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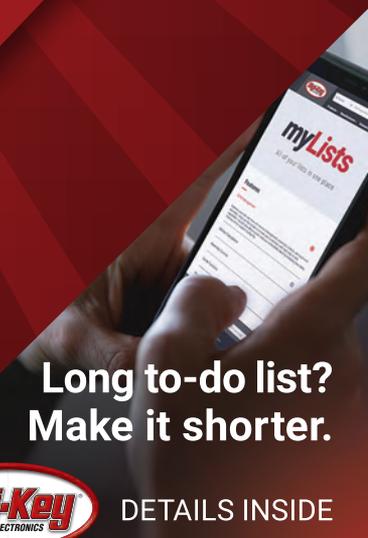
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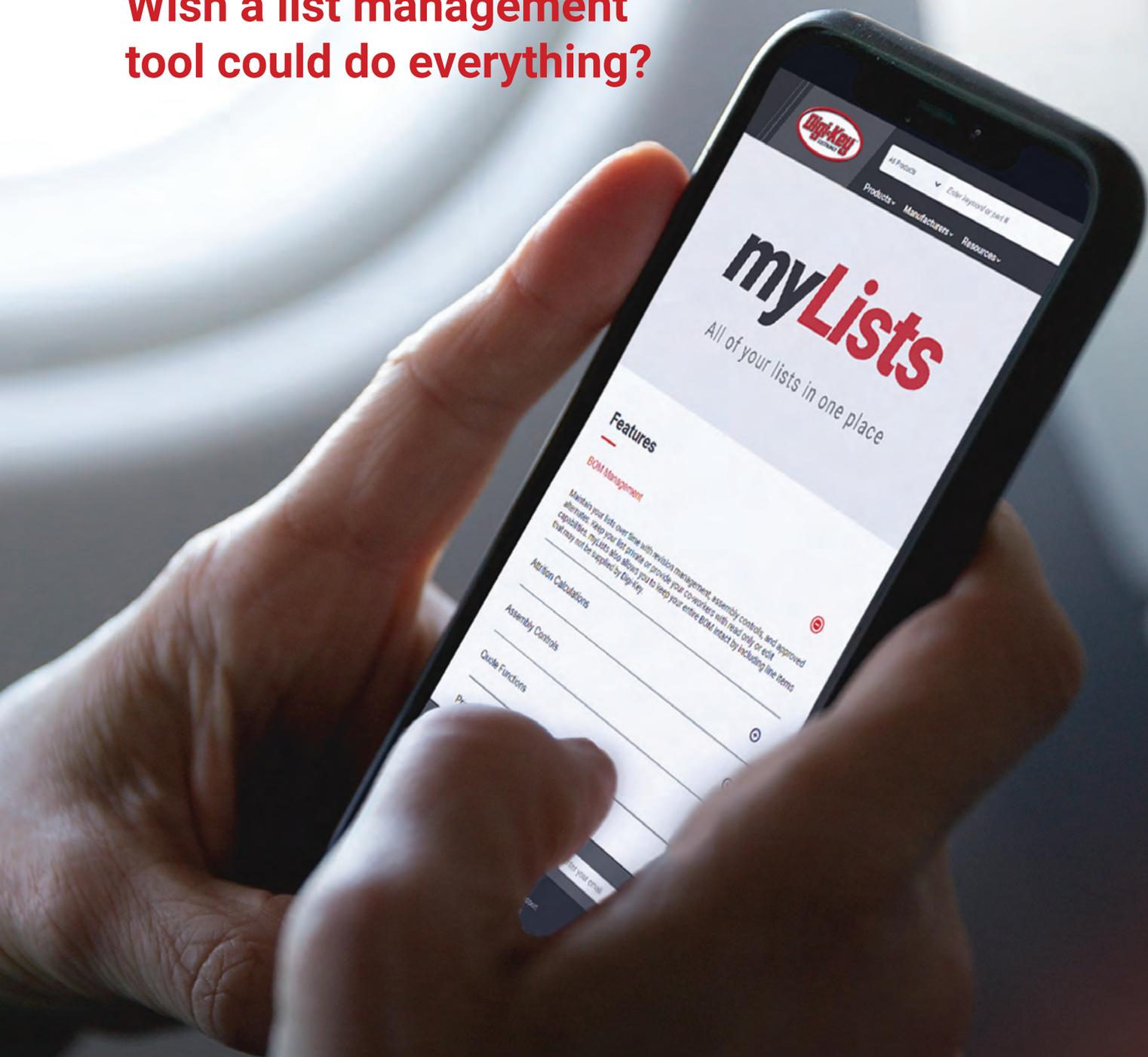
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# Editor's Word



## Show me the incentive

Today's technically complex, globalised world can easily become a confusing place. To help me make sense of things I have amassed a collection of useful phrases which I occasionally deploy. As I write this leader my current phrase of choice is: 'show me an incentive and I'll show you the future'.

The incentive, unsurprisingly, is the rising cost of energy. The future, accordingly, is efficiency.

Nothing happens on this planet without some form of energy being involved, from the food individuals consume, to the fuel they pour into their vehicles.

Personally, I feel as though I have lived through energy's heydays. I was born into an era of energy blackouts but since then energy has become more abundant, reliable and affordable. Sadly, nothing lasts forever and energy, in its different forms, is under siege on many fronts.

My stoic response is to remind myself that it is pointless worrying about the aspects of this beyond my control and focussing my attention on what I can control. One thing I can do is pay attention to the efficiency of the powered products I use.

When designing an electronic product, the engineering team will need to balance the bill-of-material's cost versus the end product's energy efficiency. From today, I imagine that balance will start tipping towards the latter. A one-off increase in the purchase price of a product is looking more appealing when compared to a lifetime of energy savings.

*Jon Barrett*

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Issue 192, Vol.18 No.05

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  
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Printed by: Pensord Press Ltd  
Electronics Sourcing is printed on  
sustainably sourced paper stock  
ISSN 2043-9504  
© 2022 MMG Publishing Ltd



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## NEWS



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## Fast turnaround EV components

Precision engineering firm Dawson Shanahan experienced significant growth in the first two months of 2022, with orders of automotive components (particularly e-mobility) up 37 per cent compared to the same period in 2021. Customers include OEMs and Tier 1 automotive manufacturers.

To meet demand, two of the company's rotary transfer machines have been refurbished for CNC control. Likewise, two new lathes are arriving in coming weeks to optimise cycle times and increase capacity. Dawson Shanahan manufactures 95 per

cent of its development and production tooling in house for quicker turnaround.

Dawson Shanahan's joint MD, Les Reeves, said: "It's been an incredibly busy start to 2022 and we're bucking the trends that are being seen globally in manufacturing. Our strategy to focus on continual investment in new machinery and having an outstanding workforce means we can withstand economic pressure and meet our customers' wide range of needs."

[www.dawson-shanahan.co.uk](http://www.dawson-shanahan.co.uk)



## Global PCIe XMC modules distribution agreement

Mouser Electronics has announced a distribution agreement with Interconnect Systems International. Mouser now offers ISI PCI Express XMC modules, including the XU-AWG, which features two 8-lane, high-speed serial links that support PCIe Gen 3.

The XU-AWG card features two 16-bit Analog Devices AD9162 digital-to-analog converter devices with standard operation at a 5 GSPS update rate. The module supports 1x to 24x interpolation with sub-nanosecond channel-to-channel synchronisation alignment. Inputs to support external clocking and triggering are provided for synchronisation across multiple modules for scalable RF channel count. A Xilinx Kintex Ultrascale XCKU060 FPGA with 4GBytes of DDR4 RAM memory supports the DSP core for demanding applications such as radar and wireless IF generation.

Mouser also offers the XA-160M PCI Express XMC module for high-speed stimulus-response, ultrasound and servo-control applications. The module features two 160 MSPS, 16-bit ADC inputs and two 615 MSPS, 16-bit DAC outputs.

[eu.mouser.com](http://eu.mouser.com)

## High contrast for small spaces

Raystar's REX006432A Micro OLED suits applications that can only accommodate a small OLED.

Just like larger products in the series, the module is engineered for excellent functionality and a clean appearance, ideal for consumer and industrial applications including audio, automotive, medical, white goods and handhelds.

Raystar states the display offers a 10,000:1 contrast ratio, is light and features a fast response time and wide viewing angle. The 0.49in module incorporates the SSD1306 IC and supports the I2C interface. Logic voltage ranges from 2.8 to 3.3V (3V typical). Resolution is 64 by 32 dots. Three different emitting colours are white, yellow and sky blue.

Specifications include: 14.4 by 11.6 by 1.26mm dimensions; 0.153 by 0.153mm pixel size; 0.175 by 0.175mm pixel pitch; passive matrix display mode; and 1/32 duty.

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## In Brief

### Saving space

New, space-saving FS series board-to-board connectors from Phoenix Contact feature a 0.635mm pitch for mezzanine PCB arrangements with high-speed data transmission rates up to 20Gbps. Various positions and stack heights allow freedom during the device design process. Integrated keyways and contact tolerance compensation ease mating and error-free production. [www.phoenixcontact.com](http://www.phoenixcontact.com)

### Reliable optical connections

ODU states its optical technologies deliver quality and stability in applications involving high data rates and fast, interference-free transmissions. Features include: Expanded Beam technology for harsh environments and high mating cycles; physical contact technology for up to 1,000 mating cycles; fibre only or hybrid versions; and singlemode or multimode fibre. [odu-connectors.com](http://odu-connectors.com)

### Ex-stock availability

BEC Distribution has launched BEC Select, a collection of passive components sourced from across the world, said to offer quality alternatives to major manufacturers, who typically have 16-week delivery times, increasing to 16 to 30-weeks with allocation issues. Within BEC Select, many products are ex-stock, with a low MOQ of just 10 pcs for samples. [www.bec.co.uk](http://www.bec.co.uk)

### Sustainable progress

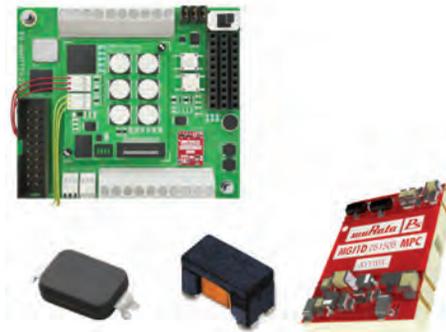
Taking place 15 to 18 November, electronica 2022 will see a focus on 'driving sustainable progress'. From start-ups to global corporations, exhibitors will show what role electronics plays in paving the way for sustainable technologies for future societal topics. A supporting program of conferences and forums offers room for personal and professional exchange. [electronica.de](http://electronica.de)

## Rugged enclosures now available

Foremost Electronics has announced availability of nVent Schroff's IP-Pro Alu EMC, ideal for housing standard or proprietary small form factor PCBs. These pre-certified rugged enclosures suit harsh environments, providing protection for sensitive electronics against water, dust and electromagnetic interference and can be tailored to customers' applications across railway, transportation, aerospace, defence, industrial IoT, instrumentation and test.

The aluminium die-cast enclosures are available in 15 different sizes from 90H by 122W by 122Dmm to 180 by 600 by 310mm. They feature an aesthetic design and outdoor powder coating in silver grey (RAL 7001) as standard. Depending on size the enclosures offer: protection to IP67 according to EN 60529; shock and vibration resistance to EN 61373 Cat 2 and AREMA Class I; IK 09 protection from external mechanical impacts according to IEC 62262; and a working temperature range from -40 to 90°C.

Foremost Electronics' key account manager, Emma Kempster, said: "The new nVent Schroff



## EV fast charging solutions in stock

Farnell is now stocking EV fast charging solutions from Murata. Product examples include common mode choke coils, DC-DC converters and capacitors.

Manufacturers can reduce common mode noise, problematic in differential transmission for automotive and EV charging applications, using the DLW series common mode choke coils.

Farnell states MGJ1 series DC-DC converters are an ideal solution for powering high-side and low-side gate drive circuits for IGBTs and SIC FETS in inverters.

DK1 series Y1 capacitors suit AC-DC switching power supplies where a low-profile is required and lead type capacitors are too large.

Farnell's VP product and supplier management, Simon Meadmore, said: "Farnell customers will benefit from Murata's wide product portfolio, in-stock availability, and other added-value services, such as our dedicated online application guides which are designed to help engineers accelerate time-to-market and maximise the performance of their applications."

[uk.farnell.com](http://uk.farnell.com)



IP-Pro Alu EMC enclosure offers an off-the-shelf and simple to customise enclosure for mounting electronic data collection and control systems in harsh environments. It offers customers time and cost savings as well as improving system reliability."

[www.4most.co.uk](http://www.4most.co.uk)



## JOSCAR accreditation renewed

Lane Electronics is continuing its association with the Joint Supply Chain Accreditation Register (JOSCAR), a collaborative tool used by the aerospace, defence and security industries to function as a single repository for pre-qualification and compliance information. Using JOSCAR, an OEM can quickly and simply determine if a supplier is 'fit for business' and a qualified Electronics Solutions Partner.

Accreditation is supported by leading defence OEMs including BAE Systems, Leonardo, Ministry of Defence, QinetiQ, General Dynamics and Raytheon and is comprised of a central register holding common supplier information which can be quickly accessed by all participating buying organisations. JOSCAR is designed to reduce the time, cost and resources needed to provide information to major prime customers while avoiding duplication of information.

JOSCAR aims to ensure information suppliers and third parties are asked to provide to clients is proportionate to the types of goods or services being supplied. A dynamic two-stage process is used to ensure the process is tailored and thus efficient.

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# FUSION WORLDWIDE EXTENDS OFFICES TO TOKYO, JAPAN

Continuing its rapid global expansion, Fusion Worldwide is proud to announce the opening of a new office in Japan. Located in the Marunouchi district of Tokyo, this is the company's fourth location in the region, with existing offices in Singapore, South Korea and China.

Japan has the world's third-largest economy and is home to many of the world's largest consumer electronics, automotive, computing and industrial automation brands.

"While we have been supporting customers in Japan previously, we saw a sharp increase in Japanese businesses reaching out to us," says Olivia Seohyn Ju, Director of Sales in Korea and Japan. "Our sourcing services have become a necessary addition to companies' supply chains, particularly within the past couple of years as the market navigates ongoing and significant component and material shortages."

The addition of Japan to Fusion Worldwide's footprint in Asia demonstrates the commitment to better understand customer needs and expectations to quickly fulfill them.

"Suppliers with world-class quality assurances and capabilities are highly-sought after in this market," says Seohyn Ju. "Fusion Worldwide is the global leader."

## About Fusion Worldwide

Fusion Worldwide was founded in 2001 and is headquartered in Boston, Mass. Since its inception, the company has grown into a \$3 billion global business with 14 offices throughout the Americas, EMEA and APAC. On top of having multiple quality and logistics hubs, Fusion Worldwide recently

acquired Prosemi, Singapore's largest electronics test house with over 22 years of experience. With the addition of Prosemi, Fusion Worldwide is now a one-stop shop for turnkey projects utilized by the semiconductor industry, CEMs and OEMs.

Ranked as the 11th largest electronic component distributor in the world, Fusion Worldwide focuses on providing efficient and innovative solutions for its valued customers. Fusion Worldwide serves customers across numerous verticals from aerospace to personal computing, industrial automation, automotive, medical, consumer electronics, telecommunications, contract manufacturing and more.

To find out more about Fusion Worldwide, visit [www.fusionww.com](http://www.fusionww.com)



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# Customer Trust is Key to E-Commerce Success

Ian Wallace, Vice President, Americas & EMEA Business Development, Digi-Key Electronics

In a crowded digital marketplace where it's tough to stand out, Digi-Key focuses on earning customer trust by making the customer experience as personalized, seamless and easy as possible.

We know how important it is for customers to source products that are in stock and access all the information they need to ensure they're getting the correct product the first time. We value and listen to customer feedback and input and have made significant investments in continuously improving the Digi-Key website to meet their changing needs.

## Trust is Essential

We've earned our customers' trust by having powerful search tools, accurate product data, industry-leading inventory levels and same-day shipping. Everything we do focuses on getting customers to the right part as quickly and easily as possible. Our team invests thousands of hours into researching every part on our website, ensuring that customers have access to verified product specs, compliance details and more.

## Rich Search Features

Searchability is key to providing an effective user experience, and Digi-Key has invested in it heavily. As one of the industry pioneers, we have continually enhanced our shopping experience to ensure that customers can easily find, research and order components that meet their exact specifications, as smoothly as possible. For example, our rich parametric search filters provide many options to filter results in real time, find the exact parts customers need and save search filters for the next time they visit. We've also built out a robust part cross-reference feature to help identify similar products: our database

has 45 million proprietary cross-references, so when you're looking at a certain part, the site can show all the other identical or similar options.

## Personalized, Localized Experience

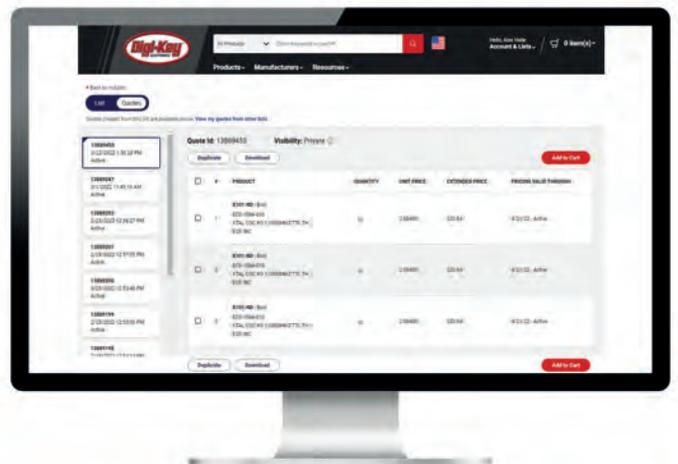
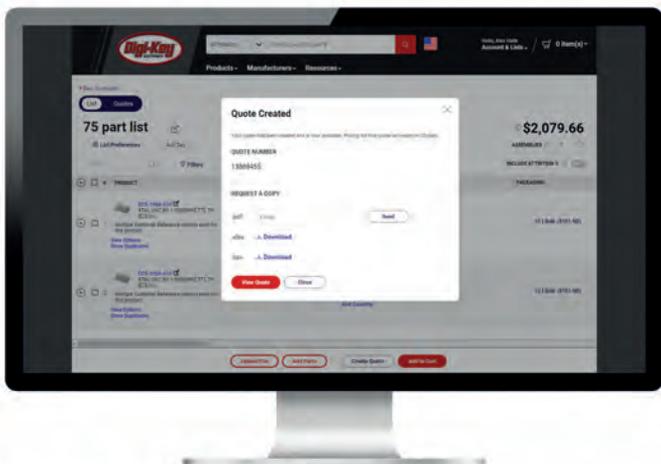
Because we do business with customers in 180 countries, our e-commerce site supports multiple languages and currencies. Digi-Key localizes experiences for different countries and regions to provide the most intuitive user experience to customers based on their location. We also tailor customer experiences based on their roles, interests and level of detail they prefer.

## Continuous Improvement

Our e-commerce strategy is always evolving and improving: we're constantly looking for ways to enhance our digital platforms and offerings.

Launched last year, the Digi-Key Marketplace gives customers access to hundreds of thousands of new products, direct from suppliers through a singular shopping experience.

We also recently introduced the myLists feature, a consolidated list management system that streamlines customers' BOM Manager, Price and Availability (PANDA®), Favorites and Quotes into one convenient solution. Launching in May, myLists Quotes secures instant pricing for 30 days, plus fast access to stock availability and lead times. Our self-service myLists tools are easy to use, save you time and provide a better user experience with easier collaboration between purchasing and engineering, as lists can be shared with others in your organization. For more information and to use the myLists Quotes feature, visit the myLists landing page at [www.digikey.co.uk/en/mylists/](http://www.digikey.co.uk/en/mylists/).



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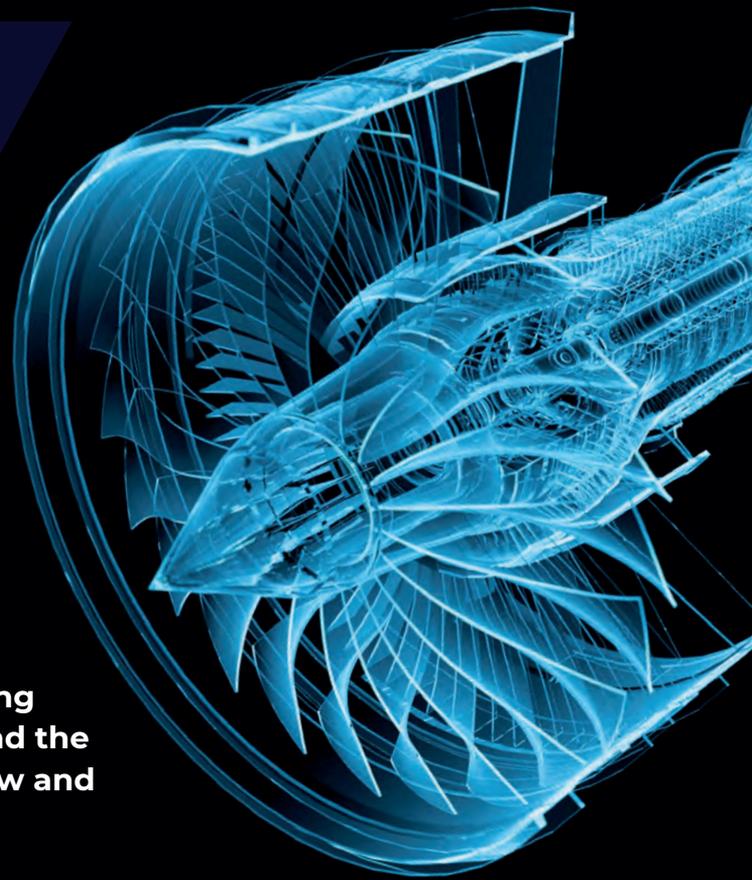
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# Do you really need a High Reliability Connector?



*By David Pike on behalf of Mouser Electronics,*

Choosing connectors for demanding applications is now more important than ever. Sophisticated devices are being deployed into harsh environments as industrial users adopt the latest technologies. Designers need to provide connectivity in the toughest conditions, and many are turning to high reliability solutions.

High reliability is the gold standard of the connector industry. It is a term that is often used to describe products with a military pedigree. For decades, manufacturers have offered connectors that conform to military specifications. Subjected to rigorous testing, connectors with a MIL-DTL or BS part number deliver superior reliability in the toughest environments.

This superior performance does come at a price, however, and an expensive MIL-Spec or BS part number is not the only way to obtain reliability. In an era of extended lead-times, rising costs and logistical challenges, perhaps now is the time to stop focussing on high reliability and instead start talking about appropriate reliability.

## Mating Cycles

When choosing a connector for demanding roles, most manufacturers publish a minimum mating cycle count in their specifications, as it provides a good indication

of how long a connector will last. A military specification connector – the archetypal high reliability solution – might boast a published performance of 500 or even 1000 mating cycles. However, the humble USB connector that has been with us for nearly 3 decades is designed to provide up to 5000 mating cycles, and there are even versions available that will provide a service life of 20,000 mating cycles or more.

Almost all manufacturers who make products conforming to a MIL standard also make the same connector under their own part number. These are usually made on the same production line, using the same materials, and deliver the same performance. As an example, the ever-popular D38999 Series III circular connector is available from Amphenol as the TV, from Souriau as the 8D and from ITT Cannon as the KJA families.

The same is true for D-Sub connectors sold as M24308 and micro-D connectors as M83513. Finding out what manufacturers call their equivalent product can save a great deal of money.

## An Alternative Choice

Mating cycles are not the only measure of a connector's reliability. The environment in which the connector will be used must also be considered. We talk regularly of IP ratings, shock and vibration, and resistance to electromagnetic interference

(EMI). The need to perform even under these conditions will have an enormous effect on the design of any connector. There are plenty of connectors that will provide excellent service.

This is important to remember, because connectors do not have to be designed for military specifications to be capable of military-grade performance. Manufacturers like LEMO have been making connectors for decades, subjecting them to a range of tests which prove their suitability in a wide range of industries.

Designed for use in applications where failure is not an option, high reliability connectors provide superior performance in tough conditions. However, the next time you need to choose a new product, ask whether the gold standard is the best solution, or even if a high-reliability connector is needed at all. The connector industry is huge and diverse, and the right solution need not have a high price tag to deliver high performance.

## About the author/Mouser

David Pike is a freelance writer for Mouser Electronics. As a global authorised distributor, Mouser offers the world's widest selection of the newest semiconductors and electronic components — in stock and ready to ship™. Mouser's customers can expect 100% certified, genuine products that are fully traceable from each of its manufacturer partners. To help speed customers' designs, Mouser's website hosts an extensive library of technical resources, including a Technical Resource Centre, along with product data sheets, supplier-specific reference designs, application notes, technical design information, engineering tools and other helpful information. For more information, visit <https://www.mouser.com/>.

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# Future of HDMI connectors

*PEI-Genesis' European director of product and purchasing, Shaun Findley, explores the evolution of HDMI connectors and how they can be used in harsh environments while maintaining operational performance*

Using high-definition multimedia interface (HDMI) connectors to transmit audio and video data at high speeds is the basis of modern entertainment and communications equipment. However, this technology is rapidly moving beyond TVs and computer monitors into many high-pressure applications.

HDMI connectors are an essential input-output (I/O) component in almost every modern piece of entertainment and communications equipment. By transferring uncompressed digital signals from a suitable audio-video (A/V) source to receivers and displays, these connectors can link everything from computer monitors to TV and games consoles.

Although originally developed for the commercial systems we find in our homes and workplaces, HDMI

connectors have evolved, and manufacturers have modified them over the years to ensure successful operational outcomes in challenging environments. These include military, medical and aviation applications, where electrical connections must be rugged and versatile.

## Serving a need

HDMI connectors were developed to help simplify pre-existing connectors, namely the Digital Video Interface (DVI) and analog Red Green Blue (RGB) component cables. At the time, DVI connectors had a reputation for problematic mating and un-mating that would either damage the connector itself or the source. RGB cables had their own issues: because they would break down the source signal into three parts, interference often occurred, and the connections were

not always secure. Therefore, HDMI cables were engineered to streamline the mating/un-mating process and reduce the number of connectors required from three to one.

Manufactures began developing HDMI cables in 2002 and there are now five different types available: The 19-pin Type-A is the standard and most widely used, found in almost every TV and computer monitor. Type-B was launched with the original standard in 2002 but was never used in products because of the introduction of HDMI 1.3, where the speed of a single link exceeded that of the old dual link. Type-C mini connectors are used in portable equipment, like DSLR cameras and satnavs. Meanwhile, Type-D connectors were introduced specifically for audio-visual connectivity in



**HDMI connectors were developed to help simplify pre-existing connectors, namely the Digital Video Interface (DVI) and analog Red Green Blue (RGB) component cables**

small and portable devices and Type-E was designed for high-speed data transmission in automotive applications.

### Modified technology

For applications in harsh environments, a connector's modifications are just as important as its type. Harsh environment HDMI connectors can include several different modifications, such as IP-rated sealing against contaminants, like fluids and fine particulate matter. Housings can vary to suit the environment, with available options including metals (e.g., copper alloy, nickel and aluminium), thermoplastics and fluoropolymers. For example, Sure-Seal<sup>®</sup> HDMI connectors are rated to IP67 to resist the ingress of dust, water, chemicals and other

contaminants. They also have copper alloy, gold-plated contacts and operate over a wide temperature range.

Overmoulding and combining the wire and connector is one option when using harsh environment HDMI connectors since this provides strain relief and ensures a more reliable performance by protecting it from challenging surroundings. Using a coupling or locking mechanism can also help to maintain a secure connection even when blind mate connections or vibrations are involved.

### Applications in harsh environments

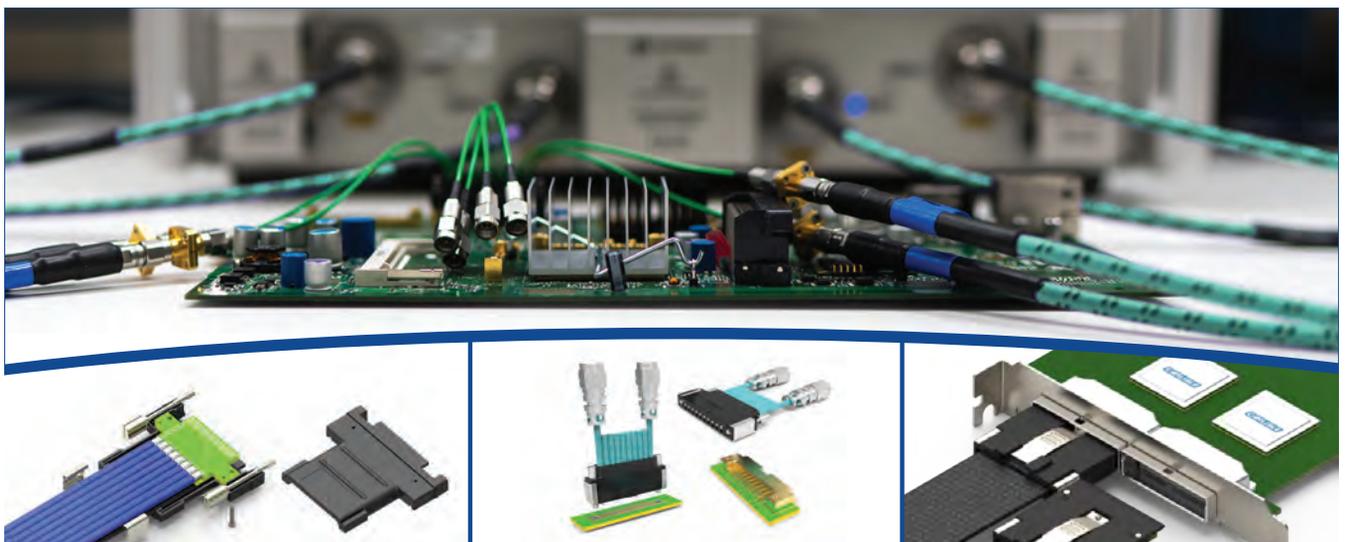
Since their creation, HDMI connectors have simplified interconnectivity for a wide range of

applications. Harsh environments include outdoor digital signage, vehicle displays, military avionics and even electronic flight bag applications. Factory automation and control, machine tools, robotics, building automation and test and measurement are also examples.

The common denominator in all these applications is that HDMI connectors must be made to withstand heavy-duty use and exposure to chemicals, water, oils and extreme temperature. Often, this means selecting a connector that meets MIL-SPEC or certain UL ratings.

[www.peigenesis.com](http://www.peigenesis.com)

**HDMI connectors have simplified interconnectivity for a wide range of applications. Harsh environments include outdoor digital signage, vehicle displays, military avionics and even electronic flight bag applications**



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# Walking the interconnect tightrope

Credit - sirene68 Getty Images

*In this article, EDAC Europe's sales director, Chrissy Cooper, guides buyers along the tightrope that demands projects are on time and on budget*

Staying competitive in today's marketplace is more than just offering value for money. Long lead times, a fragile global supply chain and a shortage in raw materials have left the interconnect industry needing to adapt to the new landscape, whilst still expecting superior performance from their connectors.

While some devices must compete at the cutting edge, where speed and performance are critical, there are

other applications in which value for money is the key driver. For hard-pressed buyers, this is a tightrope that must be walked to keep design projects on time and on budget.

In the logistics industry, small incidents can have huge repercussions on delivery dates. For some businesses, this results in a production delay which is unfortunate but can be absorbed. For others, a new solution must be found because time is of the essence.

EDAC Europe's sales director, Chrissy Cooper, said: "Whether you are looking for a brand-new connector or a drop-in replacement for hard-to-find alternatives, start communications between buyers and designers early."

Keeping connectors and components in mind during the design process should mitigate supply chain worries. It's important they are not left until last in the design process.

Raw materials shortages are adding to purchasing woes



**Whether you are looking for a brand-new connector or a drop-in replacement for hard-to-find alternatives, start communications between buyers and designers early**



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## Connectors

Demand for electronic components is only growing. Growth of IoT and its industrial equivalent (Industry 4.0) means more machines and devices will be connected to the network; only increasing connector demand.

Industry-standard connectors can often be replaced by a close equivalent from another supplier—a convenient solution for hard-pressed electronic design engineers. However, connectors play a huge part in delivering performance and are vital to maintaining a competitive edge. Reliability of a well-known brand should not be traded for a cheap copy simply to get over short-term supply chain problems.

Challenges caused by logistical uncertainty are compounded by an international shortage of raw materials, adding another purchasing woe.

Chrissy concluded: “Lead times have undeniably extended and show no signs of coming back. The best way the interconnect industry can tackle these challenges is by designers, manufacturers and buyers all working together to either commit to a forward order book or plan in advance.”

[edac.net](http://edac.net)

Visit EDAC at ECS stand ECS36

IoT growth means more devices connected to the network



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## More shielding options



Harwin has introduced horizontal backshells for its Gecko Screw Lok series of lightweight, high-reliability connectors. The backshells are designed to ensure a fully EMI/RFI shielded connection for horizontal 1.25mm pitch board-to-cable connections. Previously Gecko EMI/RFI shielding was only available on vertical board-to-cable orientations.

Applications include products requiring EMI/RFI protection but lacking in space, such as satellites, UAVs, robotics, medical equipment and high-density industrial systems.

Two horizontal variants are available. The first features rear panel mount lugs and the second without. They are

compatible with Gecko-SL horizontal through-board connectors and Gecko-MT mixed layout connectors.

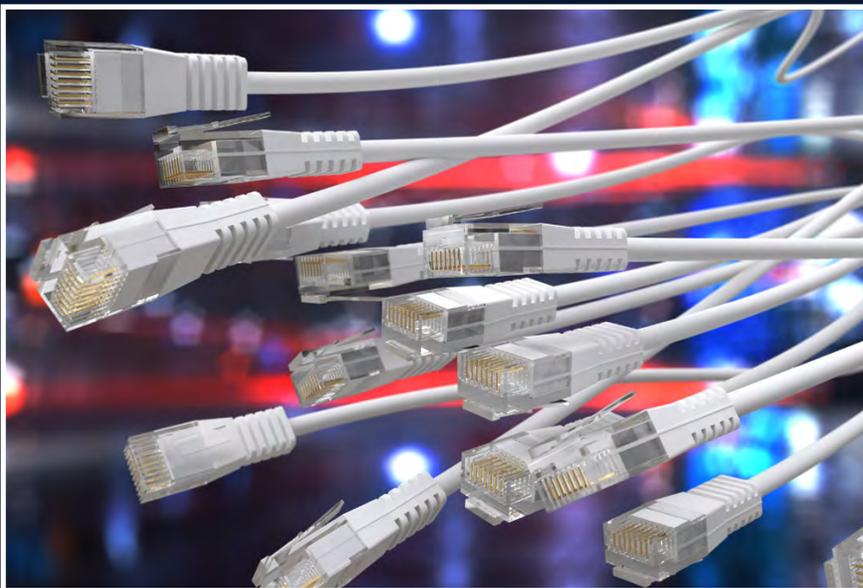
Harwin's head of product management, Ryan Smart, said: "We are now able to offer metal backshells across both vertical and horizontal Gecko interconnect configurations, which will be a major benefit to highly space-limited engineering designs. We are committed to attending the shielding needs of our avionics, space, industrial and defence customers, especially where there are closely stacked together PCBs or tight enclosures involved."

[www.harwin.com](http://www.harwin.com)

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by MH Connectors

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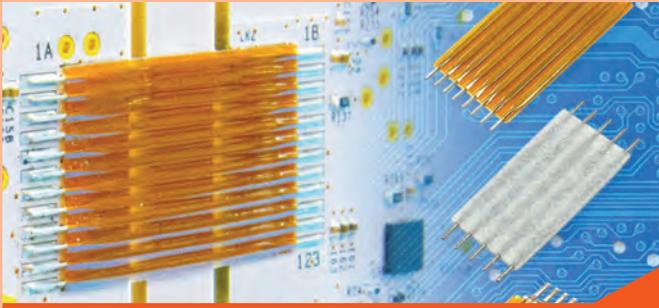
## Time saving and ease of use

Binder is offering field-wireable products in its M12 series 713, 715 and 825 with cage clamp quick connection. These connectors include four and five-pin variants, male and female. Shielded and shieldable products equipped with A, B and D coding are available.

Standardized M12 circular connectors are part of the basic equipment in factory and process automation. They are mainly used for field cabling, for example sensors and actuators. Depending on the coding, they are suitable for integrating automation components into Ethernet, Profinet, Profibus or CAN networks and can transmit signals and data as well as supply the field devices with electrical power.

Connectors that can be field assembled by the customer offer advantages. Screw terminations offer an inexpensive but comparatively labour-intensive solution. However, demand for data acquisition devices and data transmission lines is growing. Thus, simple, fast termination technology is increasingly important. In extensive and complex installations, requiring a high throughput during assembly, quick-connection methods provide a significant economic benefit due to their time advantage.

[www.binder-connector.de](http://www.binder-connector.de)



**Flexible, versatile, customisable connectivity**

Flexible jumper strips are a mature technology but still popular. GTK UK's connector specialist, Maciej Gluzniewicz, said: "Flexible jumper strips offer OEMs an extremely versatile and cost-effective method of connecting two PCBs and can tolerate repeated flexing.

"This connectivity solution is ideal for connecting PCBs in high vibration applications or where adjoining PCBs are sandwiched together or are located at unusual angles. OEMs can choose the size, pitch, mounting style and insulation material to suit their specific application. I think it is this level of versatility and customisation that has resulted in the longevity of this connector technology."

GTK supplies through-hole jumper strips in a variety of pitches including 1.27, 2.0, 2.54 and 3.5mm, with mixed pitch jumpers available if needed. Strips can have up to eighty conductors, dependent on the pitch. The jumpers are designed in a round-to-flat construction, resulting in an even distribution of stress. The strips are typically used for permanent PCB connections but can be mated with PCB connectors if a disconnect option is needed.

[www.gtk.co.uk](http://www.gtk.co.uk)



**Mate shrouded or not**

Cliff Electronics' PCB mount 4mm shrouded sockets can mate with safety shrouded and unshrouded plugs. The right-angled design reduces strain between the PCB and lead, increasing reliability and product lifetime.

The sockets suit applications including automotive diagnostic, industrial, medical, music industry, instrumentation, education and bench/hand-held electrical test equipment.

The range is designed for mating with industry standard 4mm plugs and available in black, red, green, blue, brown and yellow. Contacts are gold plated socket and rated at 1,000V, 24A, CAT III.

Cliff Electronics' MD, John Hall, said: "4mm connectors are a low cost, simple to terminate and reliable connectivity solution for a very wide range of applications in the electronics, electrical and music industries."

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- + 3 termination types: solder, crimp, print



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# OBSOLESCENCE MANAGEMENT Best Practice

*Rochester Electronics explores the impact of market conditions on the military and aerospace supply chain, the long-term consequences and best practices to mitigate risk*

The extent of capacity issues in the semiconductor market first became clear as the world started emerging from the worst effects of the pandemic 15-months ago. The automotive market with its just-in-time, minimal stock, high volume demands was an early indication of problems to come.

Since then, supply chain disruption ripples have spread to all markets including the military and defence sectors.

Categorised by smaller (stop-start) batch production runs, with extended temp and special testing needs, component supply for the defence market was always at greater risk of being squeezed.

In its simplest terms, as fab capacity disappeared, lead times extended. However, other factors have also become apparent. As demand boomed for newer technologies/geometries, third-party fabs made the decision to announce the closure of

older fabs. In many cases, this impacted product lines which had been regarded as ring-fenced 'long-term secure' technologies.

As original component manufacturers (OCMs) re-structured their production priorities with the capacity constraints they had, many chose to prune older product families, process technologies and package styles.

Increasing numbers of component discontinuations are a significant threat to the aerospace and defence markets as they have some of the longest production and service lives. It is not uncommon for production runs and service lives to be extended multiple times beyond the original planned service withdrawal dates, making it virtually impossible to accurately predict future needs.

So, with both short and long-term component availability more uncertain than ever, how do companies minimise these risks without creating new ones?

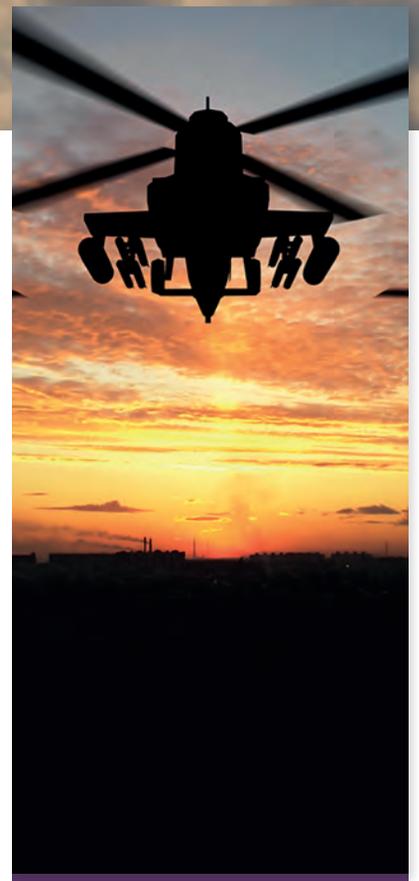
In an uncertain world, best practices include:

**Dual sourcing:** While it is rarely possible to approve multiple manufacturers for the same device, dual sourcing of authorised supply chains is essential.

**Stock in the market:** Ensure up-to-date visibility of all instantly available stock if supplies fail.

**Advanced warning system:** Share critical parts lists with trusted suppliers who can advise when: extended lead-times; natural disasters/acts-of-God; or market trends threaten supply chains. For example: A natural disaster affects production at a semiconductor plant—know within 48 hours which components are affected—see instantly available stock to prevent a line-stop—let suppliers provide pro-active rather than reactive support.

**Track component lifecycles:** Do not solely rely on lifecycle algorithms used by many online component tracking databases. Seek the support of an authorised



**Increasing numbers of component discontinuations are a significant threat to the aerospace and defence markets**

end-of-life supplier/manufacturer to provide a second opinion. Many components correctly listed on these databases as 'discontinued' by the OCM are still in production from the authorised end-of-life sources, 10 to 20-years after formal EoL.

Companies need to establish a sourcing partner that can offer guarantees of availability over the long term and also demonstrate a controlled transition process through end-of-life and into long-term fully authorised supply—or even long-term production.

As an AS6496-compliant distributor and licensed manufacturer, Rochester Electronics continues to offer military grade semiconductors and packages long after the original OCMs discontinue them. In addition to the millions of components available in stock, Rochester's in-house high-reliability hermetic assembly line offers a full complement of package styles including ceramic DIP, side brazed DIP, flat pack, CQFP, PGA, ceramic leadless chip carrier and metal can.

Rochester's in-house qualification and test facilities ensure complete risk-free sourcing of components in compliance with industry standards. Rochester is a QML manufacturer certified by DLA Land and Maritime to MIL-PRF-38535 offering Class Q and Class V microcircuits for military and aerospace applications.

Products are manufactured using known-good-die stored in one of two nitrogen wafer storage facilities and are tested to AS6496 standards using the original test processes employed by the OCM. Products retain their original part number because they are guaranteed to meet the original datasheet specification. As a 100 per cent authorised source of supply, anti-counterfeiting standards that apply to independent suppliers such as AS6171 and AS6081 are not required.

For ongoing critical obsolete component needs, where Rochester does not hold available inventory or wafer to build, the company can leverage its test and design engineering experience to keep customers' systems going.

Rochester can support fundamental design changes

such as replacement of obsolete key components with ASIC solutions. Possibility exists in these cases to transition to an ASIC which is identical in terms of fit-form-function, with no software changes and no errata. This means aerospace DO-254 re-qualifications, even for safety-critical (DAL-A) applications, can be greatly simplified as a minor change.

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# Preparing for growth in space and aviation

*TTI's vice president military/aerospace segment, Gia Hayes, presents factors manufacturers should prepare for during post-pandemic disruption and growth*

These are unprecedented times for commercial spaceflight. In addition to highly-publicized flights of SpaceX, Blue Origin and Virgin Galactic, smaller firms are striving to gain market share, including small-satellite launch provider Rocket Lab and launch vehicle company Astra Space.

At the same time, we are seeing new investments and innovations from industry leaders such as Boeing and Northrop Grumman. These contributions include rockets, engines, cargo/crew spacecraft, defense systems and the technology to support them.

This competition to bring future people and vehicles to low Earth orbit and beyond has the potential to make the dreams of science fiction become reality.

For example, with NASA's recent announcement that the International Space Station will be decommissioned after 2030, new space stations like Blue Origin's Orbital Reef concept could begin to move us toward a dream of more humans living and working in space.

This boom period in spaceflight will have far-reaching impacts beyond commercial space, creating new demand for



TTI's vice president, military/aerospace segment, **Gia Hayes**



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mil-spec and space-rated components beyond anything we have experienced before.

Another factor to consider is the speed of recovery in commercial air. We do not yet know how quickly business travel will trend back toward pre-pandemic levels, nor do we know how rapidly aircraft production will ramp back up.

Current trends seem to suggest that demand for single aisle and regional aircraft will continue to recover, reaching pre-pandemic levels much sooner than wide body aircraft. Although everyone agrees there are still many challenges to overcome, most of TTI's customer base is expecting to see some growth in 2022.

Recovery in air travel will prompt new aftermarket service revenue streams. Out-of-storage checks and return-to-service maintenance continue to drive an incremental 2022 aftermarket which could deplete existing inventory.

Even for components with shorter lead times, a rapid ramp-up in aircraft production alongside high demand from commercial space and defense could cause delays in manufacturers' programs. With the current long lead times for capacitors and other critical parts,

this combination might create a new wave of supply-chain uncertainty and complications.

Now is the time for buyers to make sure their company has strong partnerships and assurance of component supply. As a specialist distributor serving the defense and aerospace industries, TTI is working with customers to make sure they understand the current state of the supply chain and help them plan in pace with market conditions.

Responding to the pandemic's supply chain disruptions, TTI has encouraged customers to share forecasts—by part number—to ensure they remain up-to-date with realistic lead times and inventory positions.

Also, while we frequently hear customers have on-hand inventory that needs to be consumed, we also want to make sure that demand during this critical period is as accurate as possible.

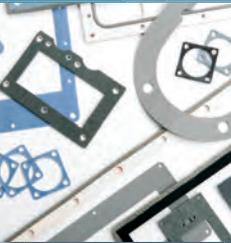
Solid planning and partnerships now can position a business to make the most of the recovery and growth in space, aviation and defense that we expect.

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# Powering tethered drones

*Tethered drone technology provides insight into the evolving bills-of-materials for new generations of flying machines*

A Japanese engineering company, Fukaden Corporation, is enabling humanitarian efforts by providing power for mobile communication base stations designed into their tethered drones. These lightweight, portable drones can be deployed by first responders to deliver near-instant communication capabilities.

Fukaden has demonstrated its Power Control BOX II main power supply unit, which delivers power via a tether to the drone. It enables 1kW of power to be delivered up to 150m.

Also, power can be scaled by using units in parallel to triple the power to 3kW,

providing cellular service to a 10km diameter.

Historically, the drawback of tethered drones was the thickness and weight of the power cable. Long, heavy cable adds weight creating more drag, which requires more power and limits the ability to add new drone features, such as sensors or high-resolution cameras.

Fukaden drones require 1kW to 5kW and increasing the supply from 24V to 370V reduces supply current by 15x. This allows thinner tether cable, which reduces the weight of the 1kW tether cable by more than 10x, from 125g to 11.1g per meter.

Running 370V requires a high density, lighter DCDC converter module in the drone to step the power down to 24V for the drive motor. The initial converter design was heavy and required too much space. So, the company replaced the converter with a Vicor DCM power module.

The Vicor DCM is an isolated DCDC converter module that uses high-frequency, zero-voltage switching (ZVS) technology and is characterized by high conversion efficiency and high output-power density. The DCM reduced the volume by 75 per cent and weight by more than 50 per cent.

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# How audits instill confidence

*Falcon Electronics' quality manager, Susan Bocci, explains how regular audits underpin purchasing confidence in the high reliability component distribution channels*

AMS (aerospace, military and space) companies will perform annual audits, assessments and/or spot checks throughout the year. These audits are not contract based and are usually performed by a quality engineer or manager to confirm the distributor/authorised supplier is compliant to different aspects of the AS9100 specification—even though the distributor/authorised supplier is certified as such. Mostly auditing documentation records, flow downs, counterfeit avoidance procedures, ESD precautions and cybersecurity.

These audits are not typically onsite (especially due to Covid-19) but are handled with questionnaires. Some AMS quality managers may request a conference call. Based on the

audit type, corrective actions are created if a non-conformance is found. Other types of audits/assessments are simple, with a series of questions and a request for documentation via email. These audits are not punitive but ensure the distributor/authorised supplier is meeting its customer's standards.

Do the distributor/authorised supplier's processes reflect documented procedures? Documented procedures must have a clear description of quality processes and is the best way to provide objective evidence during an audit. Along with quality records of the ordering and shipping process.

How does a distributor/authorised supplier incorporate its customer's specific

requirements to meet their quality specifications? Some AMS companies request specific language in the distributor/authorised supplier's procedures to ensure their quality specifications that are flowed down on their purchase orders are met. Specific language can be added to the procedure or simply create a customer specific procedure/s to this requirement. These procedures should be kept up to date and reviewed in a one-to-three-year cycle.

An important type of audit—counterfeit detection and avoidance—may occur several times a year, with the possibility of the same type of audit by different buyers within the same AMS company. A detailed procedure is required, which describes quarantining counterfeit and suspect counterfeit parts and how returned material is handled to prevent counterfeit product getting back into the supply chain. An approved vendor list with scope of approval is necessary and should be updated annually. Also, annual training for all employees is recommended.

Are accurate records maintained? As part of the counterfeit assessment, order traceability is usually requested. AMS companies select a random shipment and request the documentation required to trace the parts to the manufacturer. They need this objective evidence to ensure parts were purchased from an authorised supplier that matches their original purchase order.

Electronic Parts, Avoidance, Detection, Mitigation and Disposition: AS5553 and AS6496 (Authorised/Franchised Distribution) may be used to perform the audit. Both specifications are excellent resources to help develop a counterfeit program and/or an internal audit checklist for your counterfeit program.

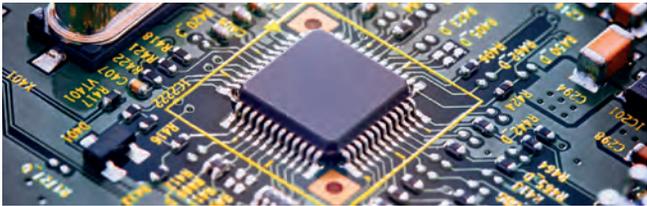
How are requirements flowed down to the OEM? Flow down verification is another key area that AMS companies audit. Purchase orders are audited, and flow down objective evidence is required to ensure their requirements are flowed down to the OEM. The easiest way to comply with standard flow downs is to add quality terms and conditions and display them on your company website.

Cybersecurity is an AMS priority. Both OEMs and distributors/authorised suppliers are mandated by the DOD to comply with CMMC requirements. Since the CMMC specification is still being developed, only questionnaires and surveys are sent at this time. Implementing the NIST 800-171 standard and maintaining good support procedures, training and documentation is a necessity which can be used as objective evidence for a desk audit.

Distributor/authorised suppliers which pass such audits receive a high rating and are assured future business. This helps the AMS company buyer streamline and simplify the process of ordering and receiving products shipped directly from the distributor/authorised supplier's warehouse. It provides confidence in the consistency of quality and guarantees that new requirements are being reviewed and flowed down to meet the AMS customer's needs.




[www.jaltek.com](http://www.jaltek.com)



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# Medical safety starts with power input

Medical electrical equipment must not place patients or staff in danger. Schurter steps buyers through some of the safety related considerations



not exceed 100µA under normal conditions (10µA for direct patient contact). Thus, power line filters for medical equipment do not have Y capacitors or only very small ones, resulting in a maximum leakage current of 5µA or 80µA.

Capacitors used are wired directly between the energised conductors (X capacitors) or between the energised conductors and earth (Y capacitors).

If the power cable is removed from the socket, the stored voltage

from X capacitors is still present on the power pins and if touched can result in an electrical shock. A bleed resistor is placed inbetween the phase and neutral conductors to discharge the capacitor.

[www.schurter.com](http://www.schurter.com)

Medical devices connected by a detachable power cord must meet the requirements of IEC60320. It is also recommended to protect against unintentionally removing the plug from the socket. For example, with Schurter's V-Lock cord retaining solution the power socket has a notch that interlocks with a cord connector latch and prevents unintentional removal.

Permanently installed medical electrical equipment comes with its own fuses. It is recommended that all such equipment be equipped with a double-pole fuse holder and that only authorised personnel can remove or replace fuses. The basic standard for medical electrical equipment, IEC/UL 60601-1, specifies fuse holders that can only be accessed with help of a tool. For this, Schurter offers Extra-Safe fuse drawers.

The power feed line switch ensures equipment is completely disconnected from power after being turned off. If only one pole in a non-polarized power distribution network is interrupted, equipment could still be live. It is preferable to use a switch that disconnects power feed on two poles.

The power line filter protects equipment from external HF interference and reduces the HF interference radiated by equipment. They are often necessary to fulfil EMC standards for CE declaration of conformity.

Filter capacitors cause leakage currents which, in medical electrical equipment, may



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## Labs benefit from narrow BNC feedthroughs

Cliff Electronics has added a BNC connector version to its Slims FeedThrough connector range. They are available in 50 and 75ohm impedances. Applications for the BNC version include laboratory environments.

The 19mm wide Slims range offers a compact alternative to the company's 26mm wide XLR form factor range. Up to 20 can be mounted in a 1U, 19in rack, rather than 16 XLR types.

Cliff's FeedThrough connectors allow standard, off-the-shelf, connecting cables to be used for internal connectivity, simplifying and speeding system assembly and facilitating easy equipment repurposing.

Cliff Electronics' MD, John Hall, said: "The new BNC version of our Slims FeedThrough connector opens a wide new market for us in RF, wireless and security systems. Our FeedThrough connectors allow systems designers to integrate many different types of connectors on to a standard 19in rack panel with just one type of cut out and use off-the-shelf connecting cables, greatly simplifying assembly."

[cliffuk.co.uk](http://cliffuk.co.uk)



## Connectivity meets medical

Mouser Electronics has announced a new ebook in collaboration with Molex, exploring the newest solutions and applications at the intersection of connectivity and medical device design. In *Improving Lives with Digital Healthcare*, experts from Molex and Mouser offer in-depth articles examining the next generation of digital healthcare solutions, including robotic surgery, medical wearables, brain-computer interfaces and medical training with immersive technologies.

Today's medical devices bring together a diverse range of sensors, connectivity solutions, and cable assemblies to deliver advances in diagnostic, monitoring and therapeutic treatments. The ebook helps untangle the complexities of digital healthcare, offering usable resources for designing new devices. One article focusses on emerging connectivity solutions for robotic surgery, including the use of optical fibre technology to support laser therapy.

The ebook features product information for 15 Molex devices. For example, Molex' ISM standalone antennas provide an antenna volume reduction up to 75 per cent compared with conventional designs. They can be integrated into telehealth devices, microwave ablation machines, diathermy therapeutic devices and more.

[www.mouser.com](http://www.mouser.com)

## Supply approved for medical and industrial



SL Power Electronics has announced availability of its TE and ME family external power supplies. TE is approved to industrial/ITE standards, while ME meets medical requirements. Nine model ranges are available with standard output voltages from five to 48VDC depending on model. Custom voltages are available to order.

Specifications include: desktop style package rated to IP22; universal input voltage range; three-year warranty; electrolytic capacitor life of >7years; EN55011/CISPR11; FCC Part 15.109 Class B Conducted and Radiated Emissions with 6db margin; approved to EN/IEC/UL60601-1 3rd Edition with isolation levels which satisfy the 2 x

MOPP requirements; and meets DoE Efficiency Level VI Requirements (no load input power, average efficiency).

SL Power's UK country manager, Gary Baker, said: "Opportunities for the use of this premium line of external power supplies continues to grow and diversify. Our TE and ME series provide an off-the-shelf solution for the vast majority of customers and as they are an in-house design, we can meet demands for modification of output voltages, connector types, cable length and full customisation to meet a user's specific needs."

[slpower.com](http://slpower.com)



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# Clearing up the confusion. Which bag?

Antistat walks readers through the benefits of different types of bags used for transporting and storing components and PCBs as they move through the electronics manufacturing process

ESD packaging, including pink antistatic bags, static shielding bags and moisture barrier bags, are some of the most important safety products used in manufacturing environments. Without these specialised packaging solutions, it would be virtually impossible to safely transport and store products and components between the production line and their final destination.

Pink antistatic bags are an ideal solution for transporting non-ESD sensitive items within an EPA. Pink poly's surface resistance is in the dissipative range and is usually around  $10^7$  to  $10^{10}$  Ohms. Pink bags

will not generate a charge but will also not protect the contents from ESD damage.

Static shielding bags are manufactured with a four-layer construction creating a faraday cage which guards against charges inside and outside the bag. Semi-transparent for easy content identification, static shielding bags are typically silver and are used for transport and storage outside an EPA of all ESD sensitive electronic components, boards and assemblies.

Moisture barrier bags protect electronics from both moisture and static damage. Bags

are available in a range of thicknesses depending on the moisture and vapour transmission rate required. They should be vacuum sealed ensuring moisture and static protection. In order to verify that dry packaging methods are not compromised during storage and transportation of these products, humidity indicator cards and desiccants should be used.

Choosing the appropriate packaging is vital to minimise the risk of static discharge damaging your products and manufacturing environment.

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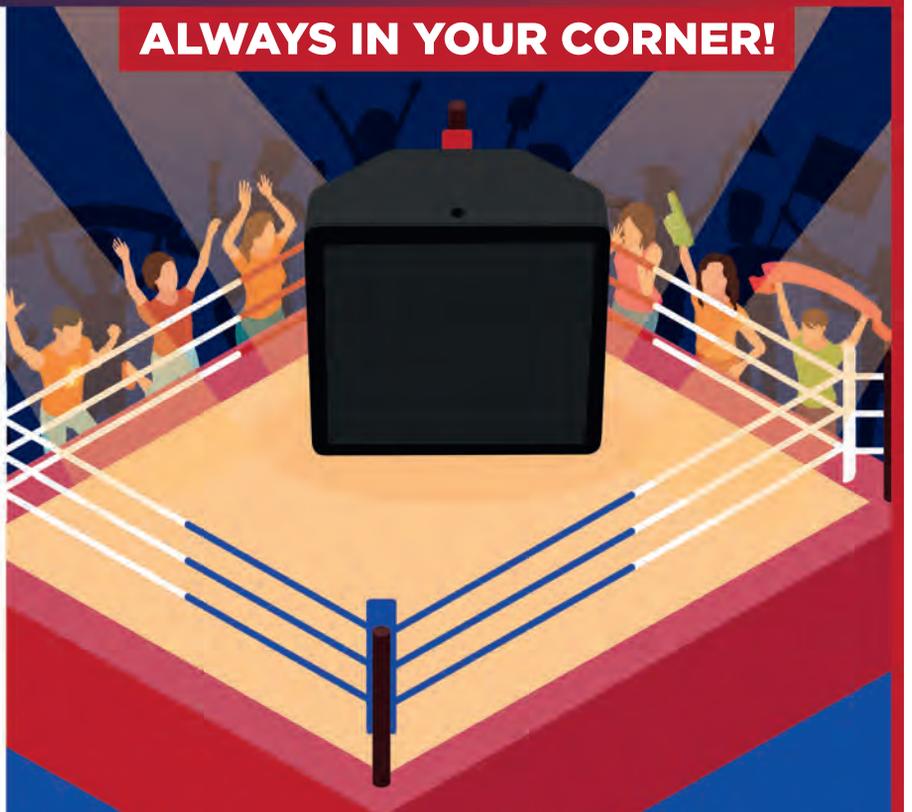
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# Not all enclosures are created equal

*Rittal's product manager for industrial and IT enclosures, Emma Ryde, guides buyers through the process of choosing outdoor enclosures*

When an enclosure spends its lifetime outdoors, it will likely face years of hot summers and harsh winters. The most vulnerable enclosure element is usually the door seals. Protecting the door seals means preventing water entering the enclosure, thus increasing enclosure lifespan.

Contaminated water can cause degradation and over time the seal will fail. In many cases the seals can't be replaced. This then becomes a costly fix, requiring a new door or enclosure. Aftermarket seals are often a compromise and may invalidate the IP rating. Water sitting on the seal during colder months can freeze. As the water expands it pushes the door away from the housing, allowing water inside. To avoid such issues, choose an enclosure

with an overhanging roof or a design that protects the door seals. Standard enclosures without such design features are often unsuitable for outdoor use.

Security and vandalism are concerns when placing equipment outside and in public spaces. Select an enclosure with deterrent features. If someone wants to gain access then they will attack the weak points: handle, lock and door hinges. Choose an enclosure offering different handle and lock options, such as a lock which requires a specific key and cannot be opened with a tool. Hidden door hinges also prevent unauthorised access. Hidden hinges mean attackers cannot easily remove the doors and trying to gain access in other ways will mean bigger tools or more noise: both of which again are deterrents.

Double walled enclosures offer huge benefits for outdoor applications. They help regulate UV solar gain and a double walled enclosure is twice as hard to gain access to.

Double walled enclosures offer a chimney style effect, removing some of the heat created by UV solar gain. The outer layer reflects some of the light and some of the heat which is transferred through the outer wall is taken away between the two layers, up and out of the ventilated roof area. Any heat gain left, plus heat generated by the equipment inside, can then be dealt with using a range of climate control options. This maybe simple fans and filters, louvre arrangements or forced air cooling. Considering if the selected enclosure offers these options, as a retrofit at a later stage, is key during the decision making process.



**Choose an enclosure with an overhanging roof or a design that protects the door seals. Standard enclosures without such design features are often unsuitable for outdoor use**

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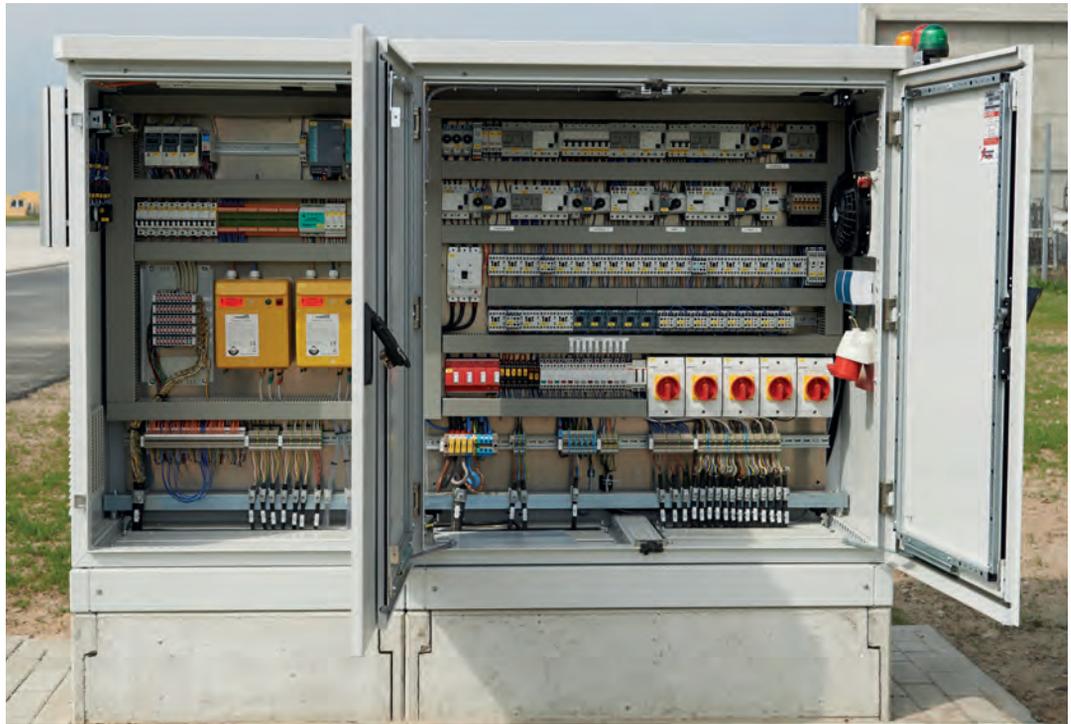
# Enclosure Climate Control

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Climate control is often overlooked in outdoor applications. The assumption is that heat generated by internal equipment, will be lost through the walls, especially when placing enclosures in cooler countries such as the UK. Sadly, experience shows this isn't the case. Sitting equipment in an enclosure works much like a flask, some heat will be lost but how much heat is being generated in the first place? Has a thermal calculation been carried out? If the enclosure is subjected to higher ambient temperatures, or more equipment is installed at a later date, can cooling be added as an option later on? These are important points that, if considered early, can save time and cost further down the line.



Double walled enclosures also offer the benefit of refurbishment. In the event of damage, rather than removing the whole enclosure which would mean shutting down the infrastructure network it is part of, the outer walls can simply be replaced.

Lastly, what materials are being used? Stainless steel may sound suitable for

outside applications but it is costly and not always the right option. Painted aluminium is lightweight, durable and can be handled more efficiently. Dependent on the application, GRP may offer more benefits and would be significantly cheaper than stainless steel.

The next time you need an outdoor enclosure, consider the enclosure as a

critical piece of equipment, within the project or build. Selecting the right solution initially will ultimately save time and money.

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**Double walled enclosures also offer the benefit of refurbishment. In the event of damage the outer walls can simply be replaced**



# Rigid-Flex PCBs drive cost savings

*DK-Daleba's business development manager, Tony Hawkins, explains how the many benefits of rigid-flex and flex PCBs are driving global growth*



DK-Daleba's business development manager, **Tony Hawkins**



Engineers are turning to flex and flex-rigid to help solve design issues that would be presented with standard rigid PCBs. Benefits include weight reduction, higher signal speeds and increased reliability in high vibration or harsh environments. These boards also offer different connection capabilities, helping reduce packaging requirements. Housing boards in smaller spaces is often considered the main benefit.

IoT involves embedding electronics in everyday consumer products. This inevitably means overcoming extreme packing issues often making rigid-flex PCBs the only answer. Their use is increasing as the IoT market grows, predicted to reach \$1,386b by 2026 from \$761.4b in 2020, a CAGR of 10.53 per cent.

In addition to these market drivers, the cost saving opportunity is becoming a significant factor. Many engineers consider rigid-flex costs to be more than rigid costs but a comprehensive approach to the whole project can often provide interesting results.

A DK-Daleba customer recently needed to reduce the cost of two rigid FR4 boards in a single assembly, at a time when PCB cost increases were making 'cost-downs' impossible. The boards were manufactured at one of DK-Daleba's Asia factories best suited to the boards' technology while achieving the lowest possible price points. With no opportunity to reduce the costs the engineers were encouraged to take a holistic approach and examine the whole box build.

At assembly stage, the two FR4 PCBs were joined by connectors. This added considerably to kitting costs and assembly labour. Past product failures had been attributed to the connectors so a new assembly without them was welcomed.

DK-Daleba discussed rigid-flex with the customer which had previously only considered them for space-saving. By redesigning the two FR4 boards, with dynamic connections through a flexible circuit, overall box-build costs could be lowered. When designing a rigid-flex PCB, different considerations need to be made versus a rigid PCB design. Advice was given and the customer redesigned the boards as a single rigid-flex assembly. Although the price was higher than two single rigids, the overall product cost reduced considerably with no connectors and lower labour assembly costs.

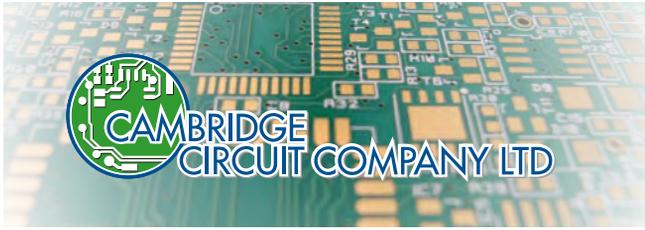
In addition to cost reduction, the product also benefitted from: lower overall weight; ultimate use of packaging space; increased reliability with no connectors; and a sturdier construction for high vibration working environments.

Switching to a rigid-flex design was a success for this customer and there will be countless similar experiences ahead as the growth of this technology increases. DK-Daleba engineers are available to ensure customers' transitions to rigid-flex PCBs are seamless.

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**Many engineers consider rigid-flex costs to be more than rigid costs but a comprehensive approach to the whole project can often provide interesting results**



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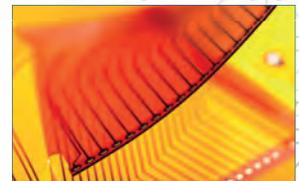
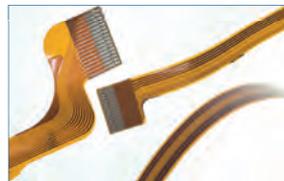
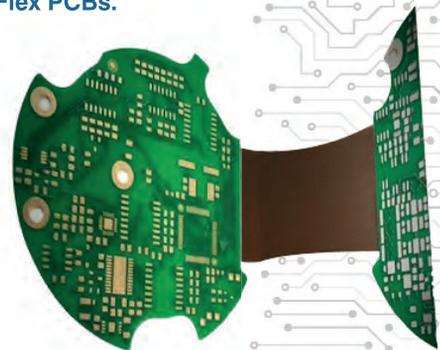


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# Understanding today's PCB supply chain

*PCB materials, costs and supply chain—a perspective by Cambridge Circuit Company's managing director, Mark Sanford*

With energy prices, interest rates and inflation all rising, everyone is facing a challenging economic climate and the PCB sector is not immune. Successive price increases for copper, glass yarn, resins and aluminium mean the PCB industry became savvier regarding forecasting demand, thus minimising cost increases and lead time delays.

As one of the UK's remaining in-house PCB manufacturers, Cambridge Circuit Company has forged great working relationships with its suppliers, especially

“  
Successive price increases for copper, glass yarn, resins and aluminium mean the PCB industry became savvier regarding forecasting demand



Cambridge Circuit Company's managing director, **Mark Sanford**



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in PCB  
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laminates specialists who continue to provide reassurance that there are no base material shortages. Using a large and long-established supplier—which has a healthy internal stock and is able to buy in bulk to keep costs down—is the best way for Cambridge Circuit Company to minimise cost increases. With material prices dictated quarterly, it's much easier to offset or delay those increases too.

There are difficulties sourcing certain products, such as heavier copper weights, largely driven by the global growth of the EV market. With some products only available to suppliers on allocation, forecasting demand and giving as much notice as possible are the ways the industry is going to navigate its way through the challenges.

Energy prices are increasing at eye watering levels and as an in-house manufacturer, Cambridge

Circuit Company truly relies on an economically priced electricity supply. The company's CFO spends significant time working with a long-established and trusted energy broker to get the best possible deals to help the company remain competitive and avoid price hikes.

International freight costs have spiralled and lead times have increased. This is the result of shipping delays from Asia and the US, plus a combination of container costs, container availability, reduced shipping routes and port congestion. While this may impact material costs and availability it can be seen, in part, as an advantage to the Cambridge Circuit Company and its UK-based customers as once production begins, manufacturing takes place in-house and products are delivered without international freight.

[www.cambridge-circuit.co.uk](http://www.cambridge-circuit.co.uk)

# Designing cost out with supplier support

*Fineline VAR's technical manager, Grant Main, explains how early collaboration between PCB supplier and customer lays the foundation for commercial advantage*

Every application is different and the design determines the execution. A product's design and technology are usually determined by an OEM before they start talking to their PCB supplier. It is advisable to talk to a PCB provider before finalising a design. There are great benefits in working with a PCB value add reseller from design and technical support to providing access to multiple factories with varying capabilities and solutions.

Generally, around 80 per cent of a PCB's cost is determined in advance. A PCB supplier's ability to design cost out of a product reduces after this point.

Over-designed PCBs cost more and limit production capabilities. OEMs should speak to their PCB partner early so they can deliver cost-effective design and manufacturing options to ensure the best technology solution, plus commercial advantage.

A good partner will strive to reduce complexity and ensure the design is an appropriate use of relevant technologies and best design and manufacturing practices.

Design-for-manufacture realises maximum benefits

when customer and supplier are aware of the requirements from the outset. From a comprehensive design brief and initial discussions prior to layout, material set(s) can be reviewed and agreed, which become the foundation onto which the design is ultimately built.

Technology requirements such as HDI and rigid-flex can also be reviewed, together with compatibility with other special features such as resin filling of vias. Even recommendations on minimum feature sizes such as track/gap, laser drill via sizes and pad diameters can all be defined and agreed to ensure the transition into prototype and volume manufacture is virtually seamless.

For existing designs, the same process can be followed but considered 'value engineering' or 'design optimisation'.

Once the PCB design is set, strong savings can be achieved through material utilisation, surface finish and other options. An OEM's PCB partner can guide them to ensure they gain maximum commercial benefit.

A value-add supplier can also guide customers through the selection of manufacturing

partners. Collaboratively, the team will take into consideration quantity requirements from prototype through pre-production to volume, technology specification, the need for supply flexibility and delivery deadlines to select the appropriate manufacturer.

A PCB value add reseller can support their customers on additional cost saving opportunities in the supply chain, much of this around logistics, stock management and effective batch sizing.

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**Around 80 per cent of a PCB's cost is determined in advance**



## Keep a close eye on quality

*In this article, Vision Engineering's Sarah Eagles introduces the benefits of microscope-based inspection, from component goods-in to dispatch of finished PCB assemblies*

Visual inspection is an essential tool in the inspector's toolbox, with visual comparisons against a 'golden board' extremely useful.

The simplest form of MVI is the naked eye. However, this is only likely to identify obvious defects, particularly when inspecting smaller, more dense PCBs. It is more common to use a microscope, ensuring a more accurate, detailed view.

Microscopes are used throughout the design-for-manufacturing process, with images captured for NPI documentation. Reporting throughout prototype development is important to track design changes and document issues and their resolutions. Image and video files are part of this process.

Many manufacturers outsource their PCB assembly. Fabricators create a replica of the drawings, matching every detail of the customer's specifications.

Prototypes are inspected under microscope for build defects. PCBs are also assessed for adaptations for improved performance, IPC compliance and increased ease/speed of manufacture.

Once the prototype is approved, engineering validation tests and design validation tests are conducted. Analysis is carried out on PCBs that fail testing and cosmetic checks are made to ensure boards meet updated client specifications.

Finally, production validation tests are run. This is the 'last build' stage before the sample PCB

is considered acceptable for mass production. The approved PCB moves into mass manufacturing.

Component defects are a major contributor to faulty PCBs. Checks are made for: missing components, misplaced/misaligned components, incorrect component value, damaged components, lifted leads and reversed polarity.

Coating integrity is crucial to proper long-term functioning so inspecting coatings is an important part of the process. Coatings are checked for: pin pricks, tears, uneven spread, thickness and correct masking. Illumination is useful when checking coatings and quickly spotting potential issues. For instance, UV lighting is ideal to assess the integrity of conformal coatings.

Complex boards have thousands of solder joints, all critical to the PCB's functioning. Inspectors will check for: solder bridging or shorts, open circuits, voids or bumps, residual copper, insufficient solder, excess solder and the general soldering quality.

Throughout all these quality checks, inspectors will also be looking at the PCB's overall quality including dirt, scratches, dents or warping.

When considering an inspection system, use the following checklist. Look for:

- An intuitive system requiring minimal training, particularly where multiple operators are involved, ensuring accuracy, speed and consistency



- Image quality
- Magnification range
- Program pre-sets, to maintain accuracy while improving throughput

For inspection, Vision Engineering's customers use the Mantis eyepiece-less stereo microscope, Lynx EVO eyepiece-less stereo microscope and EVO Cam II digital microscope.

For measurement they use the Swift PRO dual optical and video measurement system and LVC Series 3 axis measurement systems

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**Complex boards have thousands of solder joints, all critical to the PCB's functioning**

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# How to prepare for market disruptions

*Farnell's regional sales director Northern Europe, Mathew Thorpe, explains how forensic planning and preparation lay the groundwork for reliable supply in volatile markets*

While the electronics industry was worried about Brexit, the effects on supply chains was minimal. The Coronavirus pandemic was a different story. The sector was hit by: a worldwide semiconductor shortage; increased logistics costs through higher shipping container rates (rising nearly 10-fold); an acute shortage of lorry drivers; and significant disruption to ocean freight through staff either being ill or isolating. Rather than abating as restrictions began to ease, pressures increased on suppliers who saw demand not only return to pre-pandemic levels but increase beyond all expectations due to the surge in demand for home-working technology systems and at-home entertainment.

External forces beyond manufacturers' and suppliers' control have seen reduced air freight capacity, while for national deliveries, local lockdowns and other restrictions made it harder to move components. There was a risk of

semiconductor suppliers sitting on surplus component stock that could not be delivered to customers who needed them.

Electronic components have experienced the worst supply issues of any commodities market. Prices have risen across the board and industry has been unable to shoulder these costs on its own—some inevitably passing them on to customers.

While these problems have been challenging enough, forecasting how long supply chains will be affected by Covid-driven constraints has been virtually impossible. Some observers predict problems will persist into 2023 and the semiconductor market will not see real stability until 2024, particularly for discrete, power, analog and microcontroller products. Rebuilding capacity takes time.

So, how can the industry protect against possibilities of future

product shortages, higher logistics costs or freight disruption? Farnell already believed semiconductor manufacturers and suppliers had to build significant levels of resilience to face down any future devastating events.

The company tackled many potential supply issues by deciding, some years ago, to invest heavily in the breadth and depth of its global inventory. Thus, by the time the pandemic struck, the company's warehouses were holding more components than at any time in their history. Farnell had also boosted investment in its digital offering, strengthened its relationships with the world's biggest semiconductor suppliers and brought in new supplier partners across its product range. As post-pandemic demand increased, products were readily accessible to customers who also benefited from Farnell being part of Avnet.



Farnell's regional sales director Northern Europe, **Mathew Thorpe**

One lesson Farnell learned is that through forensic planning and preparation it is possible for manufacturers and suppliers to arm themselves to respond as flexibly as possible to major changes in market dynamics. No supply chain and no market wants to be pulled this way and that by external forces. Farnell has found that by acting early and fortifying supply chains (and all partners within them) it is possible to provide customers access to products they need even in the toughest market conditions.

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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
<b>CIRCUIT PROTECTION</b>											
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,800	N/A	0 €	N/A	50	2,500+	Y
EPICOS/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
<b>ENCLOSURES</b>											
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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
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
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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
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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
	Avant Electronics LTD	01449 774247	www.avantelectronics.co.uk	N	5000	N/A	£100	N/A	2	10	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
Cirrus Logic	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	200	N/A	0 €	N/A	50	2,500+	Y
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
FTDI	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	100	N/A	0 €	N/A	50	2,500+	Y
Infineon	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	8,300	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	14,050	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	24,200	N/A	0 €	N/A	50	2,500+	Y
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
Power Integrations	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	750	N/A	0 €	N/A	50	2,500+	Y
Qorvo	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	700	N/A	0 €	N/A	50	2,500+	Y
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
Semtech	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	350	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
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
Texas Instruments	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	39,050	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	10,850	N/A	0 €	N/A	50	2,500+	Y
Xilinx	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
<b>INTERCONNECTION</b>											
3M	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,750	N/A	0 €	N/A	50	2,500+	Y
Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	33,200	N/A	0 €	N/A	50	2,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	4,250	N/A	0 €	N/A	50	2,500+	Y
FCI / Amphenol	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
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
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	01494-427500	www.mouser.co.uk	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
Intelliconnect (Europe) Ltd		01245 347145	www.intelliconnect.co.uk	N/A	N/A	N/A	N/A	100%	5	30	
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100%	6	38	Y
JAE Electronics	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	23,600	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17,150	N/A	0 €	N/A	50	2,500+	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
Radiall	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
Samtec	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	16,300	N/A	0 €	N/A	50	2,500+	Y
Souriau	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,300	N/A	0 €	N/A	50	2,500+	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	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
<b>OBSOLESCENCE / HARD TO FIND</b>											
	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
<b>OPTO ELECTRONICS</b>											
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
<b>PASSIVES</b>											
AVX	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	17850	N/A	0 €	N/A	50	2,500+	Y
Bourns	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	15,100	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,750	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	5,450	N/A	0 €	N/A	50	2,500+	Y
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
Würth 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
<b>PASSIVES ALTERNATIVES</b>											
BEC Distribution Ltd		01844 275824	www.bec.co.uk		5,000	N/A	£0	100%	3	5	Y
<b>POWER &amp; BATTERIES</b>											
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
<b>SENSORS</b>											
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
<b>SWITCHES &amp; KEYBOARDS</b>											
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
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

## Buyers' Guide

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
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
<b>TERMINAL BLOCKS</b>											
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
<b>THERMAL MANAGEMENT</b>											
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
Materials Direct	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
<b>TRANSFORMERS &amp; INDUCTORS</b>											
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
Würth Elektronik	Mouser Electronics	01494-427500	www.mouser.co.uk	Y	3,400	N/A	0 €	N/A	50	2,500+	Y
<b>WIRELESS SOLUTIONS</b>											
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

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## Contract Manufacturers Buyers' Guide

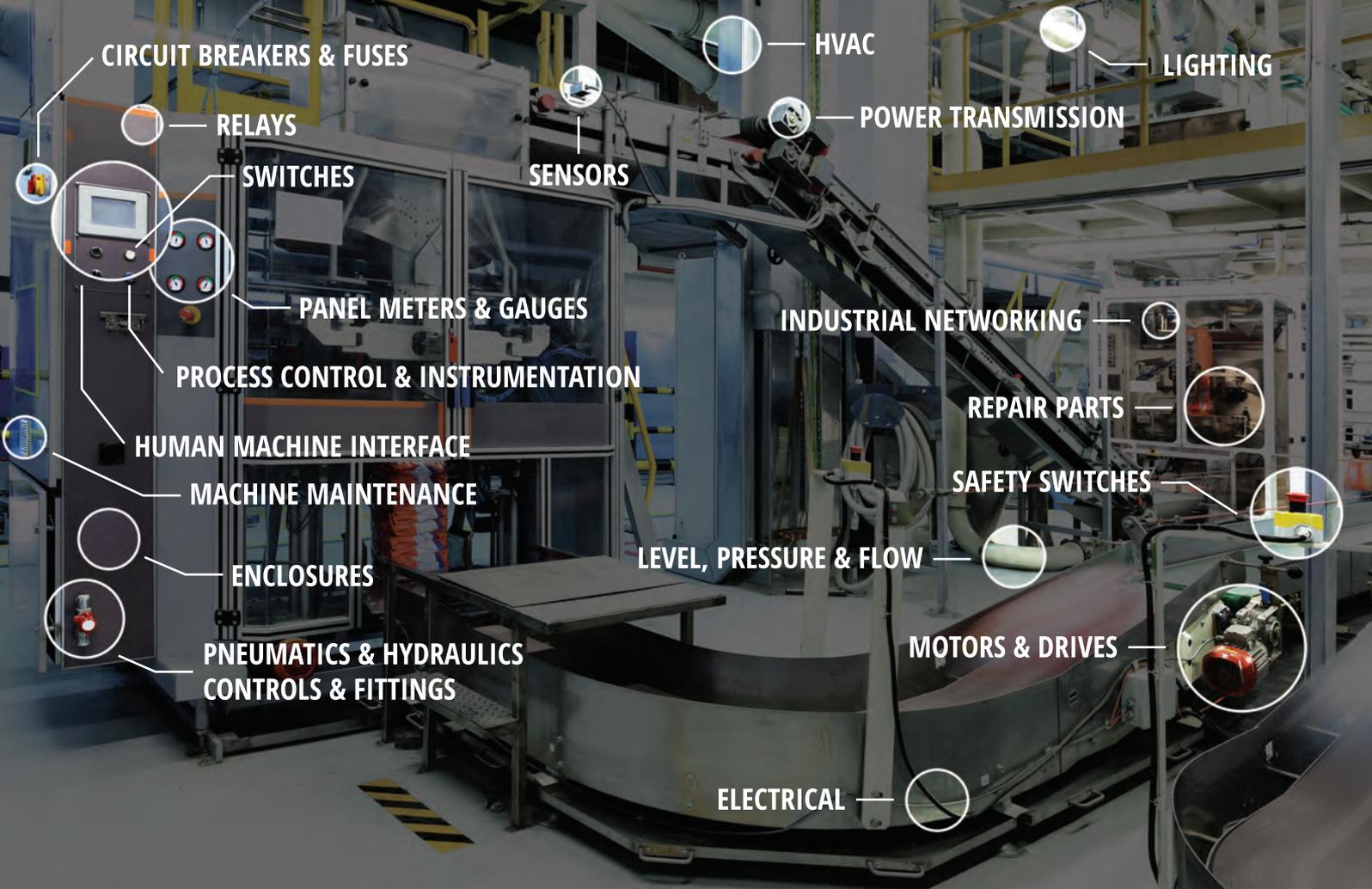
Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BCA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£10m	Essex/SE	70	9	AS9100 Rev D, ISO9001:2015, 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	£12.5m	UK & Far East	72	10	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
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£11m	Hampshire	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001:2015, ISO14001:2015, IPC 610 A Class 2 & 3	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.6m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC J-STD-001, IPC 7711/7721	Y	Y	Y	N	Y	N
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2.4m	Staffordshire	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 449080	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	5	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2018 ATEX, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
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 Electronic Wiring Ltd.	+44(0)1793 694033	www.iwv.co.uk	£5.5m	Swindon, UK	60	N/A	ISO9001:2015, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£10m	UK	90	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
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	ISO9001, 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 (i.e. Broken/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
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO9000: 2015	SML	Y	4-10	Y	N/A	N/A	Y	Y	Y	Y
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, IOSCAR	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, Joscscar	SML	Y	4-34	Y	Y	Y	Y	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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