased, develops an innovative new product or fails. Luckily, most of what I have seen are mergers and innovations. In fact, mergers often drive innovations as the purchasing company is suddenly exposed to new technology, IP, skills, experience, customers and market sectors.

Electronics Sourcing regularly reports these mergers in its news pages, followed by subsequent innovations in the feature sections. So, please keep reading if you would like to vacuum up this information.

Jon Barrett

Contact

ELECTRONICS sourcing MMG PUBLISHING

EDITORIAL
Managing Editor: Jon Barrett
jonb@electronics-sourcing.co.uk
Contributing Editor: Amy Barker
amyb@electronics-sourcing.co.uk

ADVERTISING
Director of Sales: Emma Evernden
emma.evernden@electronics-sourcing.co.uk
Sales Executive: Alex Mosqueda
alex.mosqueda@mmgpublishing.co.uk
Sales Executive: William Leary
william.leary@mmgpublishing.co.uk

PRODUCTION & DESIGN
Production Manager: Jo McCarthy
jo.mccarthy@electronics-sourcing.co.uk
Design Manager: Josh Hilton
josh.hilton@electronics-sourcing.co.uk

CIRCULATION
Data and Software Analyst: Thomas Smart
thomas.smart@electronics-sourcing.co.uk
Circulation Account Manager: Liz Poole
liz.poole@electronics-sourcing.co.uk

PUBLISHER
Mark Leary
mark.leary@electronics-sourcing.co.uk
Director of Operations: Denise Pattenden
denise.pattenden@mmgpublishing.co.uk

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Tel: +44 (0)1892 613400
Fax: +44 (0)1892 613402
@Electrosourcing

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News

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Investing in British manufactured customised wound components

Kamic Group has acquired AGW Electronics, a UK manufacturer of customised wound magnetic components such as transformers, inductors and associated assemblies. The company is based in Staveley, Derbyshire in a purpose-built 2,800m² production facility.

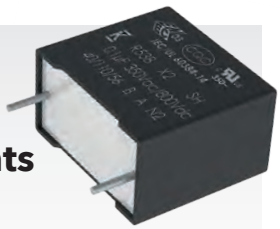
AGW has over 60 employees and annual sales of approximately £5 million. A broad customer base includes the aviation, telecommunications, audio, military and automotive sectors.

AGW becomes part of Kamic Group's magnetics business area led by Dan Phelan who said: "AGW has strong skills in the design, development and production of wound magnetic components and the company enjoys a high level of trust among its many customers. AGW will therefore be a valuable addition to our existing operations in the business area."

AGW Electronics' MD, Nigel Godwin, added: "As part of Kamic Group's magnetics business area we will have access to contacts, support and tools that in the long term will benefit AGW, our employees and our customers."

www.kamicgroup.com

Reliable in harsh environments and at high temperatures



Kemet has expanded its range of metallised polypropylene film EMI suppression capacitors with the R53B series. They are designed to operate reliably at temperatures up to 125°C and meet UL94V-O specifications thanks to an envelope of self-extinguishing resin in the housing.

Target applications include capacitive power supplies, three-phase UPS, smart metering and microinverters for solar applications. They also suit automotive applications like on-board chargers. The capacitors are available in tape and reel packaging according to IEC 60286-2.

The R53B series relies on X2 technology which combines THB class IIIB, miniaturized dimensions, high capacitance value and low halogen content. They also meet the requirements for climate class 40/110/56, IEC 60068-1, are AEC-Q200 certified and RoHS compliant.

Capacitance ranges from 0.068 to 20µF at a recommended DC voltage of ≤1000VDC and a rated AC voltage of 350VAC 50/60Hz or rated DC voltage of 800VDC. Service life is 1,000h at -40 to 125°C.

www.rutronik24.com

Fast delivery of HMI products

Farnell has been appointed an authorised distributor for Grayhill, a manufacturer of precision switches and human-machine interface (HMI) solutions. Farnell customers benefit from fast delivery of a wide range of HMI products including optical encoders, joysticks, rotary switches, keypads, pushbuttons and touch encoders.

Grayhill specialises in optimising haptics, with its designs regularly acting as a central component of products including medical devices, defence systems, emergency radios, luxury cars and rugged interfaces for off-road vehicles.

Farnell's global product segment leader for switches, Keith Forbes, said: "Grayhill's product lines of rotary switches and encoders will enable developers and OEM manufacturers to access and deliver the finest components for their projects on fast lead-times from our stock."

Grayhill's director of marketing, Karen Entriken, added: "This new agreement provides the means to deliver Grayhill's products across EMEA and APAC with the advantages of local stock."

uk.farnell.com

MADE IN CHINA...AND TAIWAN

Some fake components are easier to spot than others—and that certainly holds true for this month's counterfeit investigation by Princeps

It's no secret that integrated circuits are manufactured under stringent conditions in state-of-the-art facilities that comply with the strictest cleanliness standards. It was surprising then to see the IC in Fig 1 arrive in our lab. We're not sure exactly what that debris is between the leads—we just know it shouldn't be there. One can only imagine the impact this would have on the solderability of these parts.

Most likely, this contamination was laid down during the resurfacing process that these chips have been through, when the original part markings were removed, a secondary coating applied and then new markings lasered on to make them appear genuine.

A second giveaway can be seen in Figs 2 and 3. The entire batch had consistent part markings, including lot and date codes; but when we checked the country of origin moulded into the bottom of the parts, we noticed some said China (Fig 2) and others said Taiwan (Fig 3). While it's not unusual for an OCM to manufacture in different countries, it certainly is to have multiple countries of origin in the same lot.

The parts were reported and removed from the supply chain.

www.princeps.co.uk

Figure 1 - IC debris

Figure 2 - Made in China

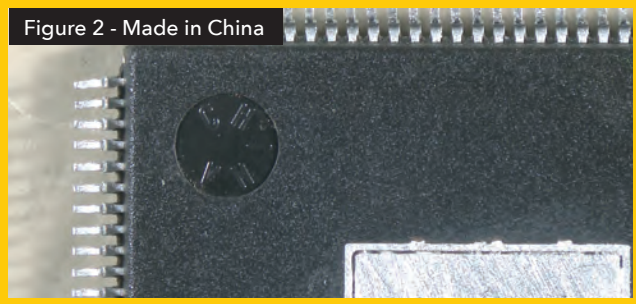
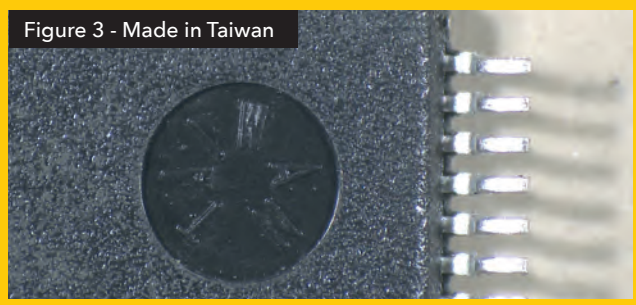


Figure 3 - Made in Taiwan



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ES News

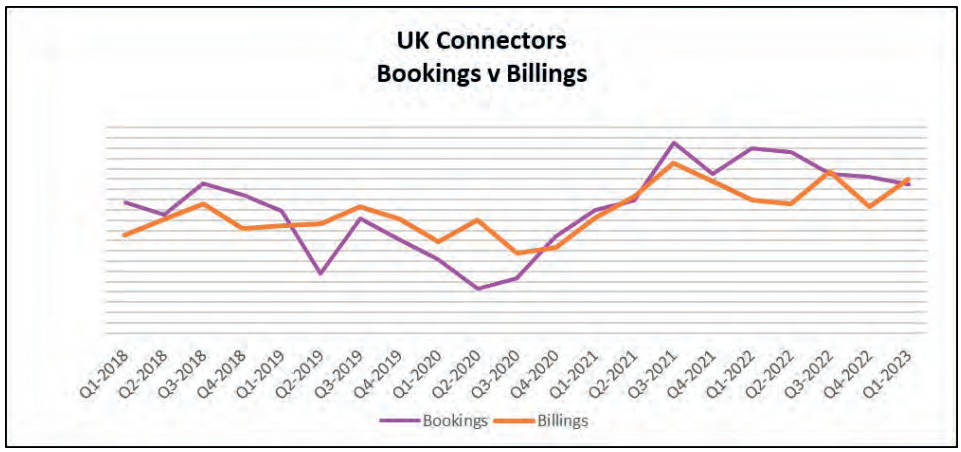
In Brief

Explore additively manufactured electronics
A new website has been launched to raise awareness about the latest advancements in 3D printed electronics and additively manufactured electronics (AME) technology. Users can access informative news articles, publications and tools about 3D printing electronics. Users can also contribute their insights, positioning the site as a valuable resource.
www.j-ames.com

Connectivity partnership bolstered
Avnet Abacus is adding TE Connectivity's ERNI range of connectivity and sensor technologies. Avnet Abacus' senior director marketing, Hagen Goetze, said: "We are ramping up stock of the ERNI portfolio to provide customers with fast access to these products, which offer features making them suitable for challenging environments."
www.avnet-abacus.eu

Customised connectivity for mobile machines
Binder offers ready-to-connect solutions for the Deutsch DT, AMP Superseal and AMP CPC model series—in combination with connectors from the Binder portfolio. Cable switches with wiring options tailored to different applications enable connector systems of different designs to be combined with one another. This way, customised connectivity solutions can be created for mobile machines.
www.binder-connector.de

Powerful addition
Arrow Electronics has signed a distribution agreement with Isabellenhütte, a specialist developer and manufacturer of products based on electrical resistance and thermoelectric properties. Arrow will supply the resistor line throughout EMEA and the companies will work together on customised solutions. Arrow will initially offer low-resistance precision and power resistors.
www.arrow.com



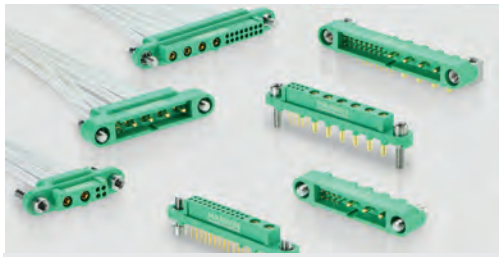
UK connector sales up 12 per cent

In its Q1 report for 2023, ITSA members have seen a 12 per cent overall growth in sales, despite a decline in both the communications and mass transport markets. Distribution remains a major contributor to growth, performing well above pre-pandemic levels.

Significantly, revenues have grown to 13 per cent above pre-pandemic levels, while the book- to-bill for the quarter was flat at 1:1. As mentioned, some key markets are showing continued decline with communications (-34 per cent) and mass transport (-15 per cent). However most markets have bounced back, including data processing (53 per cent), utilities (14 per cent) and test/measurement (30 per cent). Distribution was up 12 per cent, matching overall growth.

Overall, 2023 appears to have started positively for ITSA members, but with orders dropping we may see a flattening out in Q3 and Q4. Also, although there are conflicting market reports, with questions remaining about whether or not the UK is in recession, ITSA members and the industry remain resilient.

itsa.org.uk



Instant sourcing of mixed layout connectors

Harwin's range of Gecko-MT 1.25mm pitch mixed layout connectors is in stock at Powell Electronics. Gecko-MT connectors are claimed to be the smallest, lightest mixed-layout connectors currently available for high-performance applications where size, weight and power matter such as aerospace, defense and motorsports. The connectors are offered with two or four power contacts and eight signal contacts, with 10A and 2A per contact for each type and a 1.25mm signal pin pitch to minimize size and weight.

With operating temperature range of -65 to 150°C, Gecko-MT devices offer 1,000 mating cycles, a four-finger patented contact design that maintains electrical contact through high vibration (up to 20G for 6h) and shock (up to 100G for 6ms), plus stainless steel locking screws.

The components provide up to 50 contacts per connector and are available in a wide array of configurations. The connectors also meet NASA and ESA outgassing requirements for use in space.

www.powell.com

AVR microcontrollers ready to ship

Mouser is now shipping Microchip's AVR64EA 8-bit AVR microcontrollers, designed to provide high-speed, low-power, integrated, analog and hardware-based core independent peripherals (CIPs). Applications include real-time control, sensor node and secondary safety monitoring in industrial, consumer and automotive applications.

The microcontrollers are equipped with an AVR CPU with hardware multiplier, running at clock speeds up to 20MHz. These devices offer 64KB Flash, 6KB SRAM, 512bytes EEPROM and a 12-bit differential analog-to-digital converter with a programmable gain amplifier with up to 16x gain. The microcontroller enables measurement of smaller amplitude signals, reclaims signals from noisy environments and performs fast conversions for quick and accurate signal measurement in harsh environments, all with low-power efficiency.

The microcontrollers feature an internal 20MHz RC oscillator, configurable custom logic event system and CIPs to reduce the need for external components. The devices are offered in SPDIP, SSOP, TQFP and VQFN packages ranging from 28 to 48 pins.

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Rugged, reliable touch solutions for transport systems

Review Display Systems has announced the availability and support for a wide range of PCap touch solutions for in-vehicle and transportation applications from AMT.

Transportation systems, vehicles and vessels are operated in a wide range of terrestrial, subterranean, atmospheric and marine environments. The display and touch technologies used in these systems need to provide dependable operation under a wide range of operating environments and conditions.

Regarding temperature immunity, AMT develops and supplies PCap touch panels that are specified to an automotive standard operating temperature range of -40 to 85°C and a storage temperature range of -50 to 90°C. For outdoor applications, AMT PCap touchscreens have been tested to industry standards including accelerated UV ageing and weathering standard ASTM G154 Cycle 1 for 1,000h and environmental conditions standard MIL-STD-810H Pro 1 for 1,000h.

AMT also offers touch panels with a low-reflective (LR) design to improve image legibility in bright light conditions.

www.review-displays.co.uk

Enhancing efficiency of electric vehicles

Onsemi has released its latest generation 1200V EliteSiC silicon carbide M3S devices, designed to help power electronics designers achieve best-in-class efficiency and lower system cost. The portfolio includes EliteSiC MOSFETs and modules that facilitate higher switching speeds to support the growing number of 800V electric vehicle on-board charger and energy infrastructure applications, such as EV charging, solar and energy storage systems.

The portfolio includes new EliteSiC M3S devices in half-bridge power integrated modules in a standard F2 package. Targeting industrial applications, the modules suit DC-AC, AC-DC and DC-DC high power conversion stages.

Onsemi's senior vice president and general manager of the Advanced Power Division, Asif Jakwani, said: "Onsemi's latest generation of automotive and industrial EliteSiC M3S products will allow designers to reduce their application footprint and system cooling requirements. This helps designers to develop high power converters with higher levels of efficiency and increased power densities."

www.onsemi.com

Enabling advanced multimedia and charging

Infineon Technologies has introduced the EZ-PD CCG7D, a dual-port USB-C power delivery (PD) solution with integrated boost controller for in-car charging applications. The device complies with the latest USB Type-C and PD specifications (Ver. 3.1) and is AEC Q-100 qualified.

The PD solution is designed for automotive applications supporting Display Port (DP) in alternate mode. The solution was implemented in collaboration with Li Auto, a Chinese manufacturer for new energy vehicles, in its new SUV model L9. It lets USB devices charge while simultaneously sharing multimedia content with the vehicle. The device suits automotive charging applications, such as head unit chargers, rear seat chargers and rear seat entertainment systems.

Infineon's senior vice president and general manager wired connectivity solutions, Ganesh Subramaniam, said: "As a leading provider of USB-C PD solutions for consumer and computing applications, Infineon offers seamless interoperability for the automotive market by enabling both USB-C PD charging and display port alternate mode capabilities with the EZ-PD CCG7D."

www.infineon.com

Attractive and versatile for vehicle interiors

EAO has enhanced its Series 09 products with a new, innovative universal switch. The Series 09 Universal Switch is designed for use in vehicle interiors, such as cars, buses, trucks, electric vehicles (EV) and other special vehicles. The automotive-quality switches have an ergonomic design and durable surface coating with haptics and tactile feedback. Standard illuminated symbols are available to the ISO7000 symbol database or customer specific requirements.

Two variations are available, single and dual contact. Basic versions include switches with white symbol illumination and the option of zero, one or three red LED status indicators. Red symbol illumination for use as a warning light switch is also available as a standard configuration.

Stated advantages include: developed and manufacture to automotive quality standard IATF 16949; ergonomic, modular design with IP5K4 protection rating; snap-in mounting and two tactile styles (firm or soft); and mountable in standard DIN radio slot (DIN ISO 7736).

www.eao.com

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www.rohm.com

Supercapacitors suit automotive applications

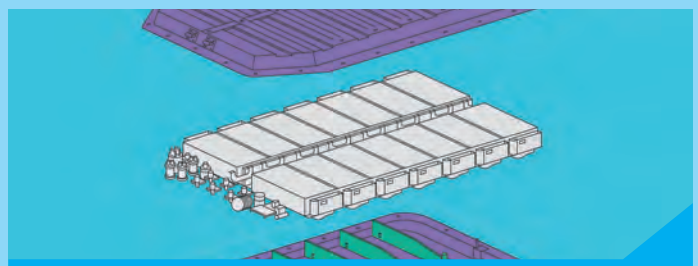
Kyocera AVX is expanding its SCC series to include automotive-certified supercapacitors. The cylindrical devices were tested against AEC-Q200 and are designed to operate reliably in mechanically and electrically challenging conditions.

Applications include electronic-mechanical locking, emergency call systems, electronic recording, regenerative braking, power and emergency power systems. To extend backup times and battery life and to take advantage of instantaneous pulse power, they can be used alone or in conjunction with primary or secondary batteries.

The capacitors meet UL810A, RoHS and REACH requirements.

Stated specifications include: 2.7 and 3V; 10 to 100F; high pulse power capability; low ESR; and low leakage current

www.rutronik24.com



Composite alternative to metal battery enclosures

Solvay's Battery Enclosure Materials Automation (BEMA) project has won Innovate UK funding. In collaboration with Airborne, the project has received letters of support from Jaguar Land Rover and Vertical Aerospace who see great potential in the design of more compact and lightweight enclosures for high-energy batteries in future electric cars and aircraft and are interested in the sustainability aspect of this project which aims to reuse composite waste.

Solvay Materials' EMEA sales manager, automotive, Mark Wright, said: "There is a pressing need to meet net-zero emission regulations and targets with more energy efficient electric powertrain and propulsion solutions.

"While already lending structural and weight saving advantages over metals in existing EVs and aircraft, fully composite battery designs for larger production volumes have yet to show their technical and manufacturing feasibility.

"BEMA seeks to deliver on these challenges by combining the benefits of Solvay's advanced thermosetting material technology with Airborne's expertise in flexible automated composite manufacturing systems to create lightweight next-generation battery packs."

www.solvay.com

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Digital Supply Chains Enhance Procurement

by **Arkadiusz Rataj**, supply chain solutions director, EMEA, **Digi-Key**

The digital supply chain aggregates data picked up from different parts of the supply chain, like procurement, manufacturing and distribution, to help sourcing professionals improve logistics. By providing all these analytics, a digital supply chain can offer users nearly immediate cost savings and long-term strategic insights.

The pandemic accelerated the move to digital solutions for many companies around the globe and it's important to keep that momentum going. While Digi-Key offers some of the most advanced API options in the industry for those that are ready – including product availability, quoting, scheduled shipments, and Supply Chain API to manage reservations – it also has tools for companies that are just beginning their digital journey.

Improving the role of a procurement buyer

One of the biggest misconceptions about digital supply chains is that they eliminate the role of a procurement buyer, but this is simply not true. Embracing digital solutions for procurement elevates your role – making it more strategic by reducing time spent on tedious tasks.

For example, tools like Digi-Key's myLists, our parts management list system, let's sourcing professionals work smarter, not harder, by using quoting functionality to keep everything in one convenient location, create multiple quotes from one list of parts and easily convert quotes to online orders. This digital solution is just one of the many ways Digi-Key is offering customers roadmaps to find their optimal path to a completely digitized supply chain.

In addition, by making the effort to start the digitalizing processes within your organization, the overall industry and channel encounter less disruption, along with sustainability benefits.

Data & Analytics

A key to supply chain success is not only having data but understanding and using it. Unless data is translated into actionable decisions, it's truly useless in the supply chain. Big data and analytics are the technology duo that can help procurement professionals cut through massive amounts of data to optimize their jobs.

Even if you're not ready to make the jump to a fully digital supply chain, one of the easiest ways to get started with digital solutions that makes the most of your current data and analytics technology is by setting up a quoting process. A quoting process alone represents a major timesaver for whoever handles your organization's quotes. Establishing a quoting process will also show you the power and speed of digital solutions. In addition to efficiency, procurement professionals can easily validate the ROI that accompanies digital solutions like these.

Innovations in Digi-Key's Supply Chain

Digi-Key is investing in supply chain innovations that will serve our customers for years to come. From opening our 2.2 million square foot/204,400 square meter Product Distribution Center expansion (PDCe) to keep pace with growing demand, to the establishment of the largest Foreign Trade Zone (FTZ) in the United States, the team is examining every angle to ensure that their supply chain is dynamic now and during any challenges that come up in the future.

For more information on the Digi-Key's supply chain solutions & services portfolio visit *www.digikey.co.uk/supply-chain-transformed*

Automotive semiconductors to the rescue

Chipmakers are counting on strong demand from automakers to help offset declines in consumer electronics and other markets

The automotive semiconductor market is still in flux, struggling to overcome a now two years long supply shortages that have crimped production at automakers while buoying sales and margins at IC vendors. Even as they commiserate with customers, chipmakers acknowledge the positive impact of the supply constraints on their 2022 financial performance and are looking forward to equally strong results for at least the first half of 2023 and even beyond.

Demand for semiconductors headed into the transportation market remains robust and well ahead of chipmakers' production capacity. In response, OEMs are racing to ink novel supply agreements to insulate their manufacturing operation against future procurement shocks.
One such deal includes a contract announced recently between General Motors and GlobalFoundries under which the contract chipmaker would dedicate production capacity at its New York fab for the automaker's chip suppliers.

GM describe the agreement with GlobalFoundries as a "first-of-its-kind" but OEMs in other electronic markets that have large IC purchasing commitments have in the past adopted similar programs. Apple Inc., for example, is reputed for paying billions of dollars to suppliers for long-term supplies at companies like Taiwan Semiconductor Manufacturing Co. Ltd. (TSMC).

Even in the auto industry, the GM contract with GlobalFoundries follows a recent pattern where automakers are reaching deeper into the supply chain for ironclad procurement deals. Having been hurt by severe shortages of semiconductors in the last couple of years companies like BMW, Ford, GM, and others have expanded chip design activities inhouse and are going straight to foundries for supply fulfillments.

Sales of automakers fell below expectations in the last two years due to challenges securing semiconductor components. The supply constraints resulted in a bunch of problems, including a 40 percent decrease in auto production at one point, according to Modor Intelligence, a market research firm.

"The automobile manufacturing industry has been hit hard by semiconductor chip shortages globally," Modor Intelligence said, in a report. "Owing to this, various initiatives were taken by regions to boost chip production. For instance, in August 2022, the United States passed the CHIPS act (Creating Helpful Incentives to Produce Semiconductors). The division received funding of $52.7 billion, which is expected to be used for the research, development, and production of semiconductors."

Pushing ahead

GM is not waiting for the US government CHIPs Act or rival initiative from the European Union to start yielding fruits before taking action to secure its components needs. The company's supply chain stabilization activities have been expanded and now includes an overhaul of its design activities with the objective of reducing the complexity of its product offerings. GM is simplifying design activities so it can use similar platforms across its offerings, potentially reducing the number and variety of components required, the company said.

The company said in a statement that the GlobalFoundries deal would help it cut "the number of unique chips needed to power increasingly complex and tech-laden vehicles. With this strategy, chips can be produced in higher volumes and are expected to offer better quality and predictability, maximizing high value content creation for the end customer."

The real objective remains assurance of component supplies, however. Demand for automotive chips is expected to keep rising through the decade as manufacturers overhaul product offerings and introduce more electronics into cars. The ongoing shift to electric vehicles from internal combustion engines

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(ICE) is accelerating the trend and leading to higher unit shipments to the auto sector. In turn, OEMs are trying to prepare ahead for the expected increase in semiconductor demand for the sector. Forecasters expect sales of semiconductors going into the automotive sector to more than double by the end of the decade to $115. 8 billion, from $48.9 billion, at the end of 2022.

"We see our semiconductor requirements more than doubling over the next several years as vehicles become technology platforms," said Doug Parks, head of global product development, purchasing and supply chain, at GM, in a statement. "The supply agreement with GlobalFoundries will help establish a strong, resilient supply of critical technology in the U.S. that will help GM meet this demand, while delivering new technology and features to our customers."

Fab expansion

Like other chipmakers, GlobalFoundries is targeting opportunities in the auto sector and expanding production to meet rising demand from OEMs. Suppliers have been expanding manufacturing capacity through the addition of new fabs but they are also striking supply agreements with customers to ensure there is a ready market for the output from the new production facilities.

"At GF we are committed to working with our customers in new and innovative ways to best address the challenges of today's global supply chains," said Thomas Caulfield, GlobalFoundries' president and CEO, in a statement. "GF will expand its production capabilities exclusively for GM's supply chain, enabling us to strengthen our partnership with the automotive industry and New York State, while further accelerating automotive innovation with U.S.-based manufacturing for a more resilient supply chain."

TSMC, the world's top foundry, and WolfSpeed Inc., a supplier of silicon carbide for power applications in a wide range of markets, including automotives, have been expanding production for the transportation industry, too. In January, WolfSpeed agreed to supply SiC devices to Mercedes-Benz for the automaker's electric vehicles. In a statement, the company said the products would be made at its facilities in Durham, North Carolina, and at a new 200mm fab in Marcy, New York.

Mercedes-Benz said the agreement would help the German automaker achieve its goals of revamping its platform to reduce complexities in the EV product lines. With WolfSpeed's support, Mercedes-Benz would be able to "improve vehicle range and power," according to Gunnar Güthenke, head of procurement and supplier quality for Mercedes-Benz.

"We have now chosen WolfSpeed as one of our key partners for future Silicon Carbide devices, thus securing preferred long-term supply, technology and quality of this decisive semiconductor component for our electrification offensive," Güthenke said, in a statement.

Adds Gregg Lowe, CEO of WolfSpeed: "We are pleased to be supporting Mercedes-Benz, an organization with a long, successful history of providing world-class performance and luxury vehicles, as they introduce next-generation EVs to the market with highly efficient power systems. We are continuing to invest in our manufacturing capacity to support a steepening demand curve for Silicon Carbide devices that will not only improve EV performance and drive greater consumer adoption, but also support the sustainability efforts of global automotive leaders like Mercedes-Benz."

In addition to the agreement with Mercedes-Benz, the SiC vendor said it will build a new leading-edge 200mm wafer plant in Saarland, Germany. The fab will service customers in automotive, energy, and industrial markets. Its construction is dependent, however, upon contribution from the European Chips Act.

WolfSpeed's proposed German plant is part of a bigger $6.5 billion fab expansion scheme the company previously announced. Other projects under the scheme include the construction of a semiconductor materials facility in North Carolina and the opening of a 200mm device fab last year.

"This new fab represents a big step forward for both WolfSpeed and our regional customers, as we enhance the ecosystem for semiconductor production and innovation," Lowe said. "This new facility will be crucial to supporting our expansion in a capacity constrained industry that is growing very rapidly, especially across the EV marketplace. It was important for us to have a facility located in the heart of Europe, near many of our customers and partners, to foster collaboration on the next generation of Silicon Carbide technologies."

Lofty sales

While semiconductor suppliers are working closely with customers to alleviate the current shortages they are hardly hurting now. In fact, most are benefitting from the automotive IC shortages. Despite the tight shortages, auto IC vendors have benefitted from higher average selling prices as seen in their recent financial results. Bookings are also stronger and there are signs the strong demand will continue to lift auto IC vendors for several more quarters.

STMicroelectronics is a typical example. The company delivered strong fourth quarter results recently and projects 2023 sales would also be strong, buoyed primarily by continued strength in the automotive industry. The Geneva-based company reported revenue of $4.4 billion in the December quarter, up 24 percent, from $3.6 billion, in the year-ago comparable period. The company's gross profit margin rose to 47.5 percent, from 45.2 percent, while operating income climbed 45 percent, to $1.3 billion, from $885 million. Sales to the automotive market contributed strongly to the solid financial performance, the company said.

"2022 was a year marked again by strong demand in automotive and industrial, still impacted by supply chain challenges due to continuing shortages and capacity constraints," said Jean-Marc Chery, CEO of ST, during a conference call. "In the second half, we started to see market softening in personal electronics and computer peripherals. In automotive, we again saw unprecedented demand across all geographies, driven by increasing semiconductor, structural transformation, and inventory replenishment."

ST said it sees revenue in its silicon carbide division, which sells primarily to the automotive and industrial markets, to rise above $1 billion for the first time in 2023, from $700 million, in 2022. The expected increase is seen coming from investments the company plans to make in its SiC production capacity and from design wins in the automotive, industrial and power markets.

"We continue to lead in silicon carbide as we have moved to high volume production of our third-generation transistors for multiple Automotive customers, and we will ramp our fourth-generation transistor in volume in the second half of this year," Chery said. "In power and energy management applications, such as electric vehicle charging stations, photovoltaic systems, and industrial power supplies, we have many important design wins with our discrete portfolio of both silicon and wideband gas-based devices, and we further extended our product offer during the year."

Is older technology still needed?

Central Semiconductor's director of marketing and sales operations, Tom Donofrio, explains distribution can be a vital resource to extend older technology component lifecycles

Central Semiconductor's director of marketing and sales operations, **Tom Donofrio**

The term 'older technology' is often associated with obsolete devices baring less than desirable specification for use in applications no longer appropriate for modern designs. Of course, this is not always true. While newer technologies are successfully replacing workhorse devices, the benefits of the older, standard products are still relevant. Case in point: silicon. New designs are now using wide bandgap (WBG) devices to perform the same function that silicon devices have for years. Even with an aggressive bill-of-materials, WBG products have become suitable replacements as pricing moves closer to parity.

So, where does the older technology still fit? These devices primarily find themselves sustaining existing products to prevent costly redesigns or for ongoing repairs of still-valuable electronics. However, considering the increasing move to WBG devices, the ability or desire for manufacturers to continue supporting older lines has moved to a diminishing support role. This pivot has increased the cost of maintaining older device production, which can reduce the consistency of specifications.

Countless end product manufacturers still require previous generation devices for their designs. As older components grow increasingly difficult to source, consider the following strategies to maintain the required supply of diminishing source devices:

- If possible, arrange a long-term production program with a manufacturer. Often, this can be arranged through a preferred distributor
- If possible, secure a bond inventory with a distributor to ensure long-term supply
- Consolidate required long-term volume to one or two manufacturers to incentivize them to continue to support the end products
- Share forecasts to help suppliers plan these devices properly and ensure adequate supply
- Ask the current supplier for a product roadmap and life cycle report

A paramount recommendation is plan for the future. In instances where manufacturers must discontinue an older technology device, end product designers and purchasers must be prepared to migrate. To avoid holdups or line down situations it is essential to work closely with component manufacturers. Ask them for their newest releases and roadmaps.

With a better understanding of device lifecycles across the BoM, discover when replacements will be available for evaluation and, if necessary, qualification. In some cases, these processes can take months. Making

> **In instances where manufacturers must discontinue an older technology device, end product designers and purchasers must be prepared to migrate**

these inquiries seems obvious but design teams can neglect to ask these questions up front. Then, sustaining the existing end product line is in jeopardy because of the apparent 'sudden discontinuation' of a required device, while the replacement is months away. Avoid shortages by communicating with the component manufacturer and securing required stock until the replacement is available.

Distribution works mainly off existing item numbers with price and delivery. If a quote is required and the part number is not showing, the initial reaction is no bid. As components become more challenging to source, some distributors have added diminishing source teams. Their job is to find suppliers known for extending life cycles or resurrecting older technology products—often a challenging and time-consuming process.

The immense gratitude I have experienced from customers when bailed out of line-down situations demonstrates the power in maintaining older technology and successfully finding devices. Even if a source no longer exists, customers appreciate the above and beyond effort by the distributor and suppliers.

Distribution can be a vital resource to extend older technology component lifecycles and, when required, help source newer technology replacements increasingly found in mainstream designs. To ensure a constant flow of end products and avoid redesigns, seek out distributors and suppliers maintaining older technology device lines and ensure regular communication about requirements.

When an essential device is finally discontinued and a redesign is required, consider pursuing wide bandgap technology. The cost to manufacture WBG technologies has become more competitive as pricing moves toward commodity, making it an appealing path. Ultimately, Moore's Law holds true—at least in the tenant where technology improves, while costs reduce.

www.centralsemi.com

EXPANDED SOURCING OPTIONS FOR EOL PRODUCTS

Resurgent Semiconductor's founder, Duker Dapper, explains how extended manufacturing bridges between a semiconductor's lifecycle and OEM's product lifecycle

The problem of obsolescence is common, unremitting and complex in the networking, industrial, and aerospace/defense industries. Original equipment manufacturers (OEMs) in these and other technology-intensive industries are committed to products that require considerable investment—time, money and resources—to produce and to change when components designed into them reach end of life (EOL). New products may take years to architect, verify and qualify. Similarly, these products' lifecycles can be a decade or more. Some will need specific semiconductors or other components well beyond their expected EOL date.

Despite knowing that components will reach EOL at some point, a scramble typically ensues when a semiconductor EOL is announced by its original component manufacturer (OCM). Product designers, engineers and manufacturers must either find a resource with sufficient inventory to provide a vital component that's soon to be off the market, or they need an alternative with the same specs and functionality. Can a new sourcing partner provide enough of the obsolete semiconductors to maintain production and, if they're in the equation, repair and refurbishment? Is there another semiconductor that might work, whether from that supplier or one of its competitors? Does the product need to be completely redesigned? Does it need to be requalified for a different component?

Although there is a clear need for components well beyond their EOL, OCMs may not be able to make a compelling financial case for continued production as they weigh the cost of manufacturing vs demand for a particular chip. At that point, it's time for the OCM and OEM to think outside the box. To avoid obsolescence, extending the manufacturing of a particular component using a third party for a specific customer or set of customers may make sense. Increasingly, companies are establishing partnerships that deliver a three-way win between the OCM, OEM and an extended manufacturing partner (EMP) to reduce the financial and supply chain risks associated with component obsolescence.

As an EMP, Resurgent Semiconductor is always looking for a three-way win. These mutually beneficial relationships enable semiconductor manufacturers to focus on new product development without abandoning customers that do not need more advanced technologies. They give OEMs an affordable source of reliable, high-quality products that match the form, fit and function of the original for as long as they are needed. And of course, the EMP closes the gap between demand and supply in a way that makes financial sense for all parties.

EMPs embrace a variety of business models to accommodate the needs of their customers. We may partner with another supplier to build a discontinued substrate, then do the product requalification ourselves. We may replace a discontinued automated test platform with something current. No two business cases are alike, so there's no one-size fits all approach. Every solution is measured against a number of variables.

For example, an EMP may not make financial sense for commodities such as memory and standard logic. However, extended manufacturing may be just the thing for customers that need several dozen high-value products in a scenario where demand exceeds hundreds of thousands of components annually.

To avoid obsolescence, extending the manufacturing of a particular component using a third party for a specific customer or set of customers may make sense

The ideal component for an EMP relationship is one with a unique pin-out that precludes a pin-compatible drop-in replacement, with a demand horizon that extends for several years.

Extended manufacturing is often dismissed based on a couple of misconceptions:

Myth: Lower product quality.

Reality: Resurgent uses the same manufacturing flow—foundry and mask set, OSAT, test hardware and software—that the OCM uses. As a result, every electrical and physical parameter complies with the OCM's data sheet. The parts manufactured by Resurgent are identical to OCM originals electrically and physically. This is a unique feature of Resurgent's business model.

Myth: Extended manufacturing won't make financial sense for the OEM.

Reality: Even if unit pricing is a bit higher, there are OEM savings to be had. For example, there's no need for the OEM to redesign the product or requalify a new part, and the risk and cost of supply chain disruptions are taken on by the EMP.

Myth: Extended manufacturing places too large a burden on the OCM to complete a manufacturing transfer or the manufacturing process is too complex for a third party to manage.

Reality: Put Resurgent to the test. We will demonstrate how efficient and painless a manufacturing transfer is. We've executed multiple manufacturing transfers producing over one million parts per year and we have the expertise to execute a transfer quickly, with minimal OCM resources. Resurgent's recent merger with Flip Electronics brings financial resources to the table to allow for a profitable transaction for the OCM.

When EOL is imminent, organisations may not think past traditional sourcing options—but they should. EMPs solve a non-trivial problem that has plagued the electronics industry for decades. Strategically leveraging extended manufacturing bridges the gap between the semiconductor lifecycle and the OEM's product lifecycle, producing a win-win-win for all involved.

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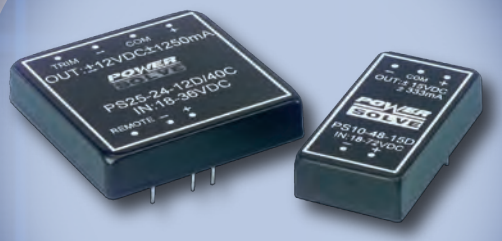

PCB mounting DC-DC from
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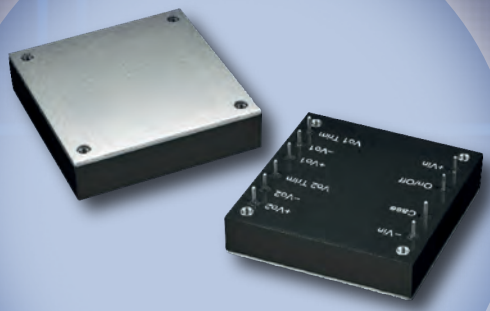

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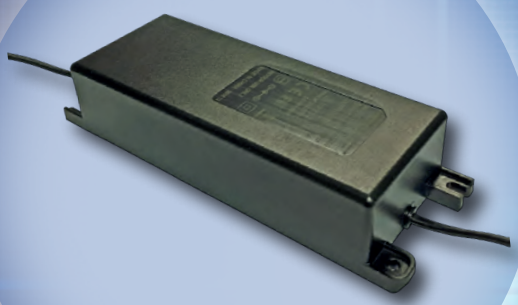

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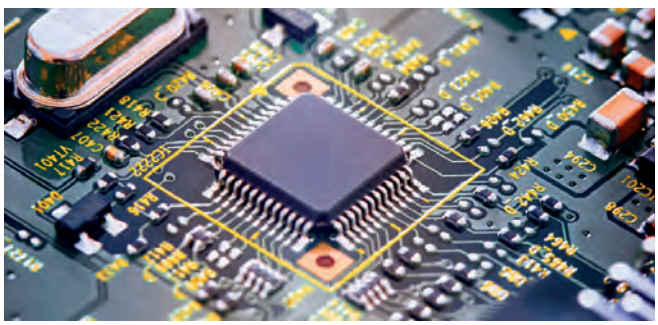

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In this article Heilind Electronics introduces some of the challenges engineers face when designing charging infrastructure and how TE Connectivity technology offers solutions

Together with TE Connectivity, Heilind Electronics is working towards a greener world by empowering the future of e-mobility infrastructure. TE Connectivity's portfolio of EV charging products is designed to answer the challenges engineers face, fitting the needs of AC and DC charging stations regardless of power level or charging speed requirements.

Main challenges designers face are faster and safer charging stations. Areas of innovation holding promise for future EV charging infrastructure include solutions for higher voltages/currents, components supporting miniaturisation and improved thermal management.

Key components in EV chargers include board/signal connectors, contactors, power resistors and terminal blocks. If these components can be miniaturized, manufacturers have the opportunity to develop more compact, flexible charging solutions.

One of the biggest challenges to widespread adoption of electric vehicles is charging speed. Currently, fast-charging stations can charge up to 80 per cent in 20 to 30 minutes.

The increasing number of fast charging stations available and the charging speed they offer pose engineering challenges. Fast charging stations must be designed for high power output and wide-ranging current regulation. This requires the selection of high-quality, reliable components that can safely connect and protect the power flow. For example, relays and contactors designed for higher power ratings contribute to reliable charging circuit

design and solid protection in fast charging mode.

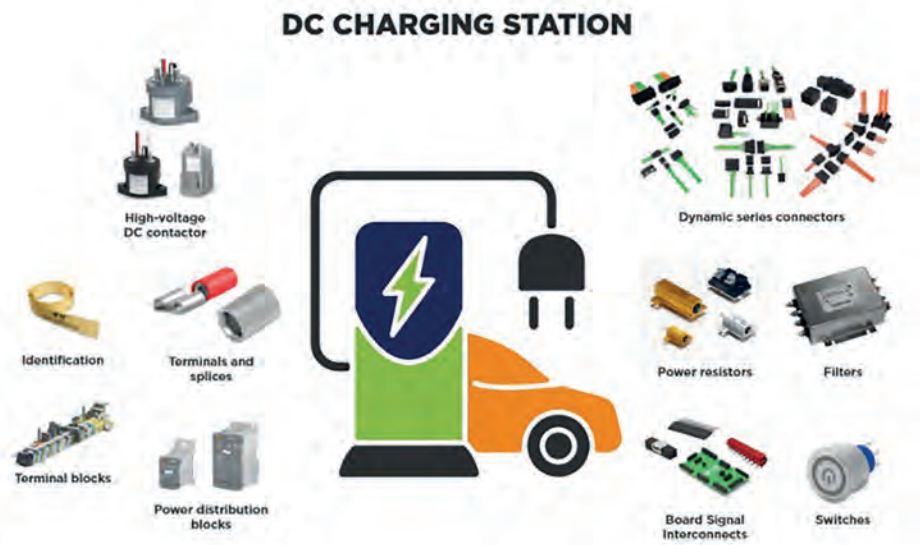
Charging systems built for higher voltages and currents increase thermal load, which increases the temperature of the battery and all connecting components between it and the charger. Thus, each component must be dimensioned to carry the rated current without overheating. However, they should not be over specified to prevent increasing system weight, misallocating limited space and adding unnecessary cost.

To address thermal loading and ensure specification of properly sized and reliable components, TE Connectivity has developed thermal modeling techniques for analyzing the performance of internal connections and components exposed to elevated temperatures during charging.

www.heilind.com

Infographics by **TE Connectivity**

If these components can be miniaturized, manufacturers have the opportunity to develop more compact, flexible charging solutions



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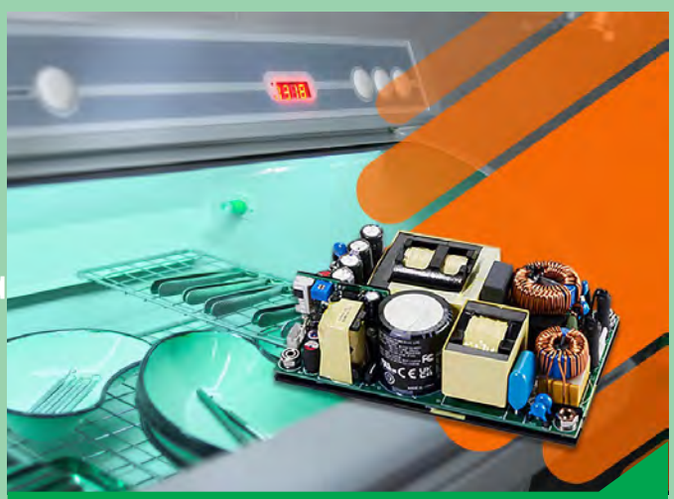

Power dense modules available via distribution

Cincon's series of single-output AC/DC power modules are now available from Relec Electronics. The CFM400S series comprises six models, with outputs ranging from 12 to 54V and an input range of 80 to 264VAC. Power output is 400W.

Power density is up to 17.3W/in³ and efficiency is up to 94 per cent. These characteristics contribute to minimising power loss in end equipment for high reliability and ease of thermal management. No-load power consumption is <0.5W, suiting power-sensitive applications. Dimensions are 127 by 76 by 39mm.

The modules are produced using Cincon's automated manufacturing methods and supported with a testing and qualification programme for reliable operation in demanding environments. Ambient operating temperature range is -40 to 85°C. Safety features include over-temperature protection with power good and power fail signals.

The modules are approved to IEC/EN/UL 62368-1 and EN 55032, 47 CFR FCC Part 15C and meet IEC/EN 60335-1. Active power factor correction (PFC) meets EN 61000-3-2.

www.relec.co.uk

Improved current sharing

Power Integrations has introduced the SCALE-iFlex LT NTC family of IGBT/SiC module gate drivers. They target the popular new dual, 100 by 140mm style of IGBT modules, such as the Mitsubishi LV100 and Infineon XHP2, plus silicon carbide variants up to 2,300V blocking voltage. The drivers provide negative temperature coefficient data which enables accurate thermal management of converter systems.

Power Integrations' product marketing manager, Thorsten Schmidt, said: "Designers of renewable energy and rail systems using SCALE-iFlex drivers already benefit from increased system performance. The SCALE-iFlex approach handles paralleling so expertly that one module in five can be eliminated without loss of performance or current de-rating. Adding an isolated NTC output reduces hardware complexity—particularly cables and connectors—and contributes to system observability and overall performance."

The drivers improve current sharing accuracy and increase current carrying capability of multiple-paralleled modules by 20 per cent, letting users significantly increase semiconductor utilisation of their converter stacks.

www.power.com

Leading the way on sodium-ion battery packs

UK battery specialist, AceOn, has produced its first sodium-ion battery packs in a move it says could usher in a new generation of sustainable power. The company has produced 12 and 43V sodium-ion packs, thought to be the first of their kind in the country.

AceOn's managing director, Mark Thompson, said: "Sodium-ion batteries are what everybody is talking about at the moment as the next big development in battery technology, and our new packs put us firmly at the forefront of their development and demonstrate the truly innovative work we are doing.

"As far as I am aware we are the first developer to have UK-developed sodium-ion battery packs in our hands. The fact that we are collaborating with a UK supply chain and developing and building the packs in the UK ourselves, is vitally important for the country. This is the future and we want to see the UK leading the world in developing it and bringing it to market."

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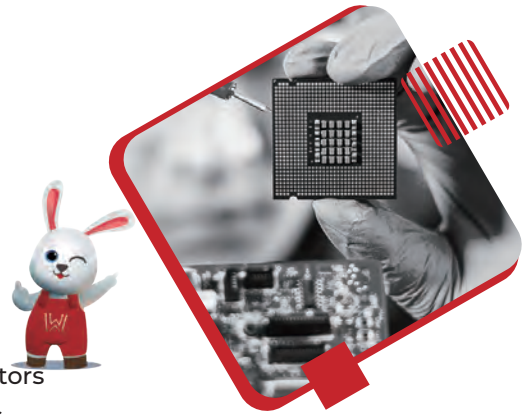

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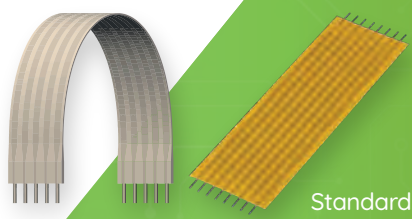

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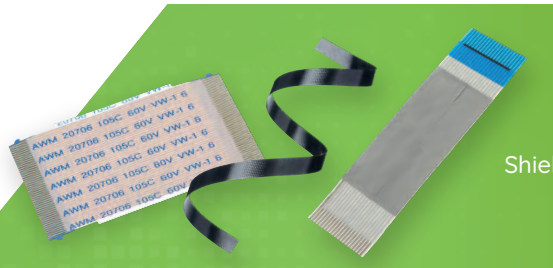

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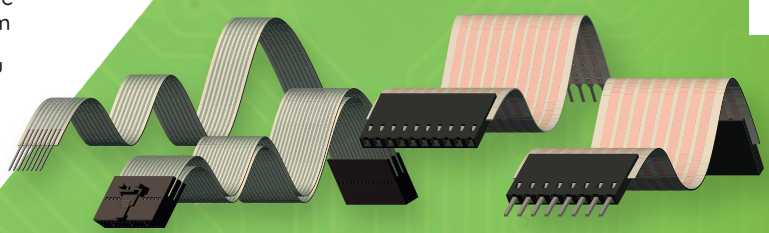

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Golden age of connectivity

TTI's business development manager—connector/electromechanical, Steve Brahosky, explains how a golden age of connectivity will provide opportunities for years

TTI's business development manager – connector/electromechanical, **Steve Brahosky**

While the Roaring 20s conjure a time of excitement and adventure a century ago, the 2020s is an equally ambitious and ground-breaking era for connectivity in electronics, as society and technology propel us towards innovations that touch every facet of our lives.

In this physically and virtually connected world, the importance of interconnectivity can't be over-stated. With this transformative shift, the industry will witness an exponential growth of the global connector market from $62 billion in 2020 to an estimated $115 billion in 2030.

Five billion people (two thirds of the world's population) have internet access. More connections equal more connectors. With increasing IoT applications, the amount of data captured by sensors and moved via connectors is astounding. The number of connected IoT devices grew 18 per cent to 14.4 billion globally in 2022, with a forecast of 27 billion connected devices by 2025. Facilitated by IoT, smart homes, cities and factories are driving the need for innovative connector solutions that are smaller, faster, lighter and more rugged.

The growing connector market is also being powered by electric vehicles in most transportation segments, including land, air and marine.

> **With increasing IoT applications, the amount of data captured by sensors and moved via connectors is astounding**

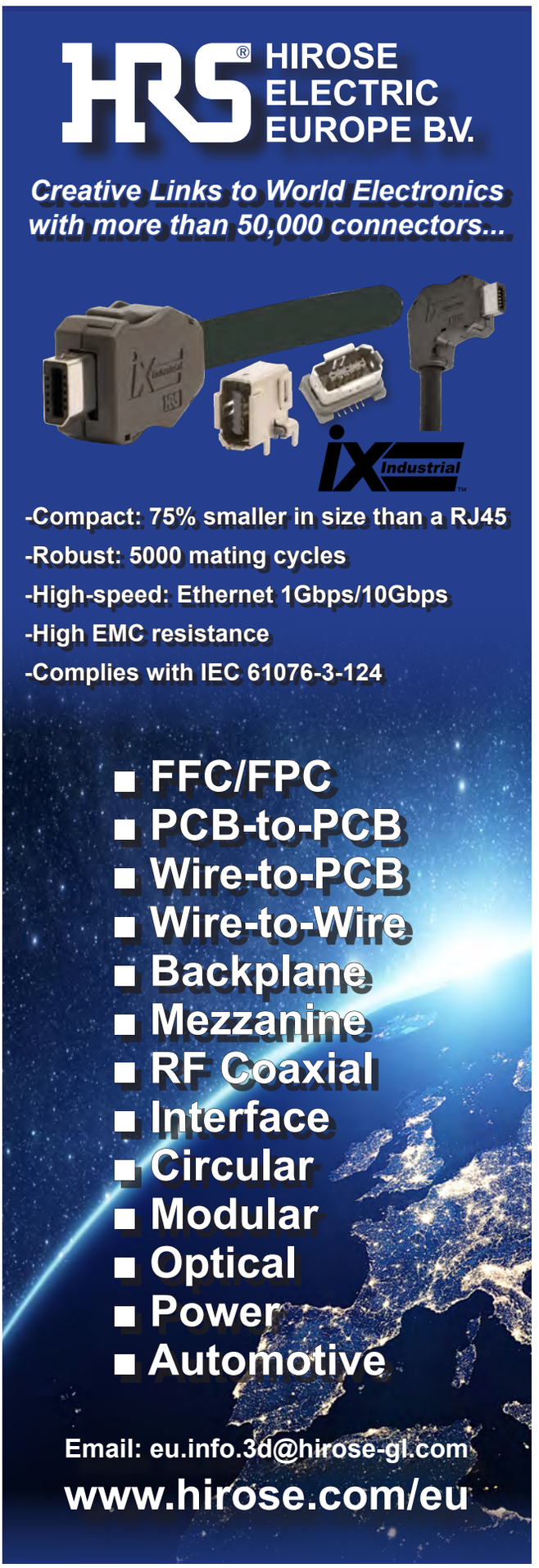
These vehicles require high-voltage connectors for the drive train, energy storage, auxiliary systems and charging interface. Also, autonomous vehicles require exponentially more connectivity as data is captured, transferred and processed continually, within the vehicle and through terrestrial and satellite infrastructures. All requiring connectors.

Consumers drive our economy. As the pandemic showed, their appetite for entertainment and shopping is unrelenting. Demand for on-line streaming, shopping and gaming skyrocketed during the pandemic and shows no signs of retreat. The data processing and bandwidth required to service this demand has created a large network of data farms with high-speed computing and vast amounts of storage. These datacenters require enormous amounts of interconnectivity to route data through an array of server networks that must be powered and cooled with subsystems containing connector solutions.

Technology advances are often enabled by and through connectivity as digitalisation and data bandwidth require connectors with high levels of performance in terms of speed and functionality. These connectors comprise copper, fiber, RF or a combination depending on modularity and performance characteristics. Artificial intelligence and machine learning architectures are emerging and will require connectivity solutions that will demand scalability and configurability.

With all these connectivity advancements come growing pains—component availability, assurance of authentic parts and demand for faster, smaller, more powerful technology. That's why partnering with a top-notch supplier who keeps customers well stocked and informed is critical. TTI's priority for the last 50-years has been to provide the deepest and widest inventory of leading-edge electronic components on the market.

www.tti.com



Own brands marry value and quality

Rapid introduces buyers to its own brand portfolio which includes products ranging from relays, enclosures and connectors to stocks of wire and cable

From its origins in educational products, Rapid has evolved into an e-commerce distributor of electronic components and consumables. Throughout its 44-years, the company considers some of its main accomplishments to be its own brands.

Rapid's own brands are managed to provide genuine alternatives to recognised brands, offering savings without sacrificing quality. Using experience and customer input, the portfolio of own brands is designed to provide trusted, quality products with constantly updating ranges.

R-Tech is Rapid's e-mech brand, comprising solder, fixings, relays, enclosures, switches, fuse holders and more. Recently added lead-free solder includes various flux options while meeting J-STD004. All R-Tech products are backed by datasheets and technical/sales support.

TruConnect is Rapid's connector brand. Introduced 25-years ago, TruConnect includes a range of UL and VDE-approved terminal blocks, audio, board-to-board, mains and multipole connectors. The growing TruConnect range is designed to offer value and quality.

Unistrand is Rapid's cable and accessory brand. Offering stocks of regularly used cables and wires at competitive prices, Unistrand is designed to be a genuine alternative to branded options.

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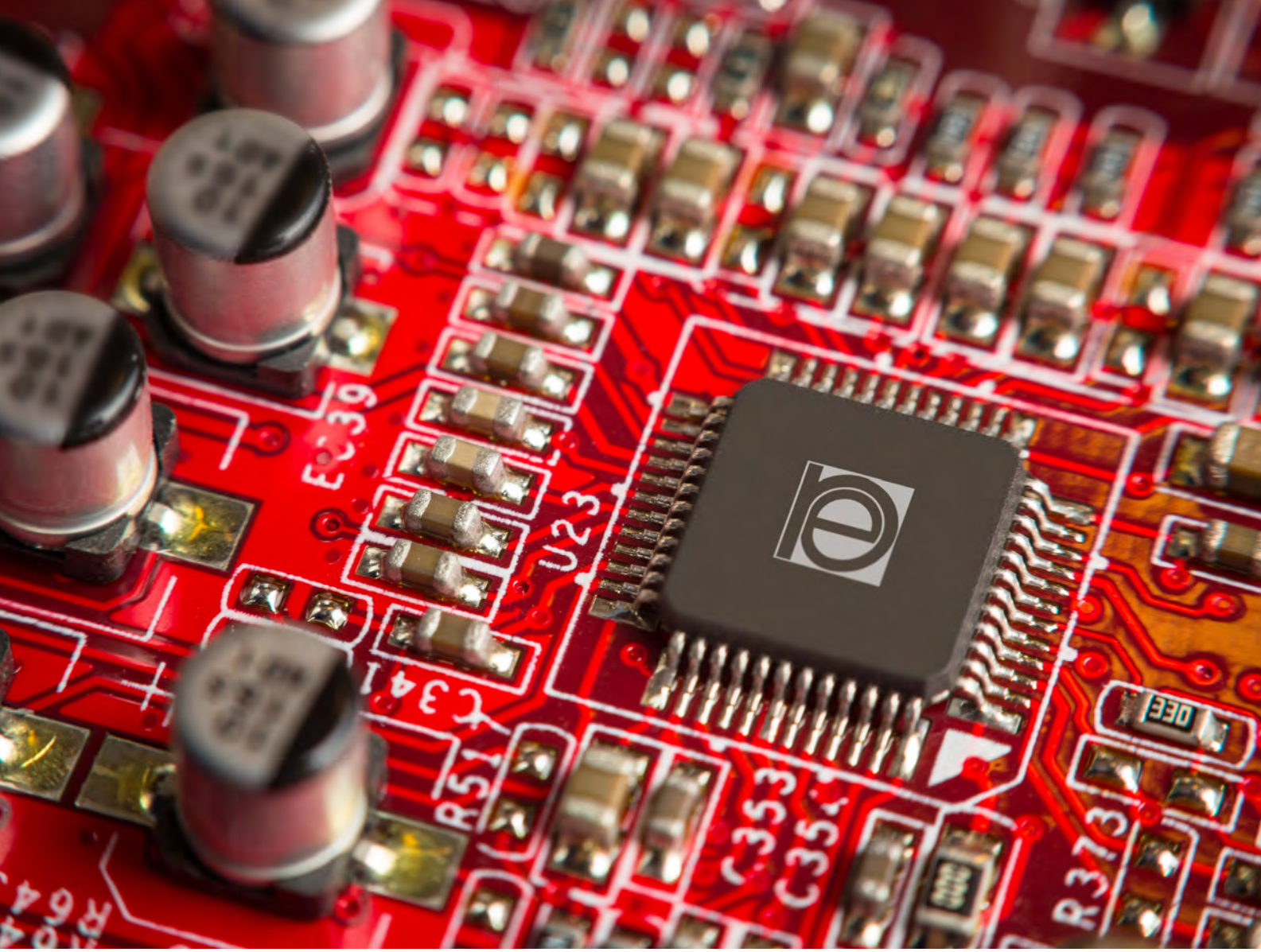

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Chip shortages and their ongoing impact

For this article, ByteSnap Design spoke with an industry insider to gain insight into the current state of the market and future trends

Many businesses are looking to restructure their supply chains to reduce risk and improve resilience. One approach gaining traction is reshoring production to the US and Europe. This is driven by several factors including: rising labour costs in Asia; changing trade policies; and the increasing need for greater supply chain transparency and control.

Reshoring also reduces transportation costs and lead times, letting companies respond more quickly to changing market conditions. Reshoring production can also help companies better protect their intellectual property and ensure compliance with regulatory requirements.

While there are challenges to reshoring, including higher upfront costs and the need for specialised skills and equipment, many businesses consider it a necessary step in securing their long-term competitiveness.

Security of intellectual property

Intellectual property security is a major concern for companies operating in Asia. In recent years, there have been many cases of intellectual property infringement, with counterfeit products and copies flooding the market. As the insider noted: "It's always a risk, but it's one you can manage."

To mitigate risk, companies can partner with local firms with good reputations and understanding of the local market. Such partnerships can help companies to better protect their intellectual property by providing access to local knowledge, expertise and resources. Additionally, setting up their own production facilities can provide companies with greater supply chain control and reduce the risk of intellectual property infringement.

Despite the risks, companies cannot ignore the opportunities the Asian manufacturing hub offers. Instead, they must balance risks against benefits.

Quality issues in different regions

Regarding quality, tier one contract electronics manufacturers are particularly adept at standardising processes and delivering successful outcomes in low-cost regions. However, smaller players may find it challenging to achieve the same success. Companies should consider the quality capabilities of their chosen manufacturing location.

Quality can be controlled through regular communication and on-site factory visits. This helps identify and address potential issues quickly, which can prevent delays and production setbacks. Also, quality control can be implemented throughout the supply chain, from component selection to final product testing.

Freight costs and environmental impact

In addition to rising sea freight costs, other challenges when shipping products include the long transit time, which can leave finished goods in transit for several weeks. This can be particularly challenging for companies relying on JIT delivery to meet customer demand. Furthermore, the pandemic has caused port congestion and shipping delays.

Air freight is faster but more expensive, while rail freight offers a balance between speed and cost. However, rail freight is limited by availability of infrastructure and can be subject to border controls and customs clearance.

Companies can also consider rethinking their supply chain strategy by reshoring production or sourcing components from local suppliers. This could also help reduce the environmental impact of shipping and improve supply chain resilience.

Supply chain flexibility and hedging variations

The insider emphasised the importance of supply chain flexibility. Staying in contact with factories and spending time onsite ensures quality and timely delivery. Dealing with the hedging of variations with the US Dollar and the Euro is simpler and more stable than dealing with other currencies, making it an attractive option.

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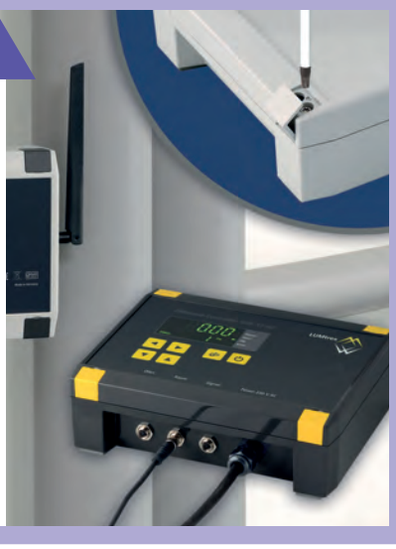

OKW has launched robust new Solid-Box plastic enclosures for desktop and wall-mount electronics in challenging industrial and outdoor locations. With IK08 impact protection, these IP66/IP67 sealed enclosures suit applications ranging from plant and machine construction to agriculture and farming.

The enclosures feature a smart, polished finish. Flush-fitting snap-on trims conceal the tamperproof and corrosion-resistant Torx lid and fixing screws. Lid screws are captive. All fixings are situated outside the sealed interior. Screw channels under the trims enable direct, concealed wall mounting. The enclosures can be installed lid-closed, protecting the seal and electronics.

A generous recess on the slightly bevelled lid can accommodate a large membrane keypad or product label, while the bottom section has two deeply recessed areas to protect connectors, switches and other interfaces. Inside, there are fastening pillars for PCBs, DIN rails and mounting plates.

Three sizes are: 135 by 115 by 50mm; 180 by 145 by 60mm; and 225 by 175 by 70mm.

www.okw.com

Rapid response and smooth graphics

Inelco Hunter has introduced the Powertip STM32 range of touch display modules incorporating an STMicroelectronics MCU chip with Arm Cortex-M7 480MHz core. The modules suit applications where rapid response times and smooth graphics are needed. For example, instrumentation products can plot graphs quickly, without jitter, while supporting full MJPEG video playback.

TouchGFX plug-and-play software lets developers define the display's graphic touch interface quickly using graphic icons from the supplied library stock. Also, custom graphic blocks can be generated or graphics uploaded from external sources.

Inelco Hunter provides its own board support package letting customers develop using STM32CubeIDE or KEIL MDK, effectively turning the display into a standalone embedded module.

Screen sizes range from 3.5 to 5in with a high resolution and wide viewing angles–typically 480 x 272px with an 80deg viewing angle and 800 plus lumens brightness. The built-in Chrom-ART accelerator saves processing power and frees up the MCU for other applications.

www.inelcohunter.co.uk

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CABLE ASSEMBLY & HARNESSING											
Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,000	N/A	0 €	N/A	50	2,500+	Y
FTDI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	50	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,550	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
CIRCUIT PROTECTION											
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,800	N/A	0 €	N/A	50	2,500+	Y
EPCOS/TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,950	N/A	0 €	N/A	50	2,500+	Y
Littelfuse	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	11,450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
DISPLAYS											
Midas Displays		01493 602602	www.midasdisplays.com	N	3,300	N/A	£0	100%	10	17+	Y
ENCLOSURES											
Bud Industries	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,600	N/A	0 €	N/A	50	2,500+	Y
CamdenBoss	CamdenBoss	01638-716101	www.camdenboss.com	N	1,199	N/A	£0	N/A	10	106	Y
Hammond	Switch Electronics	01482-862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Hammond	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,350	N/A	0 €	N/A	50	2,500+	Y
Metcase Enclosures	OKW Enclosures	01489-583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
New Age Enclosures	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Phoenix Mecano Ltd	BOPLA Enclosures & Accessories	01296 611660	www.bopla-enclosures.co.uk	Y	150	N/A	£0	N/A	3	2,000+	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	01494-427500	www.mouser.co.uk	Y	2,750	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
ECS	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Epson	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	900	N/A	0 €	N/A	50	2,500+	Y

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Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	12	24	Y
IQD Frequency Products	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,500	N/A	0 €	N/A	50	2,500+	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	100%	15	130	Y
Kyocera	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	950	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
TXC Corporation	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
HEATSINKS											
Aavid	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
ICs & SEMICONDUCTORS											
Alliance Memory	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	500	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18,700	N/A	0 €	N/A	50	2,500+	Y
Broadcom Limited	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Central Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,250	N/A	0 €	N/A	50	2,500+	Y
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Cree, Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Diodes Incorporated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	8,200	N/A	0 €	N/A	50	2,500+	Y
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Micron Technology	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	850	N/A	0 €	N/A	50	2,500+	Y
Nexperia	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,600	N/A	0 €	N/A	50	2,500+	Y
Nordic Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	60	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
ON Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18,700	N/A	0 €	N/A	50	2,500+	Y
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Renesas Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
ROHM Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
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Skyworks	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10,050	N/A	0 €	N/A	50	2,500+	Y
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Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10,850	N/A	0 €	N/A	50	2,500+	Y
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HARTING	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,800	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,950	N/A	0 €	N/A	50	2,500+	Y
Hirose Electric	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
Intelliconnect (Europe) Ltd		01245 347145	www.intelliconnect.co.uk	N/A	N/A	N/A	N/A	100%	5	30	
JAE Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
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Radiall	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
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Souriau	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,300	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	41,850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,650	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
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	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£12m	£100	75%	3	78	Y
Rochester Electronics	Rochester Electronics	+44.1480.408400	www.rocelec.com	Y	299	N/A	$250	N/A	10	400+	Y
OPTO ELECTRONICS											
Broadcom Limited	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,800	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
Osram Opto Semiconductor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
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AVX	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17850	N/A	0 €	N/A	50	2,500+	Y
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Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,750	N/A	0 €	N/A	50	2,500+	Y
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KEMET	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	23,650	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	18700	N/A	0 €	N/A	50	2,500+	Y
Ohmite	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,550	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25,450	N/A	0 €	N/A	50	2,500+	Y
Taiyo Yuden	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,100	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,050	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	11,500	N/A	0 €	N/A	50	2,500+	Y
TT Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	43850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,750	N/A	0 €	N/A	50	2,500+	Y
Yageo	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	21,450	N/A	0 €	N/A	50	2,500+	Y
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BEC Distribution Ltd		01844 275824	www.bec.co.uk		5,000	N/A	£0	100%	3	5	Y
POWER & BATTERIES											
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
Bel Power Solutions	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	600	N/A	0 €	N/A	50	2,500+	Y
CUI Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
MEAN WELL	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,400	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1500	N/A	0 €	N/A	50	2,500+	Y
RECOM	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
TDK-Lambda	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
TRACO Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Vicor	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
XP Power	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
SENSORS											
ams	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Bosch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	350	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	300	N/A	0 €	N/A	50	2,500+	Y
Sensirion	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	80	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	75	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	650	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	850	N/A	0 €	N/A	50	2,500+	Y
SWITCHES & KEYBOARDS											
Apem	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,850	N/A	0 €	N/A	50	2,500+	Y
C&K Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
E-Switch	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principal	Stock Value for Principal	Minimum Order Value	% Lead Free for Principal Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
EAO	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,800	N/A	0 €	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
NKK Switches	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Omron	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,350	N/A	0 €	N/A	50	2,500+	Y
TERMINAL BLOCKS											
CamdenBoss	CamdenBoss	01638-716101	www.camdenboss.com	N	930	N/A	£0	N/A	10	106	Y
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,850	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	13,550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
THERMAL MANAGEMENT											
Bergquist Company	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	250	N/A	0 €	N/A	50	2,500+	Y
Delta Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	700	N/A	0 €	N/A	50	2,500+	Y
ebm-papst	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
EMI Thermal	EMI Thermal	01992 510000	www.emithermal.com	N	800	N/A	£20	100%	12	200	Y
Multiple Manufacturers	Materials Direct	+44 (0)1908 222 211	www.materials-direct.com	N/A	N/A	£1,000,000+	£0	N/A	5	55	Y
Sanyo Denki	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	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	£450,000	£100	100%	7	15	Y
Universal Science	Universal Science	+44 (0)1908 222 211	www.universal-science.com	N/A	N/A	£1,000,000	£0	N/A	5	55	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	24	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,900	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,500	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,200	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,400	N/A	0 €	N/A	50	2,500+	Y
WIRELESS SOLUTIONS											
DIGI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
Espressif	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Laird Connectivity	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	100	N/A	0 €	N/A	50	2,500+	Y
Lantronix	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	25	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	30	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	150	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	20	N/A	0 €	N/A	50	2,500+	Y
u-blox	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10	N/A	0 €	N/A	50	2,500+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Alan Anderson Manufacturing Ltd	+44 (0) 333 322 7222	www.aa-manufacturing.co.uk	£21m	Hertfordshire UK	40	2	ISO9001:2015 , IPC-A-610	Y	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£14m	Essex/SE	85	12	AS9100 Rev D, ISO9001:2015, ISO 140001:2015, UL , CCC, IPC-610-G Class 3, TUV	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
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£16.9m	UK & Far East	80	6	AS9100, ISO9001, IPC-A-610 Class 3, J-STD-001	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£18.6m	Andover (Hampshire)	130	6	AS9100 ISO13485 ISO9001 IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Electronic Technicians Ltd	01202 897722	www.etluk.co.uk	£3.7m	SE	50	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£6.5m	Worthing, W. Sussex	56	3	ISO9001:2015, ISO4001:2015, IPC-A-610 Class 2& 3, IPC-J-STD-001	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.6m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721	Y	Y	Y	N	Y	N
GSPK Design Ltd	01423 798254	www.gspkdesign.ltd.uk/	£1m	North Yorkshire, UK	12	2	ISO 13485:2016, ISO 9001:2015, GS ATEX 7422	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£4.1m	Staffordshire	27	2	ISO9001:2015, IPC-A-610 to Class 3, UL	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£8.5m	Hampshire & Yorkshire	75	6	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Incap Electronics UK Limited	01782 753200	www.incapcorp.com	€169,8m	UK, Slovakia, Estonia & India	2,500	22	ISO9100, ISO14001, ISO13485, AS9100D, ISO45001 & IATF16949	Y	Y	Y	Y	Y	Y
Industrial Electonic Wiring Ltd.	+44(0)1793 694033	www.iew.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£15m	UK	105	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
KEY-TECH ELECTRONIC SYSTEMS	01592 597711	www.key-tech.co.uk	£7m	Scotland	65	2	ISO9001:2015, J-STD-001, IPC-610/620 CLASS 3, IPC-7711, BS EN ISO13485:2016, ISO 13485	Y	Y	Y	N	Y	Y
Nano Electronic Services Ltd	01388 247152	www.nanoelectronicservices.com	£1M	County Durham	2	15	ISO13485, ISO9001:2015 & IPC610 to Class 3	Y	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
NOTE Group	01753 746700	www.note-uk.co.uk	£207m	UK/EU/China	1,200	20	IPC610 to Class 3, ISO9001:2015, 13485, 14001, 18001	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	IS9001,ISO14001, IPC-A-610 Class 3, IPC-7711/7721, WHMA-3620, Certified IPC Trainer	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
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
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£15.5m	SE	131	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£16m	Derby	130	6	ISO 9001, ISO 13485, ISO14001, IPC 610, 620, 7711/7721	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	5	ISO9001:2015, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Ceramic PCBs	Heavy Copper PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2015, UL, ISO 14001:2015	SML	Y	4-16	Y	N/A	N/A	Y	Y	Y	Y
DK-Daleba Printed Circuit Boards	01992 510000	www.dk-daleba.co.uk	M	UK, Europe, Asia	ISO 9001:2015, UL, TS16949, JOSCAR	SML	Y	4-58	Y	Y	Y	Y	Y	Y	Y
GSPK Circuits Ltd	+44 (0)1423 798 740	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	IS 9001:2015, IATF 16949:2016, EN (AS) 9100, Joscar	SML	Y	4-34	Y	Y	Y	Y	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2015, EN 9100:2018, EN 9104:2013, UL796, ISO 14001:2015	SML	Y	4-44+	Y	N/A	N/A	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01543 622 435	www.tatecircuits.com	M/B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	N/A	N/A	Y	Y	Y	Y

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