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editor's word



Front cover – April 2017
Rail races ahead
page 14

Rail rolls on

I feel well qualified to comment on the rail feature in this issue. As a resident of Kent for 30-years I watched, on a daily basis, the construction of HS1. Since its opening, it's a service I've used on a weekly or monthly basis to travel between Canterbury, Ashford and London.

While I appreciate there are plenty of anti-rail protesters ready to drag me down for my appreciation of HS1, I can safely say HS1 has transformed elements of my business life. Previously, a meeting in London was a daylong event. Now it's something I can do over lunch and, due to the space, comfort, smoothness and charging facilities I can work productively all the way there and back.

To add to these benefits, the design of the track, rolling stock and power system mean this line ploughs on regardless of the weather. While other lines shutdown due to rain, wind, snow, leaves and more, HS1 charges through unfussed.

What makes all this possible is the coming together of engineering excellence in mechanical, electrical and electronic design, in an environment where safety and reliability take precedent.

My hope for the future is a United Kingdom which has the courage to design and build a grid of high speed lines, one or two North/South and maybe three or four East/West, to provide fast long distance travel while freeing existing lines for local and freight traffic.

And the cost? Who cares? Not me. Print the money and get it done. I'm talking about a national infrastructure project designed to raise the productivity of the whole nation for a century or more. A project that would employ tens of thousands of engineers for decades. A project that would regenerate manufacturing skills and facilities, from rolling steel to populating circuit boards. I see no reason to delay.

Jon Barrett



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contents

- 4 News**
Delivering data in harsh applications
- 8 Displays**
Choosing displays with care
- 14 Rail**
Creative sourcing keeps projects on track
- 26 Best of British**
Enclosures feature tough good looks
- 44 Buyers' Guide**
All the facts and figures to help you buy



ISSUE 142

Annual edition 2017 Vol13 No.4

Published 12 times per year

by MMG Publishing Limited

ANNUAL SUBSCRIPTION:

EU Countries £60 Rest of World £90

MMG PUBLISHING LTD

Suite 2, 1-3 Warren Court, Park Road,

Crowborough, East Sussex TN6 2QX

Tel: +44 (0)1892 613400

Fax: +44 (0)1892 613402

Printed by: Pensord Press Ltd

Electronics Sourcing is printed on

sustainably sourced paper stock

ISSN 2043-9504

© 2017 MMG Publishing Ltd



ELECTRONICS
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The latest industry news from the UK electronics marketplace



Ready to deliver data in harsh applications

Aerco is now stocking Provertha's M12 X-Code 10Gbit Ethernet crimp connector designed to deliver fail-safe connection and secure data transmission of up to 10Gbits for Cat6a Ethernet in railway and other mass-transit applications. The connector is said to achieve 360deg electromagnetic and radio frequency interference shielding in a small form factor, making it ideal for restricted assembly conditions. In addition to extreme vibration resistance, the housing is waterproof to IP67 when screw locked.

With its shielded full metal housing, the Provertha M12 X-Code connector helps reduce crosstalk and signal coupling. Turned and gold-plated crimp contacts maintain secure contact termination under high vibration conditions, delivering reliable high-speed data transmission rates to TIA-568 and ISO/IEC-11801 Cat6A specifications. Connectors in the series also feature a special crimp sleeve system for torsion proof strain relief. www.aerco.co.uk



AOI investment underpins manufacturing quality

In line with its policy to invest in best practice technology, electronics manufacturing services provider, Dynamic EMS, has installed a new LRD Falcon optical inspection system.

The LRD Falcon boasts a full in-line camera system with the ability to inspect almost any component. Combining this with rework and traceability solutions provides customers with a complete picture of their manufacturing process. Deploying AOI in this way ensures Dynamic EMS has monitoring, control and feedback in its manufacturing process.

Managing director, John Dignan, commented: "Testing is deeply embedded in our organisation and we aim to drive costs down by eliminating the opportunity for defects in the build process. The LRD Falcon helps achieves this."

www.dynamic-ems.com

Sourcing capacitors for reliable applications

Available now through TTI, AVX supercapacitors, or double layer capacitors, are said to provide an excellent compromise between electronic and dielectric capacitors. The BestCap, SCC series cylindrical and SCM series module capacitors enable high pulse power and capacitance density, as well as low equivalent series resistance and low leakage for reliability in multiple applications.

BestCap products offer capacitance of 4.7 to 1,000mF and voltage of 3.6 to 20V. Designed for high reliability and long life, applications include RFID, GSM, GPRS and Wi-Fi modules. SCC series cylindrical supercapacitors are available with capacitance values from one to 3,000F and voltage of 2.7V. Suitable applications are energy harvesting systems, uninterruptable power supplies and remote metering. Finally, the SCM series module, with capacitance values from one to 750F and



voltage of 5.0 and 5.4V, is available with active or passive balancing options. Applications include wireless alarms, scanners and camera flash systems.

www.tti-europe.com



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Fans won't be the first to fail

Digi-Key Electronics is currently offering immediate shipment of Sanyo Denki's ultra-long life, rugged AC and DC fans and blowers. Products boast a high temperature range and environmental protection options to dramatically increase the overall life of many designs. Applications will include automation, server cabinets, telecom, medical and the food industry.

Vice president global interconnect, passive and electromechanical at Digi-Key, Tom Busher, added: "Fans are typically viewed as the first component to fail in an application, so we believe the high reliability of these fans and blowers will positively impact application life and allow customers to get their products to market faster." www.digikey.com

Inertial products gain momentum

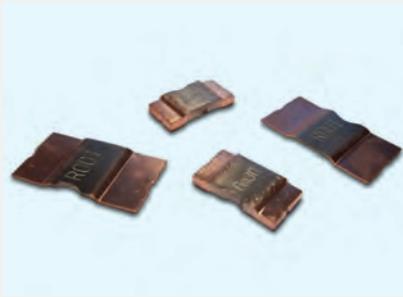
Acal BFi has added a new angular rate sensor from Tronics to its portfolio. The Gypro3300 micro-electro-mechanical systems sensor utilises vacuum wafer-level packaging technology to deliver performance and accuracy in a compact design, while offering a plug-and-play and open source testing approach for users. Supporting the introduction of the Gypro3300 is the Gypro-EVB2 evaluation kit, compatible with the open-source Arduino platform.

Chief executive officer, Tronics, Pascal Langlois, added: "Acal BFi is uniquely placed to not only supply, but also support, this level of product."

Combining key benefits on a single chip, Tronics' Gypro3300 measures just 19.6 by 11.5 by 3.7mm, as well as being light weight and consuming minimal power. Providing angular rate measurement around the Z-axis, the Gypro3300 has an input range of 300°/sec with low noise.

Hermetically sealed, it is resistant to moisture, smoke, dust and dirt, making it suitable for various industries such as avionics, security, oil and gas and marine.

www.acalbfi.com



Stocking shunt resistors for tough environments

Rutronik can now supply Yageo's new PU series of low ohmic shunt resistors, designed for automotive, power system, telecommunication and alternative energy applications.

Adopting the welding metal plate method, the new PU series is AEC-Q200 qualified for automotive requirements. It has also passed MIL-STD-202 to withstand above 1,000 times temperature cycling between -55 and 125°C and 1,000 hours high humidity. Other features include low resistance down to 0.2mohm, a tolerance of \pm one per cent and temperature coefficient of resistance as low as ± 75 ppm/°C, with a power rating from three to 10W.

www.rutronik.com



New introductions support wireless telecoms

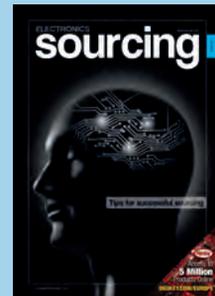
RS Components is expanding its Samtec range with the introduction of more than 190 additional devices, including RF and coaxial connectors that target wireless telecommunications applications.

Key product types being introduced include: high-speed and high-density Razor Beam self-mating systems, which are available in a variety of pitches and lead styles; high-density micro connector systems; and a range of RF connector products including PCB headers, MMCX connectors and coaxial cable assemblies.

www.rs-online.com

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EDITORIAL

Managing Editor: Jon Barrett
jonb@electronics-sourcing.co.uk
 Contributing Editor: Amy Barker
amyb@electronics-sourcing.co.uk
 Editorial & Production: Thomas Smart
thomas.smart@electronics-sourcing.co.uk

ADVERTISING

Area Sales Executive: Emma Poole
emma.poole@electronics-sourcing.co.uk
 Director of Sales: Charlotte Morgan
charlotte.morgan@electronics-sourcing.co.uk

CIRCULATION

Circulation Manager: Vicky Leary
vicky.leary@electronics-sourcing.co.uk
 Circulation Account Manager: Liz Poole
liz.poole@electronics-sourcing.co.uk

DESIGN

Graphic Designer: Jeremy Roberts
jeremy.roberts@electronics-sourcing.co.uk

PUBLISHER

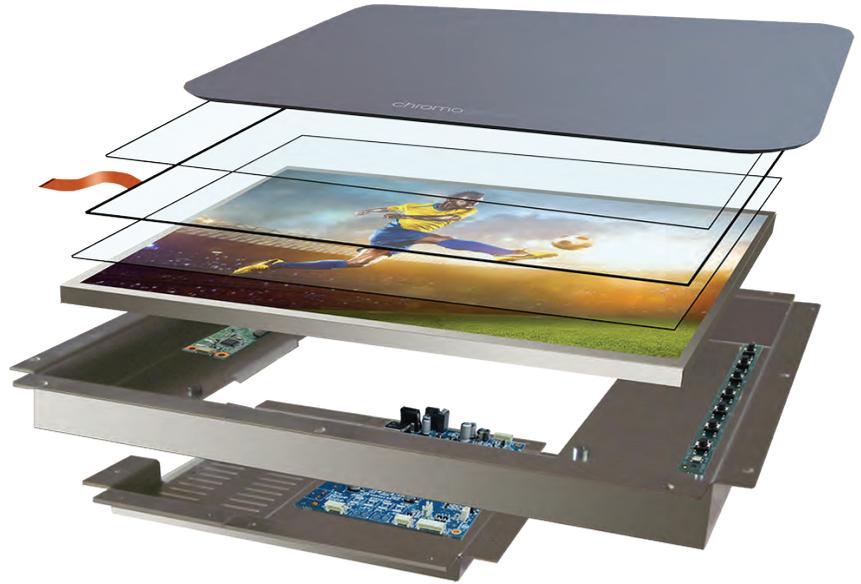
Mark Leary
mark.leary@electronics-sourcing.co.uk
 Office Manager: Denise Pattenden
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In addition to our supply chain services, cost-saving programs, and inventory solutions, **America II provides a wide range of franchise lines** for industries ranging from telecommunications, industrial and lighting to healthcare, automotive and military.



Choosing industrial displays with care

As communication links improve, the ability to source thin film transistor liquid crystal displays and touch screen products directly through Far Eastern sources has become easier; emails arrive daily offering deals that seem impossible to refuse.

Just as a sensible consumer would not buy a branded watch from a market stall, however, industrial TFT LCD purchasers would be unwise to follow these leads. In the same way that they would want to know their watch was genuine, rather than a production line reject, they will want their display to meet acceptable quality standards. There are many factors involved, including price, but it is important to consider the overall cost of ownership.

Focus on quality

During TFT manufacture, there are always quality levels in place. Anything that does not meet these standards, due to an unacceptable number of dead or bright pixels or dry joints, for example, will be classified at a lower quality level. These panels are not scrapped, but often sold cheaply or auctioned off into local Far Eastern markets for use in unbranded consumer products.

Unfortunately, Far East dealers will often source these at low prices and target the European markets where profits are higher. Sometimes even reputable display specialists source these lower grade displays at a commercially attractive price, but purchasers can only guarantee the source and quality when buying through an official distributor.

Continuity of supply

Major manufacturers will have hundreds of parts in their portfolio, but will only support a small fraction of industrial panels through distribution. This is due to the level of support required and the longevity of supply. A distribution partner will have direct dialogue

with the manufacturer, as well as access to roadmaps, and can direct the initial design to a stable product. Distributors can also pre-warn customers of any possible issues in delivery or potential end of life scenarios. Certain markets, including medical and military, have a stringent approval process and any changes can be expensive and time consuming, so continuity of supply is critical.

Look at lead times

Naturally, end manufacturers need to keep stock low, with short lead times also taking on major importance. To achieve this, it is critical to purchase through supply partners that can be flexible with stock holding. Some TFT LCD suppliers have notoriously long lead times, going out to 20 weeks. Unfortunately, these tend to be the suppliers who offer premium displays with the strongest continuity statements. It is therefore important that a chosen supplier has the financial ability, flexibility and spread of customers to support the brief.

Total support

TFT LCDs are normally just one part of a design. A good display specialist will therefore offer support products including touchscreens, cables and analogue-to-digital interface embedded boards. Services should also include optical bonding of touch screens in a clean room environment, bespoke touchscreen design and kitting.

Buying through the grey market can reward with some attractive 'front end' pricing, but it is important to look at the whole picture, including quality or support issues. Dealing with an authorised or franchised reseller ensures the best commercial pricing, as well as providing peace of mind for the future.

www.displaytechnology.co.uk

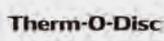
Sourcing displays direct from the Far East seems easier than ever, but as specialist distributor, Display Technology, points out, the associated risks have not diminished



A good display specialist will offer support products including touchscreens, cables and interface boards



Services could include optical bonding of touch screens in a clean room environment



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OLEDs meet growing portable demand

Diamond Electronics has announced availability of the latest Winstar small outline, passive matrix OLED displays. Four module sizes are offered, 0.49, 0.66, 0.71 and 0.84in, all with white or sky blue characters. Typical applications include wearable electronics, medical devices, handheld instrumentation and portable consumer goods including e-cigarettes, MP3 players, voice recorder pen and personal health monitors.

All products in the new range boast an ultra-thin, chip on glass format and are self-emitting, requiring no backlighting. In addition to being lightweight with low power consumption, they are said to feature wide viewing angles.
www.diamondelec.co.uk



Super bright display targets industrial equipment

GSR Technology is offering a new, super bright 15.6in high definition TFT-LCD from NLT with 1,500cd/m². The display utilises NLT's proprietary Super Fine TFT technology, offering wide viewing angles and high density, which are characteristics frequently required by the industrial equipment market.

Other key features include: an embedded display port interface, 1,920 by 1,080 resolution, contrast of 750:1 and an operating temp of -30 to 85°C.

A viewing angle of 88deg all round means the panel can be integrated in either portrait or landscape mode. The long-life LED backlight is said to provide excellent viewability even in high ambient light with more than five years' continuous usage. www.gsr-technology.co.uk



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Switch on for custom style

Schurter is launching a new series of Metal Line momentary and latching push button switches featuring capacitive touch sensor technology and a high quality-aesthetic appearance. Besides the standard offering, there are many visual and functional options available to meet individual electrical and mechanical requirements.

The new CPS family is available with 16, 19 and 22mm diameter housings, manufactured from high-grade stainless steel. Thanks to capacitive sensor technology, the switches have no moving parts, ensuring the CPS family is capable of an unlimited number of actuations. A finger guide on the actuator is said to enhance the user experience.



Customers can choose from a range of illumination options, including ring or area illumination in a single colour, bi-colour, or multicolour configuration. Besides red, green and blue, CPS switches also offers additive colours like cyan, magenta, yellow and white for custom colour variations.

CPS switches can be customised by choosing from a list of configuration options or employing customer specific adaptations. Many different applications are possible in sectors such as industrial automation, food processing, lab equipment, door and access control panels and white goods.

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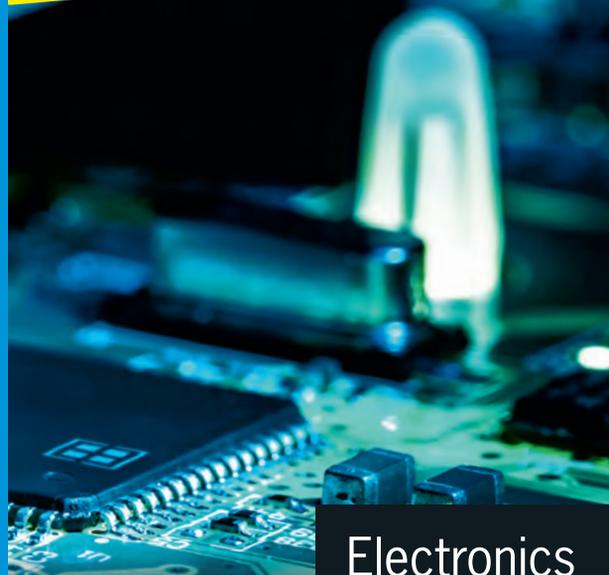
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Expect steady growth and modest price declines for power management integrated circuits

Portable electronics, Internet of Things and automotive will help drive the global power management chip market over the next four years *By James Carbone*

The power management integrated circuit (PMIC) market will post steady growth through 2020 driven in large part by portable electronics and Internet of Things, as well as the computer, automotive, industrial segments.

The global PMIC market totaled \$11.2 billion in 2016 and will grow to \$13.1 billion in 2020, according to Semico Research. While the market will post steady growth for the next several years, buyers can expect some price erosion.

PMIC average prices have been declining since 2011 when the average price was \$.28, the researcher said. Since then the price declined to \$.203, but will increase to \$.22 in 2017. After that, the average PMIC price will decline by about a half cent per year through 2020, said Semico.

Switching and linear regulators dominate the power management IC market. Switching regulators represent about 50 per cent of PMIC revenue. In 2016, 54 billion power management ICs shipped and 17 billion of them were switching regulators and 18 billion were linear regulators, the researcher said.

Other PMIC devices include voltage regulators, reference devices, frequency and control circuits and battery charging management ICs.

Battery operated portable devices will continue to be drivers of power

management ICs. Devices such as mobile phones and tablets “need small power solution sizes. These types of devices will always be favourable to PMICs,” said Andrew Goodson, product marketing engineer for integrated power management at Texas Instruments.

Portable applications are also driving power management capability and function because battery life and a small footprint are critical, said Mark Downing, senior vice president, for power solutions division at Intersil, a Renesas company

“Power hungry multi-core processors along with space constraints have resulted in significant innovation to create highly integrated power management ICs that are more efficient than ever before,” he said.

However, portable electronics are not the only driver of PMICs. “Maxim’s PMIC products are used in high power density applications in communications and datacenter, high efficiency low thermal dissipation in industrial applications, low quiescent current battery charging in consumer applications, and advanced driver assistance in automotive applications,” said Anil Telikepalli, executive director, industrial & healthcare for Maxim Integrated.

Besides portable electronics equipment, Internet of Things will grow as a driver of PMICs. “When we talk about Internet of Things



“Power hungry multi-core processors along with space constraints have resulted in a significant innovation to create highly integrated power management ICs that are more efficient than ever before,” said Mark Downing, senior vice president, for power solutions division at Intersil

we talk about everything that is connected to the Internet,” said Jim Feldhan, president of Semico. “That includes all the smart phone, computing applications, connected cars, televisions and set-top boxes,” he said.

Feldhan said the number of such devices connected to the Internet will grow from about 15 billion in 2016 to 36 billion by 2020 and those devices will need power management ICs.

“That’s a lot of electronics that need power and that power needs

to be turned on and off. Switching regulators and voltage regulators are needed for different parts of the system. There’s really no way to get around it,” said Feldhan.

Industrial IoT is also driving PMIC demand, said Goodson. “Industrial IoT devices like smart-home HUBs, video doorbells, smart thermostats, robotic vacuums are all directly impacting PMIC growth across industrial,” he said.

Downing added that industrial IoT is “where we are seeing the most growth in opportunities. Smart factories, smart cities and the advanced telemetry capabilities are increasing processing across devices, which has a corresponding impact on the power load, driving demand for integrated power devices,” he said.

He noted many of the “end points in industrial IoT” are battery powered. “Those batteries must provide a multi-year life, which magnifies the power challenge. These trends are all creating opportunities in the power management market,” said Downing.

In addition, IoT will also be used in nontraditional applications such as infrastructure. For instance, sensors are being put on bridges and pipes to detect leaks or faults in a structure.

“Those applications are pretty much battery operated so power management is critical. You don’t



Global PMIC market to hit \$13.1 billion by 2020: The healthy demand for power management ICs from multiple and customer segments will result in steady growth for the global PMIC market

Source: Semico Research

want to be out there replacing batteries every few years on thousands of sensors,” said Feldhan.

No shortages are likely

While demand for PMICs will continue to grow, there should be enough capacity. “I don’t anticipate that we will see any shortages,” said Feldhan. “It seems like there’s plenty of capacity at this point. A lot of these products are made on older 200mm fabs,” he noted. There are at least six major PMIC manufacturers, so there should also be competition for business, said Feldhan.

Automotive is another growing segment for power management ICs. Goodson said with the increase in electronics in vehicles, more complex processors are being used, mainly in infotainment and cluster systems. “These complex processors suit PMICs well because they require complex features like digital voltage scaling, complex power sequencing, and system-power integration. As cars integrate more electronics, there becomes increasingly more socket potential for PMICs,” said Goodson.

Features in traditional cars are also driving power management including infotainment, cruise control, electric steering, and automatic braking among others. “All those features require power management,” he said.

Downing added that automotive is the “most exciting growth

opportunity since mobile phones” because of the increase in content in vehicles. “There is an explosion of electronics both in the cabin and under the hood,” said Downing. Infotainment, networking, autonomous driving and hybrid/electric powered vehicles “all create demand for massive amounts of ICs,” he said.

“Electric cars obviously require a huge number of power



“Maxim’s PMIC products are used in high power density applications in communications and datacenter, high efficiency low thermal dissipation in industrial applications, low quiescent current battery charging in consumer applications, and advanced driver assistance in automotive applications,” said Anil Telikepalli, executive director, industrial & healthcare for Maxim Integrated

management ICs and so do hybrid cars, said Feldhan.

Electric vehicles and hybrids are creating demand for sophisticated multi-cell balancing battery management, according to Downing. “Battery management can mean the difference between a stalled car and another hour of drive time. Battery life is a major factor in the consumer’s purchase decision, so anything we can do to extend this life is very valuable for the car maker,” said Downing.

Another PMIC opportunity in automotive is the introduction of a 48V battery to provide power for the new applications being added to vehicles. Providing power management to support these advanced power architectures, “to link between the two power systems and safely manage very diverse power requirements is a key challenge for car makers that has opened up many new opportunities for our battery management technology,” said Downing.

Trends, challenges and opportunities

As PMICs are used in more applications, power management IC manufacturers are increasingly facing new challenges and opportunities. “Increasing expectations for long battery life in the face of changing battery chemistries, increasing portability to enable industrial IoT and changing processor architectures

impacting the servers that make up the data center” are some of the trends impacting the PMIC market, said Downing.

Telikepalli said other trends impacting the PMIC market include the push to smaller size products, greater integration and the need for greater power efficiency.

The move to micro sizes in consumer electronics and the use of “multiple robots in a single space in industrial automation means more stringent thermal and power dissipation requirements in ever shrinking equipment sizes, said Telikepalli.

He added that certain segments such as industrial data centers and consumer electronics require more low-power processing. “For wearables, we are looking for higher integration and extending battery life through maximising the efficiency and reducing the quiescent current,” said Telikepalli

Many companies are looking to reduce operating costs and reduce their carbon footprints, which is an opportunity for PMIC manufacturers. “With more and more intelligent electronics deployed in factories, cars, and the power grid to improve energy efficiency, power management opens the door to reducing operational expenditures and even boosting performance per watt, said Telikepalli.

By the numbers

\$11.1 billion

The size of the global power management integrated circuit market 2016

The average selling price for power management IC 2017

\$.22

50%

The percent of the power management IC market represented by switching regulators

The number of power management ICs shipped worldwide in 2016

54 billion

\$13.1 billion

The forecasted size of the global power management integrated circuit market in 2020

Creative sourcing keeps rail projects on track

One of the main difficulties in the rail industry is that component procurement typically centres on upgrades to existing systems, rather than new projects. The reason for this is simple: although the rail industry is keen to use the latest electronics to enhance passenger safety, comfort and convenience, it also has rolling stock with extremely long operational lifetimes. This longevity, combined with the heavy penalties imposed on rail operators for train breakdowns, places upgrades and refurbishments at the centre of the industry's procurement initiatives.

Ingenious solutions

The replacement of obsolete components with modern alternatives often demands an element of creativity within the procurement process. For example, one buyer first approached Charcroft when he was unable to find a drop-in replacement for some legacy circuit breakers that had non-standard fixings. The only option appeared to be significant and costly alterations to the metalwork of the distribution panels to accommodate the fixings of the replacement breakers.

Close liaison between Charcroft's franchised circuit-breaker manufacturer, Sensata, and a third-party fixings company, enabled Jeff to source adaptor plates for the new breakers. This allowed the new breaker to be fitted directly into the existing footprint of the legacy component and eliminated the need to re-configure the metalwork of the panel.

Customisation is key

Flexible thinking was also the answer when refurbishing a heating, ventilation and air conditioning system on a legacy carriage. The customer's buyer had spent considerable time searching for spares inventory, only to find that the manufacturer had withdrawn the thermostats some years earlier. Working with the buyer, Jeff engineered a Klixon thermostat to provide the same electrical, mechanical and thermal parameters as the legacy unit and ensure that it would be available on a short lead-time.

Getting tough

The demanding operating environment is another challenge faced daily by buyers in the rail industry.

One of Chris's customers, for example, had an issue with an open-frame DC/DC converter that was failing in service.

Chris suggested a more rugged supply from MTM Power, with vacuum encapsulation for protection against the extreme environment.

Customisation was used to add fixings which ensured that the standard 30W supply was a drop-in replacement for the legacy unit. These modifications also meant that the unit could quickly be swapped-out during the trains' regular service windows, without the need to pull vehicles from service. The fact that the converter was supplied with a low minimum order quantity also eased another common issue for rail-industry buyers.

Working on these, and many other rail-based projects, has shown that customisation, low minimum order quantities and ensuring that components are rugged enough to provide a long operational life, are keys to success in rail procurement.

Long operational lifetimes and extreme environments mean procurement in the rail industry can be tricky. Charcroft's Jeff Gurr and Chris Leek highlight some of the intriguing challenges they have faced



E-mech specialist, Charcroft, Jeff Gurr



Power specialist, Charcroft, Chris Leek

Intelligent Railway Travel with AAEON Boxer PCs

The AEV-6356/357VS Boxer PCs are primarily chosen for their media playing, monitoring, communication and video surveillance capabilities. These EN50155T compliant products help train crews to monitor different operating parameters of the train such as cabin temperature, door statuses and surveillance, as well communicate with external networks. Take a look at even more exciting features of these PCs.

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Rugged systems withstand life on the rails

Electronic systems used in railway environments need to withstand vibration, temperature variation and harsh weather conditions. Train crews rely on them to monitor parameters such as cabin temperature, door status and surveillance, as well as communicating with external networks. To further complicate matters, nowadays, passengers also expect technologies such as Wi-Fi and infotainment systems across the network.

Embedded computing

Various solutions are available from Review Display Systems including one for system monitoring and video playback. The Boxer 6357VS is an EN50155T compliant embedded computer system designed for modern train systems.

Based around a Core i7 processor, this powerhouse system features isolated RS-232/422/485 ports, isolated digital inputs and outputs, as well as Wi-Fi, 4G and GPS. It can handle a range of input voltages from 12 to 36V or 16.5 to 75V and features rugged M12 connectors. Operating over a temperature range of -40 to 70°C, it can withstand up to 80°C for 10 minutes. As well as system monitoring and video playback, this solution also has tracking and communication capabilities.

Another embedded computer option is the Boxer AEV 6356, specifically designed for public transportation systems. Here anti-vibration and anti-shock protection are a necessity, along with reliable high performance and long life operation.

This unit supports up to 8Gb DDR3 SODIMM memory and for storage, two SATA 3.0Gb/s hard disk drive bays and one CFast slot. It boasts

low power consumption and an operating temperature range from -40 to 70°C. A DC input range from 17 to 30V also helps meet railway demands. This system is said to be ideal for monitoring and control purposes and is fully compliant with the EN50155 Tx standard.

One system to offer flexible configuration is the Aaeon PC. This system aims to make complex wiring a thing of the past, as all the devices are linked with connections that conform to TCP/IP protocols. TCP/IP protocols also allow the use of Aaeon's remote display technology; configurations intended for multiple devices of a single type installed in various parts of the train can be changed universally at the PC controller.

Rugged displays

Just like embedded computing systems, displays must also withstand the rugged railway environment. Drivers rely on them for up-to-date information, while ticketing systems and passenger information units all need to present reliable information. Displays therefore need to cope with 24-hour operation and a wide operating temperature range, while also providing optimum readability. Industrial displays such as the EN-5-155 compliant A1904 19in screen can provide a solution. This model supports 1,280 by 1,024 resolution at 600cdm² with an 89deg viewing angle, making it ideal for this type of environment.

www.review-displays.co.uk

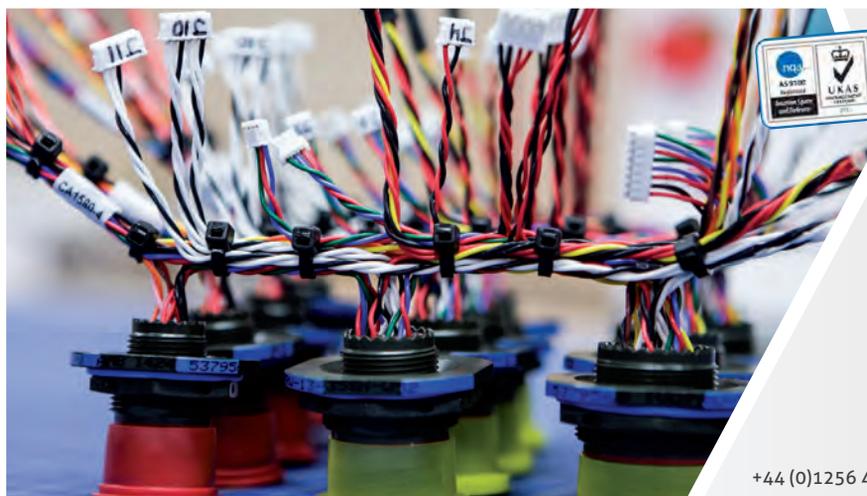
It's a hard life for electronics used in the rail environment; extreme vibration and harsh weather necessitate a rugged approach, while passengers demand increased on-board connectivity. Review Display Systems offers various solutions



The Boxer 6357VS is an embedded computer system designed for modern train systems



The Boxer AEV 6356 is specifically designed for public transportation systems



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Life on both sides of the track

It is widely recognised that the rail industry has been underfunded for many years. This, coupled with passenger numbers doubling over the last 20 years and forecasts for them to double again in the next 30, means a serious upturn is required in rail infrastructure capacity. Expansion needs to be rapid, yet fast-paced growth is at odds with historic experience in this vertical market, which is generally regarded as a technology follower, not a leader.

The CEM perspective

From a contract electronics manufacturer's perspective, working with the rail industry is both interesting and challenging, commercially rewarding and risky. Initially it can be difficult as there are several layers of operators and stakeholders involved in any given project. While Texcel has worked directly with Network Rail on power product design approvals, often it has worked in a supply chain with two or three parties between Texcel and the end customer. Here, effective communication throughout the chain is critical or projects can go off course.

Project timescales in the rail industry can be long. CEMs need to supply products that are robust, fully tested and compliant with all the relevant industry and safety standards. Once this has been achieved, often the original

equipment manufacturer will subject the product to internal 'usability' standards and this testing can take months. There is also a degree of risk. Sometimes, Texcel has worked on projects involving considerable design and prototyping, only to find the project is mothballed or cancelled.

Speed of innovation is another important factor. Some projects are borne out of the need to remedy a problem or troubleshoot safety issues with existing infrastructure. In other cases, it is only when products and technologies become obsolete that the rail industry is forced to consider new designs. Historically the industry dislikes change and once products have been approved, they will last the technology lifetime. Texcel had experience of that with synchronous digital hierarchy systems. This is a legacy signalling system but the communications protocol had become redundant. Innovative involvement allowed Texcel to supply SDH to IP 'protocol converters', saving cost and extending the operating life of equipment.

In fact, Texcel has several rail industry projects that are currently 'in progress,' but it is difficult to forecast when they will go into full production. This makes planning and provisioning unpredictable. With rail industry products featuring extended lifecycles, having

The rail industry is both challenging and rewarding. Commercial director of Texcel Technology, Peter Shawyer, looks at what this means for CEMs and OEMs that want to go far in this sector



Commercial director of Texcel Technology, Peter Shawyer

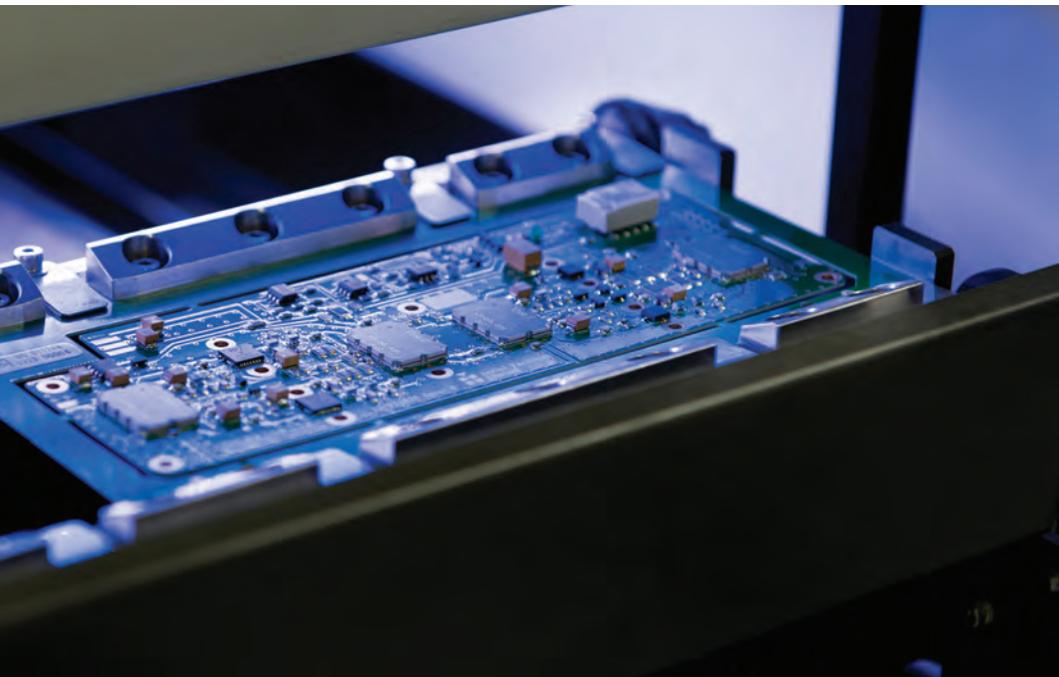
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Project timescales in the rail industry can be long

processes and plans in place to deal with component obsolescence is also vital.

Ultimately, once a CEM has successfully negotiated this vertical market and established itself as a reliable supplier, the prospects of additional project opportunities are high, however these projects may have one or more of the quirks discussed. Although the rail industry can be lucrative, there is risk involved, and it makes sense to have a portfolio of customers that operate in different verticals, as this helps to balance the risk.

The OEM perspective

Just as it affects CEMs, the nature of the rail industry will also influence the OEM when evaluating design, production and subcontract partners. Most OEMs will be looking for CEMs with which they can build long term partnerships. This will help build up knowledge and experience of designing products for this market. While rail industry experience is not essential, a CEM with existing experience of the industry is an advantage.

Financial stability is also an important selection criteria. Extended design and product lifecycles involve up-front investment and risk, which a financially stable CEM is better positioned to provide.

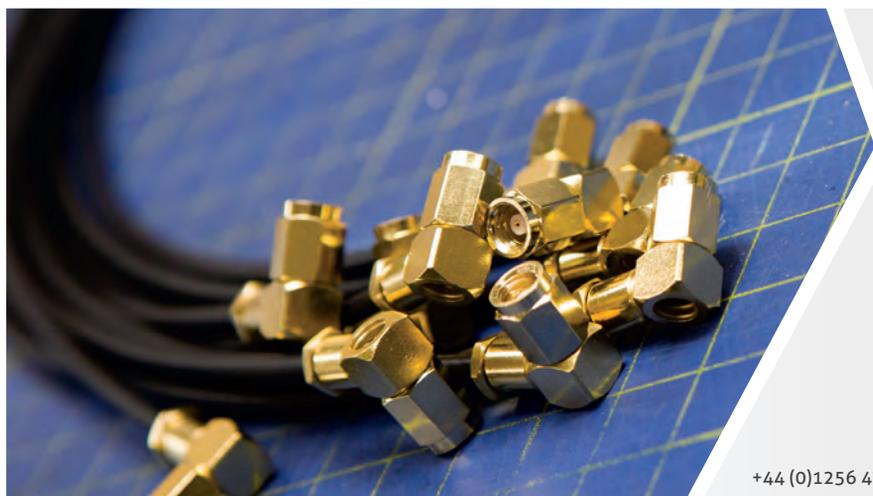
Any CEM keen to operate in this sector needs to demonstrate robust project management skills and processes, particularly when multiple parties are involved in design and manufacture. Clear lines of communication and documentation are essential. OEMs will also be looking for CEMs that have a proven track record of product and component obsolescence management, with the ability to design in alternative components. Naturally, OEMs will therefore seek out CEMs that have significant engineering resource and a history of innovative and agile design capability.

Overall, it seems the rail industry is entering an exciting and challenging phase with significant growth potential for the electronics industry. It has some traits which are different to other vertical markets and it is not without risks, but the right 'fit' of OEM and CEM can make for a long term lucrative partnership for both sides.

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The rail industry is entering an exciting and challenging phase



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As a trusted supplier partner to the rail industry, Telegärtner UK offers a host of products that meet rigorous environmental demands in this sector

With its focus firmly on high quality electro-mechanical connectivity, Telegärtner UK supplies into a number of demanding industries, including the rail sector. To support these exacting industries, the company supplies its own Telegärtner RF and Datavoice components, as well as representing various German manufacturers of connectors, cables and speech communication products.

Complementing this line-up, Telegärtner UK also provides cable assembly services with capabilities across flexible, conformable and semi-rigid coaxial assemblies. The company also provide multiwire, panel and overmoulded assemblies and wiring looms from its purpose-built production facilities in UK and Slovakia. All production staff work to IPC620A and the company is ISO 9001 and ISO 14001 certified. Further services include vendor managed inventory, supplier management, kitting and testing.

With this offering, Telegärtner is well positioned to support the varied demands of rail industry customers, as well as offering vendor reduction and effective supply chain management.

During Railtex, in May, Telegärtner UK will present a selection of products designed for rail industry applications including Pei Tel's IP68 waterproof hand-held rugged microphone, ideal for use by train conductors. Other highlights include Hummel's IP68/IP69k V0 HSK-K cable glands, approved by rail sector end-users such as Alstom and Provertha's IP67 M12 90deg connector with crimp flange technology, which provides 360deg electromagnetic and radio frequency interference shielding and torsion proof strain relief. Finally, Telegärtner's M12x1 X-coded connection cords meet increased requirements for fire protection in rail vehicles, making them ideal for networking passenger information systems.

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Score a networking goal

As a reader of *Electronics Sourcing* magazine, it's a pretty safe bet that you have a keen professional and personal interest in keeping abreast of developments in the UK and international electronic components markets. There's no better way to do this than by attending the next ECSN annual industry event, to be held in Brighton on 25 May 2017. There you can meet and interact with over two hundred industry friends, suppliers, customers and colleagues in an informal social environment.

The day kicks off with the electronic components industry five-a-side football tournament, sponsored by *Electronics Sourcing* magazine. Held at the Sussex Football Association headquarters in Lancing, West Sussex, the event will be organised on the day by football's Guy Butters, who boasts over 600 professional games for Tottenham, Portsmouth, Gillingham and Brighton and Hove Albion. He will be joined by Kerry Mayo, who has played over 400 professional games for Brighton and Hove Albion, and several other professional coaches.

Anyone in the electronic components industry can participate and although the event is competitive, the focus is on team building and having fun. Entries are invited from company teams or individuals who'd like to be placed within a team. A great time is guaranteed, whether you are playing or spectating. For further information, please send an email to sales@electronics-sourcing.com

In the afternoon, events move to a Brighton seafront hotel to recover before the evening programme begins at 18:00. ECSN's market

analyst, Aubrey Dunford, will present a global electronic components market overview with an interactive presentation examining the latest UK and Ireland market data. He will discuss trends in the domestic markets, as well as in Europe, North America and Asia, to complete the international view.

The electronic components industry panel discussion starts at 19:00. Editor of *Electronics Sourcing*, Jon Barrett, will moderate this panel line up of interesting senior industry folk. Always popular, these sessions provide an opportunity for audience discussion with the panel and attendees encouraged to participate, ask questions or pose alternative opinions.

Moving swiftly past the bar, dinner will be at 20:00, after which an auction of football memorabilia will be hosted by Guy Butters, with proceeds going to the charity Albion in the Community.

This year sees chairman and chief executive officer of PEI Genesis, Steven Fisher, as keynote speaker. Flying in from the US, Steven has a great deal of practical experience to share, gained as a leader and manager in the industry since he joined PEI Genesis in 1973. His presentation is sure to be interesting, thought provoking and amusing in equal measure.

Kindly sponsored by Gelec, the ECSN annual industry event looks to be a winning fixture. Readers who would like to participate in the full day or in the evening only, should email Jill Waite at enquiries@ecsn-uk.org.

www.ecsn-uk.org

Keep up to speed with the industry by attending the Electronic Components Supply Network's annual event in Brighton this May. Meet colleagues, suppliers and customers for discussion, dinner and even a friendly game of football

More than tough

Mother Nature is brutal, uncompromising and unforgiving. Electronics designers are under no illusions about this so they specify the toughest enclosures they can find, but are they the right kind of tough? IP ratings are an obvious starting point for most designers but ingress protection is merely one aspect of the challenge; it is not a panacea. Smart design is also vital.

Smart design

There is no point, for example, in specifying an enclosure with a waterproof seal if an engineer installing it during bad weather has to remove the lid to screw the box in place. 'Lid closed' installation is therefore a key design feature for many heavy-duty cases manufactured by Rolec, a company which has focused on enclosure design for over 35 years.

During this time, electronics enclosures specialist, Rolec, has brought many innovations to the conservative world of 

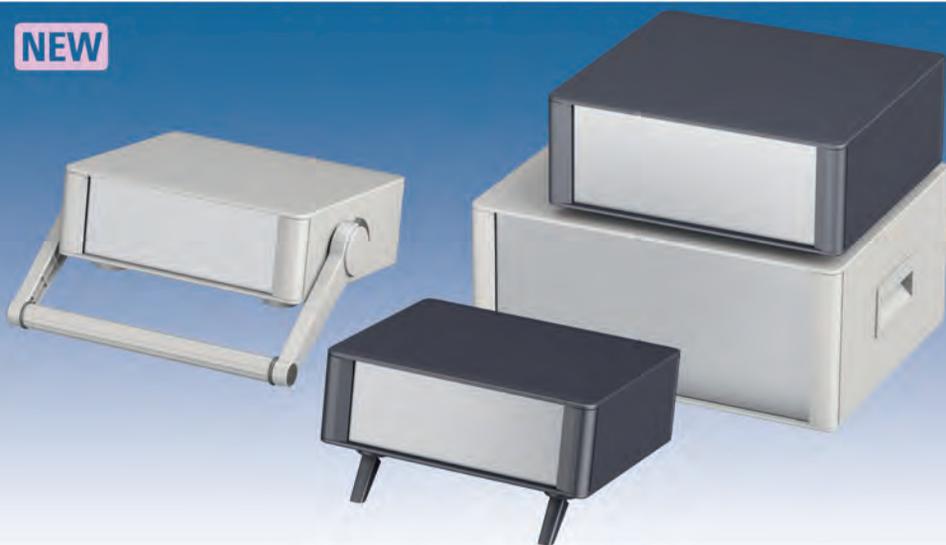
Industrial electronics enclosures need to be tough, but ingress protection is only one part of the equation says enclosures specialist, Rolec. Enclosures also need to be smart



Lid closed installation protects electronics

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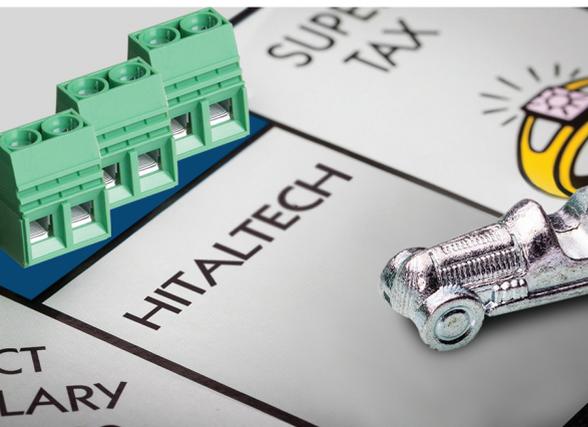


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multiPANEL enclosures can be mounted on a suspension arm for easy manoeuvring

industrial electronics PCB cases. The company's 'go anywhere' aluCASE, available in IP 66, 67 and 69k ratings, was a new concept in diecast aluminium enclosures when it was launched. Its enduring popularity is confirmed by the fact that it's now available in 29 sizes.

Other innovations that brought a breath of fresh air include: recessed lids for keypads or labels; fixing screws hidden under clip-on trims; lid retaining straps; integrated hinges; optional key lock; and an emphasis on smart, modern appearance.

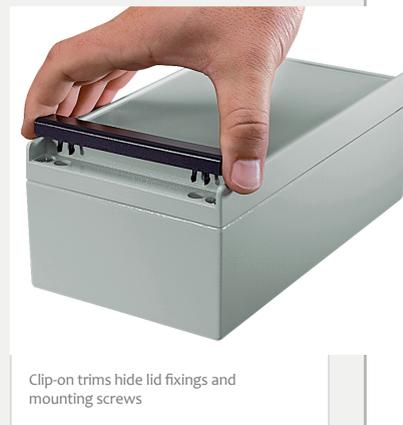
No surprise then that designers wanted the benefits of aluCASE in traditional industry-standard sizes. Rolec obliged with the aluPLUS IP 66/67 and suddenly industrial electronic enclosures no longer had to look prosaic. They could be both tough and aesthetically pleasing, but until recently, there was one thing they were not — round.

Standard aluminium enclosures are traditionally rectangular, not least because of the difficulties in fitting cable glands to a curved wall. Rolec's solution was the aluDISC IP 66/67/69k, which draws inspiration from the shape of a wristwatch. Cable glands and controls can be fitted to the two flat sides, but the 'round' aesthetics make aluDISC suitable for applications where curves matter, such as pipework.

Like the aluCASE, aluDISC also features lid-closed installation, lid support and screw hinges plus an optional IP 65 transparent cover for display applications.

Tough materials

Aluminium is the common factor in all these enclosures. It is often the first choice when it comes to enclosure materials, but it is not the only one. Stainless steel, A2 or A4, offers significant impact protection, while its resistance to corrosion can be further enhanced by electropolishing. Laser-cutting and laser-engraving speed up the customisation process. >



Clip-on trims hide lid fixings and mounting screws



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Where corrosion is a serious issue, polycarbonate provides an alternative as it too boasts major toughness. Enclosures at risk from chemical attack are best moulded from polyester, while Luran offers great UV stability for enclosures destined for use outdoors.

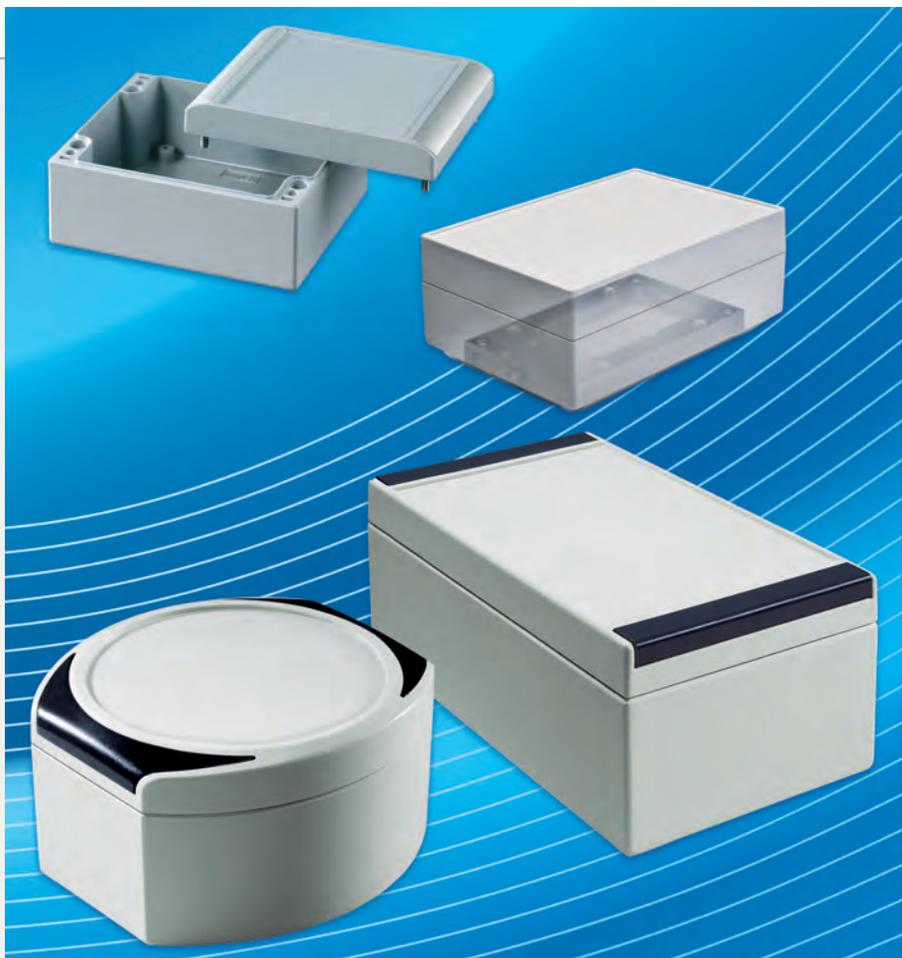
One such enclosure is Rolec's new technoPLUS range, an IP 66/67 rated housing purpose-built for pole-mounted electronics. Mast attachments enable rapid installation at height with plastic or metal straps, while clever design means the enclosure can be mounted vertically or horizontally. Because technoPLUS is designed to be installed at height, installation is 'lid closed,' but if it must be opened, retaining straps and captive lid fixing screws prevent items from being dropped and lost.

Ergonomics is another key factor that can be under-prioritised by designers specifying heavy duty enclosures. In the past metal enclosures tended to be overlooked, simply because so many were bolted to walls, machines and bulkheads, rather than being handheld like many of their plastic counterparts, but that should not preclude ergonomics from being an important part of their design.

Nor should it be forgotten that handheld enclosures made from diecast or extruded metal should be as comfortable to grip as plastic cases, if not more so, because they will weigh more.

Easy handling

In situations where easy handling is a key priority, Rolec's multiPANEL enclosure range can be mounted on a suspension arm with an ergonomic grab handle to make manoeuvring the screen easier. Enclosures are manufactured from extruded aluminium with silver anodised front plates, manufactured in three depths, and designed to fit the profiPLUS modular



suspension arm system, which features time-saving 'one screw adjustment.'

Multiple cables, such as HDMI, DVI and network cables, can be routed inside the arms, with cable protectors integrated into all rotating system elements.

As these designs illustrate, smart design is the key to installing enclosures in harsh environments where tough specifications are not always enough.

www.rolec-enclosures.co.uk

A variety of industrial electronic enclosures are available, including the round aluDISC



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Vibration sensor provides multi-axis measurement

Manufacturer of industrial accelerometers, Hansford Sensors, has launched a new high performance triaxial vibration sensor, capable of providing simultaneous measurement in three axes. The HS-173R has been developed specifically for use with route-based and stand-alone data collectors, which increasingly require multi-channel inputs from a range of permanently or temporarily mounted sensors.

Based on an electromechanically coupled piezo-electric sensor mechanism, the HS-173R is protected in a robust stainless steel capsule. It is said to provide a reliable, compact and lightweight device, capable of providing repeatable measurements, with excellent frequency response and a settling time of 1.0 seconds.

The HS-173R has an AC output via a standard M12 connector, is sealed to IP67 and can be used in a range of applications between -55 and 130°C. www.hansfordsensors.com



Table-top enclosures feature tough good looks

OKW's new Evotec table-top plastic enclosures are designed for tough working environments. Applications include measurement and control engineering, IT, medical, laboratory and environmental technology. For access control applications, Evotec can also be wall mounted.

Moulded from ASA+PC-FR for enhanced UV stability, these soft contour enclosures can be specified with a sealing kit for IP65 protection.

There are three variants: Version I has a flat top with a large operating area for switches, push buttons and touch displays. Version II features a smooth sloping top for desktop applications. Version III also has a sloping top but is recessed to accommodate a membrane keypad or product label. All three versions feature PCB screw pillars in the top and base, rubber feet for stable positioning and Torx assembly screws to prevent tampering. www.okw.co.uk



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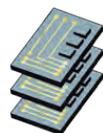




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Best of British

Buying British is back in fashion

A wonderful thing is happening in the UK electronic component manufacturing sector. People are buying British again. What is causing this phenomenon? Patriotism, marketing, government policy, green considerations, transport costs, communication issues or long delivery lead times?

No, it's price; UK buyers are purchasing UK products based on price. Electro-mechanical component manufacturers like Intelliconnect are reporting increased UK sales values of up to 50 per cent since the middle of 2016 and significant uplifts in export revenues.

The reason for this, of course, is primarily the weak pound, which, although it has rallied a little recently, is increasing the cost of some imported products by up to 30 per cent and decreasing the cost of UK goods to foreign buyers by up to 30 per cent.

This is not, however, the only reason UK manufacturers are becoming more competitive. Productivity is improving rapidly and volumes are increasing, with UK manufacturers more willing to trim their margins to win business. The total acquisition cost of purchasing locally is also being driven down by supply chain excellence initiatives such as SC21 in the defence and aerospace markets and supply chain excellence awards across all sectors.

The downside is that while UK buyers are more willing to buy British, they may struggle to find a British manufacturer for their requirement. Fortunately, no such issues exist in the radio frequency connector, adapter and cable assembly area. Here Intelliconnect provides a one stop shop for all interconnect needs, providing a competitive platform for UK manufactured and low cost components.

www.intelliconnect.co.uk

Managing director of Intelliconnect, Roy Phillips, explains how buyers are once again turning to UK component manufacturers



Intelliconnect provides a one stop shop for all RF interconnect needs

Display helps products stand out

With their dark background, usually featuring a backlight, PMVA displays boast a very high contrast ratio. The combination of this high contrast with a wide operating temperature range has made PMVA a popular choice in the automotive and white goods markets.

GTK's high duty PMVA display, for example, is ideal for applications such as utility monitors and industrial controls, where a 1/64 duty ratio can provide higher resolutions and help customers' products stand out against the competition. Not only this, customers can also design large-format displays while avoiding complex PCB designs, as fewer display controllers are needed.

Displays are customised to meet specific requirements and can be configured as segment only, graphic only or a combination of both. Entry level displays utilise white content on a dark background, but colours can be added using an LED backlight array or via silk screen printing for fixed colour content.

Business manager for optoelectronics at GTK, Clive Dickinson, said: "We are seeing an increase in the use of PMVA technology for several reasons. It has good all round performance at an affordable unit price and is a step up from monochrome technology. PMVA technology also has a relatively simple interface, speeding up product development. We are working on a variety of projects using this technology for different applications, clearly demonstrating its versatility."

www.gtk.co.uk

Performance, adaptability and a relatively simple interface, are making passive matrix vertical alignment displays a cost-effective alternative to thin film transistor products



PMVA is a popular choice in the automotive and white goods markets



Business manager for optoelectronics at GTK, Clive Dickinson

Waterproof connectors simplify assembly

CamdenBoss has launched a new range of IP68 waterproof connectors featuring one-piece construction to reduce the possibility of incorrect assembly. Ideal for all field installation applications, heavy duty CPWP3 connectors feature an integrated terminal block to ensure no small parts are dropped. This makes them ideal for joining cable in the field where losing parts can create difficulties. One-piece construction ensures ease of installation with colour-coded terminals for easy wiring and Braille points for identification of connections in low light conditions.

Three models are available: a T connector, an in-line connector and a three-pole panel mount connector. Specifications include voltage and current ratings of 250V 16A, contact resistance of 10mohm, insulation resistance of 500Mohm at 500V DC and a temperature rating from -40 to 105°C. www.camdenboss.com



Collaboration lights up latching relay design

When low energy lighting specialist, Helvar, needed a customised enclosure for its latest relay unit, it turned to Hitaltech to provide a solution.

The process began by bringing both company's engineers together to explore options. Helvar needed a low-profile housing as a traditional DIN rail mounting would have restricted user access. The company had already attempted to squeeze the relays into a suitable enclosure, but they needed them to protrude through the housing.

Hitaltech managing director, Andy Fitzer, explained: "We chose our Modulbox Compact, but by modifying it and machining custom cut-outs, we were able to provide access to the actuators."

Hitaltech supplied the green terminal blocks and printed and machined the enclosure using plastics that meet UL94V0 fire regulations. Helvar asked Hitaltech to mould the terminal guard in translucent red so it could be used as an LED display. This allows Helvar to place a seven-segment LED display beneath it.

Other key features are the wiring legends and logo, printed directly onto the enclosure. Traditionally, Helvar had used overlays to identify the terminals on its products. This would have been difficult on an enclosure with cut-outs, so the ability to digitally print the enclosures directly saved time and labour.

Mechanical and PCB designer at Helvar, Mark Holmes, said: "Early-stage collaboration meant design took just seven months." www.hitaltech.co.uk

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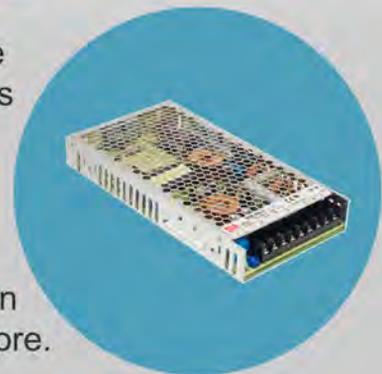
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Low current clock offers high accuracy timing

Mercury Electronics Europe has announced a new range of temperature compensated crystal oscillators designed for high accuracy timing in a range of applications. The new ME32T series offers 15pF CMOS output at a frequency of 32.768kHz with a maximum frequency stability of ± 5 ppm over the industrial temperature range of -40 to 85°C.

Typical current consumption of 1.5 μ A makes the ME32T suitable for use in battery-powered devices while its 3.28 by 2.15 by 1.3mm ceramic SMD package is ideal for microminiature and embedded applications.

Further benefits of this low current clock are said to include a proprietary temperature compensation technique applied to the built-in 32.768kHz tuning fork crystal and temperature sensor to deliver timekeeping accuracy of ± 2.62 minutes/year. Applications include frequency reference for real time clocks, portable instruments, smart metering, data loggers, GPS transceivers, telematics and timing synchronisation for networks, hubs, routers and switches. www.mecxtal-europe.com

Innovation lights up a classic design

Schurter has improved on a classic product with its new 6600-5 series IEC outlets, now available with integrated light pipes. This space-saving solution for power distribution units can be used in data centres and other multi-distributed power applications.

Data centres continually appear in new applications, with demand for reliable transmission and increased speed, plus constant pressure to improve efficiency and reliability, driven by regulatory requirements. At the heart of this demand is a reliable power supply and at the heart of that, a simple connector. Schurter's IEC outlets with integrated light pipes bring

an improved solution to intelligent power distribution.

The high packing density of servers in modern data centres means space is at a premium when it comes to power distribution units. Schurter's integrated light pipes are said to provide space and assembly cost savings over conventional strip designs. Service technicians can see which systems are working and respond quickly to required maintenance requirements. LEDs can be independently triggered so each state can be clearly represented. An outlet could, for example, signal an outage with a red LED, or a critical power consumption pattern with a yellow LED.



New 6600-5 series IEC outlets feature integrated light pipes

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UK expert gains IPC President's Award



Long-time IPC volunteer, Debbie Wade, of Advanced Rework Technology, was presented with an IPC President's Award at IPC Apex Expo 2017

This year, Apex Expo saw the IPC President's Award go to UK IPC volunteer, Debbie Wade of Advanced Rework Technology

Recognising her significant contribution of time, talent and ongoing leadership in IPC and the electronics industry, IPC volunteer, Debbie Wade, of Advanced Rework Technology, was presented with an IPC President's Award at IPC Apex Expo 2017.

Debbie was recognised for her contributions to IPC standards, training committees and training and certification programs, which she has worked on for nearly 15 years. She is, in fact, a master IPC trainer for J-STD-001 and J-STD-001SP, IPC-A-600, IPC-A-610, IPC-A-620 and IPC-7711/21.

When not leading classroom training and certification, Debbie has lent her expertise in fabrication, assembly, board process and acceptance to 33 IPC technical committees. She sits at the helm of six of those, including European technical training committees for J-STD-001, IPC-A-600, IPC-A-610 and IPC-A-620.

IPC president and chief executive officer, John Mitchell, said: "IPC and the entire electronics industry are fortunate to have Debbie volunteer her time and expertise. Her work has enriched both the industry and IPC and we are thankful for her dedication and hard work."

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Who They Are

Olson Electronics are a manufacturer of standard, specialised and bespoke power distribution units, interconnecting cables and other power distribution accessories. Founded in 1961, Olson design and manufacture all of their products at their dedicated head office and manufacturing facility located in Greater London, UK. Their product range is one of the most comprehensive on the market and if they don't have a standard product solution for their customer, they can custom build one to suit their specific requirements, with a quick design, manufacture and delivery time, without compromising quality.

The History

1961

Olson Electronics Limited was founded and has remained a family run enterprise ever since. Originally producing components for radios, Olson quickly moved towards manufacturing instrument cases for the communications industry.

1971

Olson's first PDU was designed for their own use at an exhibition. This innovation received orders due to its high build quality and saw the launch of standard UK 13 Amp power distribution units. Production expanded and new premises were found in Shoreditch, East London.

1986

Following market growth, Olson's main focus became manufacturing power distribution units, which prompted another move to larger premises in Tottenham, North London. The communications industry was evolving and the 19" rack range for data cabinets was developed.

1990

With the success and popularity of their 13A ranges, Olson launched a new international range to meet demand outside of the UK. Exports of both standard and rack mounting options soon increased Olson's turnover.

1998

1998 saw the move to the new head office in Stanmore where we are still based. This gave improved manufacturing facilities, (incorporating R&D) as well as sales and marketing alongside manufacturing. This allowed Olson to grow our bespoke service and shorten response times for design and manufacture.

2001

The launch of data centre range, incorporating cable management to 19" rack mounting PDUs for the very first time. This quickly grew in popularity within the industry and the range has continued to expand. A patent was applied for 'sequential start' which was then approved in 2006. This allows multi-power installations to have fast and secure start up sequences, avoiding potentially damaging surges.

2017

Today Olson offer over 30 different standard catalogue product ranges catering for all types of applications. Despite their vast range of products, options and specifications are never ending, the bespoke market growing is integral to the business and the relationship with their customers.



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There's more to supplier performance than product quality

When it comes to evaluating suppliers, it is not just about quality, delivery and cost anymore.

While those three criteria are central to most supplier evaluation programs in the electronics industry, more companies are also factoring in other criteria such as responsiveness, total cost of doing business with a supplier rather than just unit price, corporate social and environmental responsibility and technology development.

For instance, suppliers of computer manufacturer Lenovo aren't just rated on cost quality and delivery. They are also scored on technology, service and sustainability, including how they manage water and waste. David Martin, manager, strategy & operations global operations, said suppliers are evaluated annually and the company meets with its top-tier suppliers semi-annually.

"We also implemented the Electronics Industry Citizenship Coalition (EICC) Code of Conduct with our suppliers to ensure timely self-assessment" and independent third party EICC audits of suppliers concerning treatment of workers and ethics issues, he said. The Code of Conduct is a set of standards to ensure that working conditions at an electronics company are safe and that workers are treated with respect and dignity, and that business operations are environmentally responsible and conducted ethically.

Martin said Lenovo generally awards business based on overall acquisition cost, which includes the cost of parts, as well as manufacturing, delivery, logistics, warranty, and manufacturing costs and on-time delivery.

Of course, product quality is also measured. Martin said Lenovo measures several quality parameters including first past yield (out of box testing in key supplier outsourced manufacturing), incoming quality for parts, field reliability and repair actions at PPM levels. He

said across those parameters, Lenovo measures to ensure issues are resolved quickly because prevention of a quality defect in manufacturing costs less than fixing it in the field.

"Delivery is a key measurable in our supplier evaluation," said Martin. "Generally, most of our supplier volume is on pull replenishment, so we track towards hub levels and day-of-supply metrics," he said.

Evaluation evolution

For many electronics OEMs and electronics manufacturing services (EMS) providers, supplier evaluation and scorecards have evolved over the years.

Stewart Partridge, vice president supply chain and process improvement for TT Electronics, based in Woking, England, said in the past his company would measure a supplier's performance based on parts per million defect levels of the components the supplier manufactured and purchase price variance 

When electronics companies evaluate supplier performance, they also take a close look at total cost of ownership of purchasing from a supplier, how well a supplier responds to requests, and if the supplier provides flexibility in payment terms and order quantities

By James Carbone

"We have scorecards where we weigh quality, cost and delivery, but also weigh other factors like a supplier's ability to deliver smaller order quantities, Stewart Partridge, vice president supply chain and process improvement for TT Electronics



(PPV). If a supplier provided a lower price for a part than other suppliers, the supplier with the lower price would be ranked higher.

TT manufactures components and provides integrated manufacturing services to defense and aerospace, industrial and rail OEMs.

"In the past, we never really looked at the total cost of ownership performance," said Partridge. Now we have scorecards where we weigh quality, cost and delivery, but also weigh other factors like a supplier's ability to deliver smaller order quantities" and provide flexible payment terms.

Partridge said TT annually evaluates more than 400 suppliers that represent 80 per cent of the company's production spend. "We have 24 manufacturing locations around the world and they all measure quality, cost and delivery in exactly the same way," said Partridge.

Supplier performance data is stored on a web-based spend analytics tool where TT buyers can view supplier performance, quality, cost and delivery. "Then we can compare vendors and make decisions based on scorecards," he said.

Emphasis on TCO

He said while TT evaluates suppliers on traditional criteria of quality and delivery cost, it is also looking at total cost of ownership in doing business with suppliers and how well suppliers respond to issues and TT requests. With quality, suppliers are measured on how well they meet the PPM targets that TT set for them. With delivery, suppliers are evaluated on how well they meet TT's zero days late, three days early delivery window. Cost refers to the price that suppliers charge TT for components.

With total cost "we look at the landed cost of the part. We try to make sure that freight, tax, duty, transaction fees, and payment terms are all in a spreadsheet," said Partridge. He said from the data TT can determine which supplier has the lowest total cost versus the lowest unit price.

Total cost of ownership can be impacted by supplier responsiveness, or the lack of it. So can TT's ability to get a product to market in a timely fashion, which is important for TT to compete in the marketplace.

"You don't just compete on quality and price. You compete on responsiveness as well," he said. Responsiveness is related to total cost. For instance, many suppliers have minimum order quantities (MOQ), which can have an impact on total cost. If an OEM needs to purchase 100 parts from a supplier, but the supplier has an MOQ of 1,000, it means the OEM customer has to hold inventory, resulting in a higher cost of ownership in doing business with a supplier.

"So now we want smaller MOQs, smaller batches, smaller purchases, smaller deliveries," said Partridge. "We don't want to hold loads of inventory" and be burdened by the cost of it, he said. So TT may request small MOQs and factor in responses of the supplier when calculating supplier performance.

Suppliers may also be asked for flexible payment terms rather than being paid 30 days or for a discount if TT pays in less than 30 days.

"I think responsiveness, order quantities, inventory holding, cash holding and payment terms are all in the forefront of supplier selection and working with suppliers and all this goes to total cost of ownership," said Partridge.

TT also evaluates the financial viability of a supplier and the risk of placing too much business with a vendor. That puts the supplier into a risk category because then the supplier is dependent on us.

"We don't want to get to 25 per cent of a supplier's revenue," he said. That puts the supplier into a risk category because they are dependent on us. If there's a downturn, they may go out of business" and would not be available to supply components to TT in the future, said Partridge. "We don't need that risk."

Examining supplier service

Other companies are also looking more closely at total cost and supplier responsiveness to requests, problems and issues. At EMS provider Kimball Electronics, based in Jasper, Ind., "service" is a key criterion that is measured, said Paul Grooms, quality manager. Service includes how well a supplier responds to an issue brought to its attention and if they address the issue with root cause analysis, corrective actions and formulate a preventative action plan, said Grooms.

TCO is an important component of supplier evaluation at Kimball. "The cost of transacting business is factored into the overall business rating of all suppliers," said Jamey Mann, director of global purchasing and supply for Kimball. "Suppliers that provide additional attributes that lower the cost of doing business are provided more consideration in our sourcing decisions," he said.

Such attributes include "coverage of liability, terms, freight, and inventory programs, all add value and are expected. We value the innovative contributions from our supply base," said Mann.

Kimball measures quality of the products that suppliers manufacture. "Quality is an objective measure of the PPM (defect levels) over a rolling three-month period," said Grooms. He added in discussions with suppliers, quality is "much more involved" than the PPM defect level.



"The cost of transacting business is factored in to the overall business rating of all suppliers and suppliers that provide additional attributes that lower the cost of doing business are provided more consideration in our sourcing decisions," said Jamey Mann, director of global purchasing and supply for Kimball Electronics

“For example, a supplier that has a defective shipment, but demonstrates/provides services to address the immediate needs, such as sorting, replacement parts, failure analysis to address design marginalities is an invaluable partner and it is recognized by Kimball as a differentiator for doing business,” said Grooms.

With delivery, suppliers are measured on delivery to their committed date, said Mann. The percentage of deliveries that are on time are measured. “Each supplier’s ability to provide shipments within a fixed time frame (plus & minus) of the due date is very important to Kimball Electronics,” said Mann.

Shipments made too early impact inventory levels. Late deliveries can result in production lines going down, he noted.

While social responsibility is not part of the scorecard, a supplier is assessed on this when becoming a Kimball approved supplier. “Kimball makes it a priority to ensure our suppliers address both social and global regulatory responsibilities when doing business with us,” said Grooms.

Mann said that Kimball uses scorecards as the center point of periodic business/quality reviews with critical suppliers to improve relationships with suppliers to meet both parties’ needs.

Mann said scorecards are important to Kimball because having suppliers that “deliver a high-quality product on time and at the best cost is invaluable to us and our customers.”

Poor quality = less business

He said poor quality and service will impact the awarding of future business to a supplier. However, Kimball will work with problem suppliers to improve their performance.

“Many of our customers are highly regulated and changing a supplier after a product introduction can be a very expensive proposition,” said Mann. “Therefore, Kimball remains focused on working with suppliers on issue resolution.”

However, in cases where quality and service do not meet our requirements, “we will work with our customers on alternative solutions,” he said.

“We expect, as do our customers, that our supply base deliver high-quality materials at all times,” said Mann. He said Kimball Electronics has had some suppliers that have improved their performance and

sustain superior performance after having had issues.

Other suppliers have ups and downs concerning performance based on new product introductions and specification changes. Those suppliers need to make timely, effective corrective actions, he said.

Mann noted that Kimball is a global company with multiple locations. To communicate supplier performance data for all its locations, Kimball has developed supplier quality database so suppliers providing materials to multiple Kimball Electronics locations “can be scored/assessed globally with the click of a mouse, not just at the local level. In this way Kimball Electronics can understand the full impact of a supplier on our business and not make decisions that don’t reflect or take into account the overall performance.”

Continuous improvement of supplier performance is imperative to OEMs and EMS providers.

“We’re always working to improve supplier performance because each commodity

segment has a concentrated number of suppliers and the industry is working on thin margins so performance is essential,” said Martin of Lenovo.

However, he noted that supplier performance waxes and wanes in part because suppliers face increasing challenges as the marketplace dynamics change.

“For example, one year cost is tantamount. Next year it’s supply,” said Martin. “In another year, it’s quality. They must continually be flexible and adapt to constant change,” he said.

“They need to adapt to those changes to maintain or improve

their performance score. Those with unacceptable levels don’t make it, while those with acceptable levels keep getting business,” said Martin.



“Suppliers need to maintain or improve their performance score. Those with unacceptable levels don’t make it, while those with acceptable levels keep getting business,” said David Martin, manager, strategy & global operations for Lenovo

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IoT helps distributors attract more customers

Some distributors are adding more product lines for sensors and enhancing their expertise in IoT technologies

By James Carbone

Many electronics distributors are counting on the Internet of Things (IoT) to boost sales over the next several years by attracting new customers and increasing business with existing ones.

Startups and established OEMs that are designing products that will be connected to the Internet often reach out to distributors for advice on IoT technologies and which components are needed for an application as well as for parts for prototype builds. Once the IoT device goes into production, distributors then supply components to support the manufacturing of the product.

Distributors are right to be optimistic about the impact that IoT will have on business. Semico Research, based in Phoenix, Ariz., forecasts that the number of products connected to the Internet will increase from 15 billion units in 2016 to 36 billion in 2020. Those newly designed products will require billions of wireless ICs, microcontrollers, sensors, power management ICs, passives and connectors.

Many distributors say that IoT is already having a positive impact on business.

"IoT has definitely played a role with increasing our sales and adding new business opportunities,"

said David Beck, vice president of marketing for Symmetry Electronics, based in Hawthorne, Calif.

Beck said the new opportunities are coming from existing customers and new ones. He said it's just not design engineers that are Symmetry's IoT customers.

"The IoT customer may be a top-level business executive or a group leader looking to expand the features of their existing products," said Beck.

He said one of the exciting things about IoT is that almost anybody with an idea can become an IoT customer. However, not all customers have the engineering knowledge and look for help from distributors.

Beck noted that IoT involves many customer segments, so there is huge potential for continuing growth. "IoT can fit everywhere and there are countless opportunities for connecting devices to control or monitor them," said Beck.

He said some of the segments that have seen immediate growth from IoT are home health and fitness such as wearables, asset tracking, smart home, drones, and agricultural. But industrial IoT will have an even greater impact on distribution.



"IoT has definitely played a role with increasing our sales and adding new business opportunities," said David Beck, vice president of marketing for Symmetry Electronics

More IoT growth coming

"When you see the statistics about the many billions of connected IoT devices over the next five years, a big part of this number comes from the almost countless potential consumer applications," said Beck. However, the value surrounding all of these consumer applications isn't as strong as some of the industrial applications, he said.

"For example, having a kitchen appliance connected to the cloud and communicating with a phone or other appliances is exciting to think about, but how much money is a consumer willing to spend to make use of that feature," Beck asked. However, if a company owns a fleet of vehicles or high-dollar equipment and they want to track their assets or monitor usage and anticipate failure before something actually breaks, "this has tremendous value and can save companies lots of money," he said. "We see a large potential opportunity for industrial IoT applications."

Anja Schaal, product marketing manager at Rutronik, based in Ispringen, Germany, agrees. She noted that the consumer market is and will remain a big market for IoT-related products such as sensors and wireless ICs. "But the industrial market will for sure experience a great growth in the coming years," said Schaal.

She said a lot of industrial customers have just started the "development and evaluation process" of how to participate in IoT. "I expect a rapid growth in sales figures for this segment in the coming years."

Cliff Ortmeier, director and global head of technology product marketing and solutions development for Premier Farnell, said one reason industrial IoT is growing is because expansion of low power sensing and wireless capabilities is offering new application and business models for all industrial applications.

“This applies to both industrial automation, which can more easily monitor and control processes remotely to wider industrial applications where the ability to store and analyse data on the cloud is lowering the individual product cost due to reduced computing resources,” said Ortmeyer.

The right stuff

Whether it is for consumer or industrial applications, distributors say the key to serving IoT customers is having components, expertise, tools and services that customers need.

Premier Farnell has seen strong demand for parts from engineers developing IoT products. There is also robust demand for IoT solution kits that contain the “gateway with some type of external sensing combined with an out-of-the-box cloud solution,” according to Ortmeyer.

Demand for products and kits related to IoT is bringing in new customers and new business from existing ones, said Ortmeyer. “Existing companies are continuing to expand their wireless connectivity options and determine what and how to best use the cloud to reduce their standalone computing needs where it makes sense,” he said.

Additionally, new customers—established OEMs and startups—are coming to Premier Farnell looking to take “advantage of our design and manufacturing services as well as researching the latest IoT solutions on our element4 community and our design center,” said Ortmeyer.

He added that requirements of IoT customers are similar to other customers, although there is additional emphasis on wireless communication, low power usage and “helping them effectively utilise the cloud.”

Of course, Premier Farnell isn’t the only distributor that is attracting new customers because of IoT.

“Companies are continuing to expand their wireless connectivity options and determine what and how to best use the cloud to reduce their standalone computing needs where it makes sense,” said Cliff Ortmeyer, director and global head of technology product marketing and solutions development for Premier Farnell



Schaal of Rutronik said the distributor’s IoT sales are growing and she expects growth to continue as more customers look for technical advice about IoT technologies and parts. She said most of those requests come from startup companies, but established OEMs are also looking for parts and advice because they need to have their products connected to the Internet.

IoT interest growing

She said besides the industrial segment, interest in IoT is also coming from automotive, smart metering, home and building automation, medical and consumer. “The automotive and smart metering segment is currently a big market due to government regulations/guidelines in many countries all over the world,” she said.



Because of growing interest in IoT, distributors are adding products, services and tools. For instance, Ortmeyer said Premier Farnell is investing in core products related to gateways and endpoint nodes and in software and “partnerships that allow us to provide everything necessary for our customers to develop a complete IoT solution.” That includes partnerships with the leading cloud providers to “bring their IoT solutions to market quicker with fewer resource investments.”

Symmetry is also expanding its IoT solutions, according to Beck. Symmetry has added product lines including MediaTek for its multi-radio SoCs; Ethertronics, a supplier of high performance antennas; Digi International, a supplier for networking, RF, and connectivity

“The automotive and smart metering segment is currently a big (IoT) market due to government regulations/guidelines in many countries all over the world,” said Anja Schaal, product marketing manager at Rutronik

products and Monolithic Power Systems (MPS), which makes highly efficient, low-noise power management ICs.

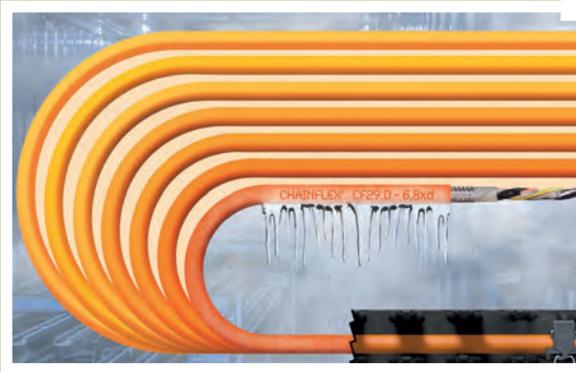
He added that besides parts, IoT customers need advice on the latest IoT technologies and not just “semiconductor based products. “IoT requires a full understanding and partnerships throughout the IoT ecosystem, including hardware design support all the way to a customer’s unique application running on their chosen platform,” said Beck.

He noted that the IoT ecosystem consists of modules and devices, including wireless ICs and sensors. There are many IoT platforms available and identifying the right one for a customer’s application is not straightforward, said Beck.

“There is a large and still growing number of IoT platforms focused on managing data along with several large company platforms such as Microsoft Azure, Amazon’s AWS, and Google’s latest Android Things,” he said.

Symmetry’s website provides information on IoT technologies and the different platforms Symmetry also has engineering support team, which includes technical salespeople in the field for “local face-to-face support,” said Beck. Symmetry has application engineers, who specialise in supporting the newest technologies and standards for wireless and video, such as 4G/LTE, Bluetooth Low Energy, LoRA, WiFi and HDMI and HEVC for video.

“IoT demand has increased our need to understand these technologies,” said Beck.



Servo cables bend to the max

CF29 servo cables from Igus are ideal for energy supply to drives, motors and industrial machines. They provide a solution for users with demanding requirements such as low ambient temperatures, small installation spaces or heavy duty applications.

Designed for continuous motion, these chainflex servo cables boast a core structure optimised for motion. This, combined with a gusset-filling extruded TPE inner jacket, provides stability, alongside the flexible TPE outer jacket.

Cables in this series boast a small bend radius, down to 6.8 times diameter. CF29 cables also offer a guaranteed solution in temperatures down to -35°C for moving applications in deep-freeze warehouses. This is made possible by the halogen-free TPE outer jacket material, which is also oil resistant. www.igus.co.uk



Programmable sensor boasts integrated diagnostics

Solid State Supplies now offers the A1377 linear Hall-Effect sensor IC from Allegro MicroSystems. Mainly targeted at industrial and automotive deployment, the A1377 device is said to precisely determine changes in magnetic fields. Various parameters can be programmed including sensitivity, quiescent voltage output, offset and polarity. This means it can be fine-tuned to meet specific needs.

Complementing this versatility, the A1377 also boasts diagnostic capabilities. These include input short circuit, over-voltage and under-voltage detection, as well as EEPROM error checking. Its segmented, linearly-interpolated temperature compensation mechanism ensures thermal stability and combats sensor drift issues. An integrated small-signal, high-gain amplifier, plus a clamped low-impedance output stage further assist in enhancing performance.

With an operational temperature range of -40 to 150°C, this sensor is also resilient to electromagnetic interference and can be used in challenging application settings. www.sssltd.com



Modular supply features PMBus communication

Excelsys Technologies' CoolX600 series of 600W convection-cooled modular power supplies is now available with the option of PMBus communication.

The new PMBus interface facilitates the communication of operating parameters such as output voltage, output current and internal temperature with other PMBus enabled devices. It also provides remote adjustment of parameters such as output voltage level and current limit as well as control features such as power supply and individual output enable/inhibit.

Billed as the only fan-less modular power supply, the CoolX600 series is housed in an 8.5 by 4.5 by 1U package, with typical efficiency greater than 93 per cent and a five-year warranty.

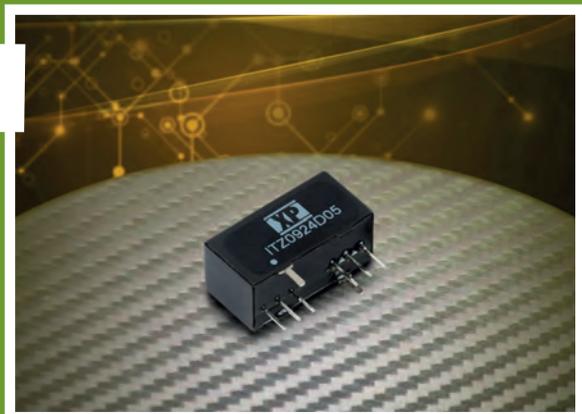
The supply is available with safety certifications to UL/EN60950 and UL/EN60601 third and fourth edition for both industrial and medical applications. Other medical features include body floating rating, dual fusing, two times means of patient protection and less than 300µA leakage current. Typical applications include medical clinical diagnostic equipment, medical lasers, dialysis equipment, radiological imaging and clinical chemistry. www.excelsys.com

Tiny converters accept 4:1 input range

XP Power has introduced a series of compact regulated nine watt DC-DC converters. Products in the ITZ series accommodate a 4:1 input and are available with single and dual outputs.

Packaged in a metal cased SIP-8 package measuring 21.9 by 11.2 by 9.6mm, the converters are up to 89 per cent efficient and have a power density of 44W per cubic inch. With no additional heat sink or forced airflow required, the converter occupies the smallest footprint possible, which is key for today's space constrained designs.

Suitable for use in most environments, the ITZ series can operate from -40 to 85°C and delivers the full output power up to 60°C. Typical applications include mobile, portable and wireless products and any low power use where isolation and DC voltage conversion is required. www.xppower.com



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SAVE THE DATE:
Thursday 25th May 2017



The Annual Electronics Sourcing Football Match continues to be a popular event with friendly competitive matches for readers & advertisers at the MK Dons, Madejski and the AMEX Stadium in Brighton.

With a record number of players requesting to join in the fun for 2017, *Electronics Sourcing* has organised an industry 5-a-side football tournament on Thursday 25 May, 2017.

The tournament will be played in Lancing, West Sussex the home of the Sussex FA. This stadium has the latest artificial pitch and is an ideal venue for both players & supporters to enjoy the matches, to meet, and make friends across the industry.

Refreshments will be available all day at the stadium as well as free onsite car parking. With coffee and bacon rolls on arrival, the first games will kick-off at 11:00am with the aim to play the final match between the two best teams at around 3:30pm.

You are then invited to attend the ecsn UK / Ireland Electronic Components Industry Dinner at Brighton. Sponsored by Gelec, it kicks off at 5:30pm for an informative and enjoyable evening of entertainment.

We would like to encourage as many readers as possible to participate in the tournament and have a great day playing against their fellow industry colleagues.

To help some of the teams to play competitively, we have enlisted a number of ex-professional players from Brighton, Spurs, Portsmouth and Gillingham to provide some additional encouragement and tips...

We have also sourced team kits with your organisation or team names to purchase at a very competitive price and will be publishing full details of the tournament in future editions of *Electronics Sourcing*.

To register as an individual, organisation or team please send an Email to: sales@electronics-sourcing.com and we will then contact you to confirm your team entry and keep you updated directly with further details.



Keep phase noise to a minimum

IQD's latest high performance rubidium oscillator, the IQRB-2, boasts low phase noise making it ideal for frequency calibration, long term evolution base stations, high speed wireless communications and surveillance applications.

Specifically, the IQRB-2 delivers phase noise of -112dBc/Hz at 1Hz and -158dBc/Hz at 10kHz. It is housed in a 95.5 by 62.5 by 44.3mm module and can be used in a 1U rack. Electrical connections include an SMA connector for radio frequency output, RS232 connectors RX and TX, a voltage control input and a frequency locked monitor. Short term stability is said to be 100 times better than a typical oven controlled crystal oscillator at 0.002ppb/s at 100s.

Based around an atomic clock, the IQRB-2 delivers an accuracy of $\pm 0.3\text{ppb}$, irrespective of temperature fluctuations, from -20 to 65°C . It operates at a standard frequency of 10MHz with a Sinewave 50ohm output.

Although specified with a supply voltage of 12V, the module will operate over a voltage range of 12 to 18V, with a power consumption of 6W when stabilised and a typical warm up time of five minutes. www.iqdfrequencyproducts.com



High-gloss finish feels right for wellness

OKW has launched a new range of high-gloss ergonomic handheld enclosures ideal for applications such as remote controls, notably in medical and social care, but also in household, office and industrial settings.

Designed to offer a high quality user experience, Style-Case is also easy to keep clean. It is assembled using tamper-proof Torx screws, which is important for medical and wellness applications and its operating panel is recessed to accommodate a membrane keypad or product label.

An integrated battery compartment houses two 1.5V AA cells, which can be accessed from the outside via a screw-closed lid.

Cases measure 166 by 64 by 31mm and are available in high quality traffic white ASA for UV stability or black PMMA for infrared permeability. Both plastics are rated UL 94 HB for flammability. www.okw.co.uk

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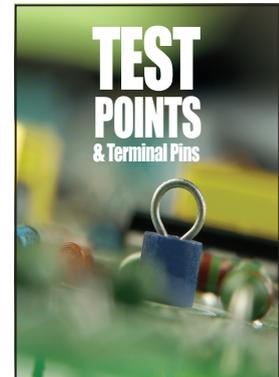
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Aerco.....	26	Intelliconnect	30
America II	7	Kemtron.....	23
Anglia.....	BC	Mouser Electronics ..5, 12, 13, 36, 37 42, 43, 44, 45, 46, 47 & 48	
ANR Manufacturing Ltd.....	49	OKW Enclosures Ltd.....	21
Best Windings Ltd	50	Olson Electronics.....	32
Digi-Key Electronics.....	FC, IFC, 42 & 43	Relec Electronics Ltd.....	18
Display Technology Ltd.....	10	Review Display Systems (RDS).....	14
Ecopac Power.....	29	Rhopoint Components.....	35
Electronics Sourcing	39	Rutronik	11
Farnell	41 & IBC	Schurter UK.....	11
Foremost Electronics Ltd.....	9 & 24	Speedboard.....	27
Forge Europa.....	10	Spelsberg.....	23
GTK UK Ltd.....	15 & 17	Telegartner.....	40
Hammond Manufacturing.....	25	Texcel TechnoLogy	16
Hitaltech UK Ltd.....	22	Wilson Process Systems (WPS).....	19



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Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	97%	50	1,500+	Y
CIRCUIT PROTECTION											
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35000	N/A	£0	67%	50	1,500+	Y
DISPLAYS & LEDs											
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ELECTROMECHANICAL											
CUJ CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	15,168	N/A	£0	91.34%	150	3,400	Y
MURATA CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	61,903	N/A	£0	99.72%	150	3,400	Y
OMRON CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	70,119	N/A	£0	95.28%	150	3,400	Y
PANASONIC CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	156,533	N/A	£0	93.83%	150	3,400	Y
TDK CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	64,978	N/A	£0	99.30%	150	3,400	Y
TE CONNECTIVITY CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	437,107	N/A	£0	75.47%	150	3,400	Y
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Evatron Plastic Enclosures Ltd	Evatron Plastic Enclosures Ltd	01908 675121	www.evatron.com	N	2,000	N/A	£0	100%	3	9	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	91%	50	1,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ECS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	99%	50	1,500+	Y
Epson	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	59%	50	1,500+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz		01276 605900	www.jauch.co.uk			£3M		100%	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	67%	50	1,500+	Y
ABL Components	ABL Components	0121 789 8686	www.abl-heatinks.co.uk	Y	3,000+	N/A	£150	100%	50	500+	Y
ICs & SEMICONDUCTORS (continued on next page)											
ALLEGRO MICROSYSTEMS, LLC	Digi-Key	0800 587 0991	digikey.co.uk	Y	2,867	N/A	£0	86.22%	150	3,400	Y
ALTERA	Digi-Key	0800 587 0991	digikey.co.uk	Y	10,502	N/A	£0	80.39%	150	3,400	Y
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y



widest Selection

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ANALOG DEVICES	Digi-Key	0800 587 0991	digkey.co.uk	Y	50,633	N/A	£0	73.33%	150	3,400	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,500	N/A	£0	83.00%	50	1,500+	Y
Atmel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,700	N/A	£0	58.00%	50	1,500+	Y
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
BROADCOM LIMITED (AVAGO)	Digi-Key	0800 587 0991	digkey.co.uk	Y	2,237	N/A	£0	99.96%	150	3,400	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
CREE INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,398	N/A	£0	100.00%	150	3,400	Y
CYPRESS SEMICONDUCTOR	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,030	N/A	£0	89.02%	150	3,400	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
DIODES INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	32,186	N/A	£0	89.01%	150	3,400	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
FAIRCHILD	Digi-Key	0800 587 0991	digkey.co.uk	Y	39,380	N/A	£0	97.62%	150	3,400	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Digi-Key	0800 587 0991	digkey.co.uk	Y	486	N/A	£0	100.00%	150	3,400	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
IDT (Integrated Device Technology)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	97%	50	1,500+	Y
Infiniteon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	66.00%	50	1,500+	Y
INFINEON TECHNOLOGIES CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,610	N/A	£0	85.64%	150	3,400	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
INTERSIL CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	24,063	N/A	£0	74.18%	150	3,400	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
IXYS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	7,268	N/A	£0	99.55%	150	3,400	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	36,207	N/A	£0	76.91%	150	3,400	Y
MAXIM CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	65,795	N/A	£0	77.63%	150	3,400	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,200	N/A	£0	67.00%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,600	N/A	£0	91.00%	50	1,500+	Y
MICROCHIP CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	58,558	N/A	£0	90.13%	150	3,400	Y
Microsemi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	90%	50	1,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	40%	50	1,500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	38,701	N/A	£0	99.27%	150	3,400	Y
ON Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,100	N/A	£0	87%	50	1,500+	Y
ON SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	57,566	N/A	£0	79.85%	150	3,400	Y
Power Integrations	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	59%	50	1,500+	Y
Qorvo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	90.00%	50	1,500+	Y
ROHM Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	55.00%	50	1,500+	Y
SEMTECH CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	3,694	N/A	£0	87.63%	150	3,400	Y
Silicon Laboratories	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	96%	50	1,500+	Y
SILICON LABORATORIES CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	17,747	N/A	£0	96.09%	150	3,400	Y



inStock

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ICs & SEMICONDUCTORS (continued on from previous page)											
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spansion Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	93.00%	50	1,500+	Y
STMicroelectronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	99%	50	1,500+	Y
STMICROELECTRONICS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	43,448	N/A	£0	97.47%	150	3,400	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	36,900	N/A	£0	41%	50	1,500+	Y
TEXAS INSTRUMENTS CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	210,905	N/A	£0	89.60%	150	3,400	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
XILINX INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	7,354	N/A	£0	51.78%	150	3,400	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION (continued on next page)											
3M	Digi-Key	0800 587 0991	digkey.co.uk	Y	54,086	N/A	£0	93.83%	150	3,400	Y
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
AMPHENOL	Digi-Key	0800 587 0991	digkey.co.uk	Y	426,945	N/A	£0	82.42%	150	3,400	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
Anderson Power Products	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	50%	50	1,500+	Y
Cinch Connectivity Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	82%	50	1,500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
EDAC	EDAC	01933 427300	www.edac.net	N/A	N/A	N/A	£100	100%	34	500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
HIROSE ELECTRIC CO LTD	Digi-Key	0800 587 0991	digkey.co.uk	Y	39,499	N/A	£0	91.53%	150	3,400	Y
Huber+Suhner	Lane Electronics	01403 790661	www.fclane.com	Y	766	£116,000	£0	100%	6	38	Y
ITW McMurdo	Lane Electronics	01403 790661	www.fclane.com	Y	866	£219,000	£0	100.00%	6	38	Y
JAE Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,200	N/A	£0	32%	50	1,500+	Y
JST SALES AMERICA INC	Digi-Key	0800 587 0991	digkey.co.uk	Y	4,320	N/A	£0	81.46%	150	3,400	Y
Kycon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	99%	50	1,500+	Y
LEMO	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	65%	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	16,900	N/A	£0	75%	50	1,500+	Y
MOLEX CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	123,772	N/A	£0	95.41%	150	3,400	Y
Neutrik	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	86%	50	1,500+	Y
Phoenix Contact	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,000	N/A	£0	99.00%	50	1,500+	Y
Phoenix Contact	Premier Farnell	08447 111111	www.uk.farnell.com	Y	2,000	£250,000	£0	100%	20	3,000	N/A
Phoenix Contact	Rapid Electronics	01206 751166	www.rapidonline.com	Y	16,000	N/A	£0	100%	11	200	N/A
Phoenix Contact	RS Components	08457 201201	www.uk.rs-online.com	Y	7,000	£250,000	£0	100.00%	30	4,000	N/A
Phoenix Contact	Anglia Components	01945 474747	www.anglia.com	Y	500	£25,000	£0	100%	12	200	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



fast Shipping

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	30,900	N/A	£0	40%	50	1,500+	Y

OBSOLESCENCE / HARD TO FIND

	America II Europe	01462 707070	www.americaiieurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y
	Cyclops Electronics	+44 01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y
Force Technologies Ltd		+44 01264 731200	www.forcetechnologies.co.uk	N/A	N/A	N/A	£0	5%	6	26	Y

OPTO ELECTRONICS

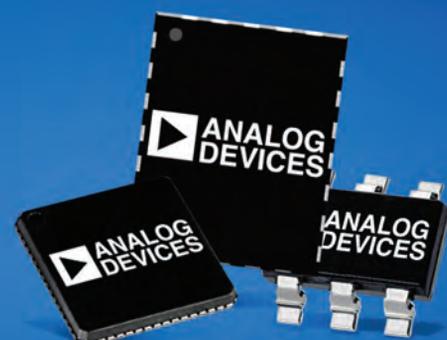
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
Kingbright	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	100%	50	1,500+	Y
Lumileds	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	99%	50	1,500+	Y
NEC	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	200	£200,000	£0	100%	5	20	Y
Newhaven Display	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	65%	50	1,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,800	N/A	£0	99%	50	1,500+	Y
VCC	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,000	N/A	£0	92%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	99%	50	1,500+	Y

PASSIVES (continued on next page)

ABRACON CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	28,548	N/A	£0	98.89%	150	3,400	Y
ARCOL	ARCOL Resistors	01872 277431	www.arcolresistors.com	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
BEL FUSE	Digi-Key	0800 587 0991	digkey.co.uk	Y	4,207	N/A	£0	83.53%	150	3,400	Y
BOURNS	Digi-Key	0800 587 0991	digkey.co.uk	Y	59,314	N/A	£0	82.47%	150	3,400	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
Coilcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EATON CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	28,434	N/A	£0	86.49%	150	3,400	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
HONEYWELL CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	26,319	N/A	£0	86.01%	150	3,400	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	48,025	N/A	£0	90.12%	150	3,400	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
KYOCERA ELECTRONICS CORPORATION (AVX)	Digi-Key	0800 587 0991	digkey.co.uk	Y	65,718	N/A	£0	83.48%	150	3,400	Y
LAIRD CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	14,568	N/A	£0	97.21%	150	3,400	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,800	N/A	£0	50.00%	50	1,500+	Y
LITTELFUSE CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	86,652	N/A	£0	82.87%	150	3,400	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
NICHICON	Digi-Key	0800 587 0991	digkey.co.uk	Y	35,421	N/A	£0	96.30%	150	3,400	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y

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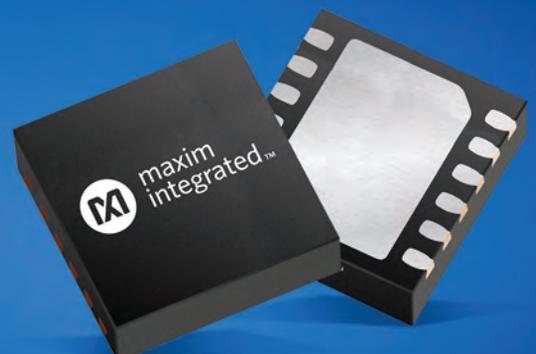
Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
PULSE CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	11,098	N/A	£0	93.56%	150	3,400	Y
ROHM SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	63,003	N/A	£0	99.85%	150	3,400	Y
Samsung Electro-Mechanics	Digi-Key	0800 587 0991	digikey.co.uk	Y	21,522	N/A	£0	100.00%	150	3,400	Y
TAIYO YUDEN	Digi-Key	0800 587 0991	digikey.co.uk	Y	16,677	N/A	£0	99.96%	150	3,400	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TOKO	BEC Distribution Ltd	0845 4900 405	www.bec.co.uk	Y	6,000	£300,000	£20	70%	2	8	Y
TT Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	32,800	N/A	£0	55%	50	1,500+	Y
United Chemi-Con (UCC)	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	13,900	N/A	£0	99.00%	50	1,500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
VISHAY CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	275,942	N/A	£0	88.52%	150	3,400	Y
WURTH CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	22,245	N/A	£0	100.00%	150	3,400	Y
Würth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO CORPORATION	Digi-Key	0800 587 0991	digikey.co.uk	Y	141,986	N/A	£0	83.67%	150	3,400	Y

POWER & BATTERIES

Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRIWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y

SENSORS

All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y
Sensirion	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	N/A	50	1,500+	Y



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Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	70.00%	50	1,500+	Y
Apem	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	84%	50	1,500+	Y
Carlting Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	87%	50	1,500+	Y
CHERRY	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	77%	50	1,500+	Y
EAO Ltd	EAO Ltd	01444 236000	www.eao.co.uk	N	5,000	£500,000	£150	100%	6	22	Y
E-Switch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	94%	50	1,500+	Y
Grayhill	EAO Ltd	01444 236000	www.eao.co.uk	Y	2,300	£150,000	£150	99%	6	22	Y
Grayhill	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	84.00%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98%	50	1,500+	Y
NKK Switches	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	94%	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	68%	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	98%	50	1,500+	Y
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	+44 01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
ADDA	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	800	N/A	£0	59.00%	50	1,500+	Y
Delta Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	28%	50	1,500+	Y
ebm-papst	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	99%	50	1,500+	Y
Sanyo Denki	EAO Ltd	01444 236000	www.eao.co.uk	Y	300	£150,000	£150	99%	6	22	Y
Sanyo Denki	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,900	N/A	£0	N/A	50	1,500+	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
Sunon	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	86.00%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

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PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie. Boiler/Manufacture &/or Repair)	Location	Approvals	Volume Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
ABL Circuits Ltd	01462 894312	www.ablcircuits.co.uk	M	SE	ISO 9001:2008	SML	Y	4-10	Y	Y	Y	Y	Y
Cambridge Circuit Company Ltd	01223 423100	www.cambridge-circuit.co.uk	M	SE	ISO9001:2008, ULL	SML	Y	4-16	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	M	NE	ISO9001:2008 ULL	SML	Y	4-30	Y	N	Y	Y	Y
CS Electronics (UK) Ltd	0116 242 4058	www.cs-electronic-pcb.co.uk	B	M	UL, ISO 9001, TS16949	SML	Y	4-32	Y	Y	Y	Y	Y
Daleba Electronics Ltd	+44(0)1992 510000	www.daleba.co.uk	B/M	SE	ISO9001:2008, TS, UL	SML	Y	4-30	Y	Y	Y	Y	Y
DK Thermal Ltd	+44(0)1992 514200	www.dkthermal.co.uk	M/R	UK, Europe, Asia, USA	UL, ISO9001:2008, TS16949:2009	SML	Y	N	Y	N	Y	Y	Y
European Circuits Limited	0141 9411388	www.european-circuits.co.uk	M	Scotland	BS EN ISO9001: 2008 CERTIFIED	SM	Y	8	Y	Y	N	Y	Y
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	BSEN, ISO9001:2008, TS16949:2009, UL, CECC release, Queens Award	SML	Y	4-16	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2008, UL	SML	Y	4-30	Y	F/R	Y	Y	Y
Photronix Group	01903 231901	www.photronix.co.uk	B	SE	ISO9001:2008, ISO14001:2004, AS9100-B, NADCAP, TS16949:2002	SML	Y	4-58	Y	F, F/R	Y	Y	Y
Prestwick Circuits GPS Ltd	01294 224631	www.prestwickgps.com	B	UK, Portugal, China	ISO 9001, ISO-TS16949, AS9100, IPC610 Class II/III, UL	SML	Y	4-48	Y	Y	Y	Y	Y
Tecbridge Circuits	0207 993 6503	www.tecbridgecircuits.co.uk	M Rep.	UK Europe	UL, TS16949(2009), ISO14001(2004), ISO9001(2008)	SML	Y	4-16	Y	N	Y	Y	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
AWS Electronics Group	01782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	380	9	AS9100, ISO9001, 13485, 14001, NADCAP, TS16949, SC21, IPC	Y	Y	Y	Y	Y	Y
Axiom Manuf. Services	01495 242130	www.axiom-ms.com	£40m	SW	300	3	ISO9001, AS9100, ISO13485, ISO14001, SC21, IPC610E, BSI Kitemark, NADCAP, ISO27001	Y	Y	Y	Y	Y	Y
Briton EMS Ltd (OSI Electronics)	01234 266300	www.britonems.co.uk	£12m	Bedford & Singapore	100	3	ISO: 9001, 13485, 14001, AS9100, BSI Kitemark IPC610	Y	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£52m	Essex	55	7	ISO 9001, 14001, UL, IPC-610, SC21	Y	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	£3.7m	NE	60	2	ISO9001:2008 UL	Y	Y	Y	Y	Y	Y
Contract Production Limited	01751 475950	www.contract-production.co.uk	£1.9m	North Yorkshire	20	2	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Corintech Ltd	+44 (0)1425 655655	www.corintech.com	£7.5m	UK	72	3	AS9100, ISO9001, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
CRS Electronics Ltd	01920 871061	www.crs-electronics.co.uk	£3m	SE	44	2	ISO9001:2008	Y	Y	Y	Y	Y	Y
Custom Interconnect Ltd	01264 321321	www.cil-uk.co.uk	£14m	Andover (Hampshire)	130	6	ISO 9000, IPC610, ISO 13485	Y	Y	Y	Y	Y	Y
DJ Assembly	01904 436 456	www.djassembly.com	£1.25m	North Yorkshire	15	2	ISO9001:2008, AS9100, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y
Dynamic EMS Ltd	01383 822911	www.dynamic-ems.com	£9m	Scotland	94	3	ATEX, ISO9001:2015, OHSAS18001, IPC-610 F class 3, ISO14001, UL	Y	Y	Y	Y	Y	Y
Electronic Technician Ltd	01202 897722	www.etuk.co.uk	£3.5m	SE	55	2	AS9100, ISO9001, ISO14001, IPC610/620 Class 3	Y	Y	Y	Y	Y	Y
Elite Electronic Systems Ltd	028 6632 7172	www.elitees.com	£17m	UK	160	5	ISO9001, ISO13485, UL, IPC610/620	Y	Y	Y	Y	Y	Y
Esprit Electronics Ltd	02380 455411	www.espritelectronics.com	£9m	S/Malaysia	80	4	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Exception-Fabrinet	01249 814081	www.exceptiongroup.com	£21m	UK/Thailand/US	210	5/31/2	AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4m	S	50	3	ISO9001, ISO13485, IPC-A-610, IPC1-STD-001, IPC 7711/7721, BS EN 61340-5-1/2 (ESD)	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 798294	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	6	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2011 ATEX, IPC-A-610 Class3	Y	Y	Y	Y	Y	Y
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.iiew.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	Y	Y
JIS Manufacturing	01455 555500	www.jismanufacturing.com	£23m	M/CZ Republic	270	3	ISO9001:2008 and IPC610 to Class 3	Y	Y	Y	Y	Y	Y
Nemco Limited	01438 346600	www.nemco.co.uk	£10m	SE	120	5	AS9100, ISO9001:2008, IPC610/620 to Class 3, ISO14001:2004, SC21	Y	Y	Y	Y	Y	Y
Northern Hi-Tec Ltd (NHT)	01524 67833	www.nht.co.uk	£4.5M	Lancashire (NW)	66	4	ISO9001:2008, IPC-A-610/D	Y	Y	Y	Y	Y	Y
NOTE	01453 797580	www.note.eu	£100m	UK/EU/China	1,000	14	ISO9001, 13485, 14001, 18001, IPC-610 Class 3	Y	Y	Y	Y	Y	Y
M-TEK (Assembly) Ltd	01189 455377	www.mtek.co.uk	£2.4m	SE	30	4	ISO9001:2008, IPC-A-610 Class 3, WHMA-620/ISO14001:2004/IPC-7711/7721	Y	Y	Y	Y	Y	Y
Pektron PLC	01332 832424	www.pektron.com	£40m	E-Midlands	350	7	ISO9001, ISO14001, TS16949, BEAB, VCA, TÜV, UL, TickIT	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	1m	Luton	10	2	UKAS ISO9001:2008, IPC-A610	Y	Y	Y	Y	Y	Y
Season Electronics Limited	02392 452222	www.seasongroup.com	£5m/£95m	Havant/Global	65/1800	2/18	(AS9100 & ISO9001 in UK) (TS16949 & ISO13485 at sister sites)	Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£4m	SE	50	3	ISO9001:2008, ISO13485, IPC-A-610 Class 3 & IPC-7711	Y	Y	Y	Y	Y	Y
Speedboard Assembly Services	01753 746700	www.speedboard.co.uk	£11.1m	Windsor, SE	92	5	ISO9001:2008, IPC610 to Class 3	Y	Y	Y	N	Y	Y
Tenkay Electronics Ltd	01903 855455	www.tenkay.co.uk	£4.1m	West Sussex	50	1	ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007	N	Y	N	N	Y	Y
TEXCEL TECHNOLOGY PLC	+44(0)1322621700	www.texceltechnology.com	£12m	SE	105	7	ISO9001, ISO14001, IPC610 Class 3,	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£12.5m	Derby / Corby	110	7	ISO 9001:2008, ISO 13485, UL, IPC 610F Class 3	Y	Y	Y	Y	Y	Y
Trojan Electronics Limited	01792 469020	www.trojanelectronics.co.uk	£2m	South Wales	20	2	BS EN ISO 9001 2008, ISO 14001 2007	Y	Y	Y	Y	Y	Y
Wilson Process Systems	01424 722222	www.wps.co.uk	£12m	SE	100	4	ISO9001:2008, IPC-A-610 Class 3	Y	Y	Y	Y	Y	Y

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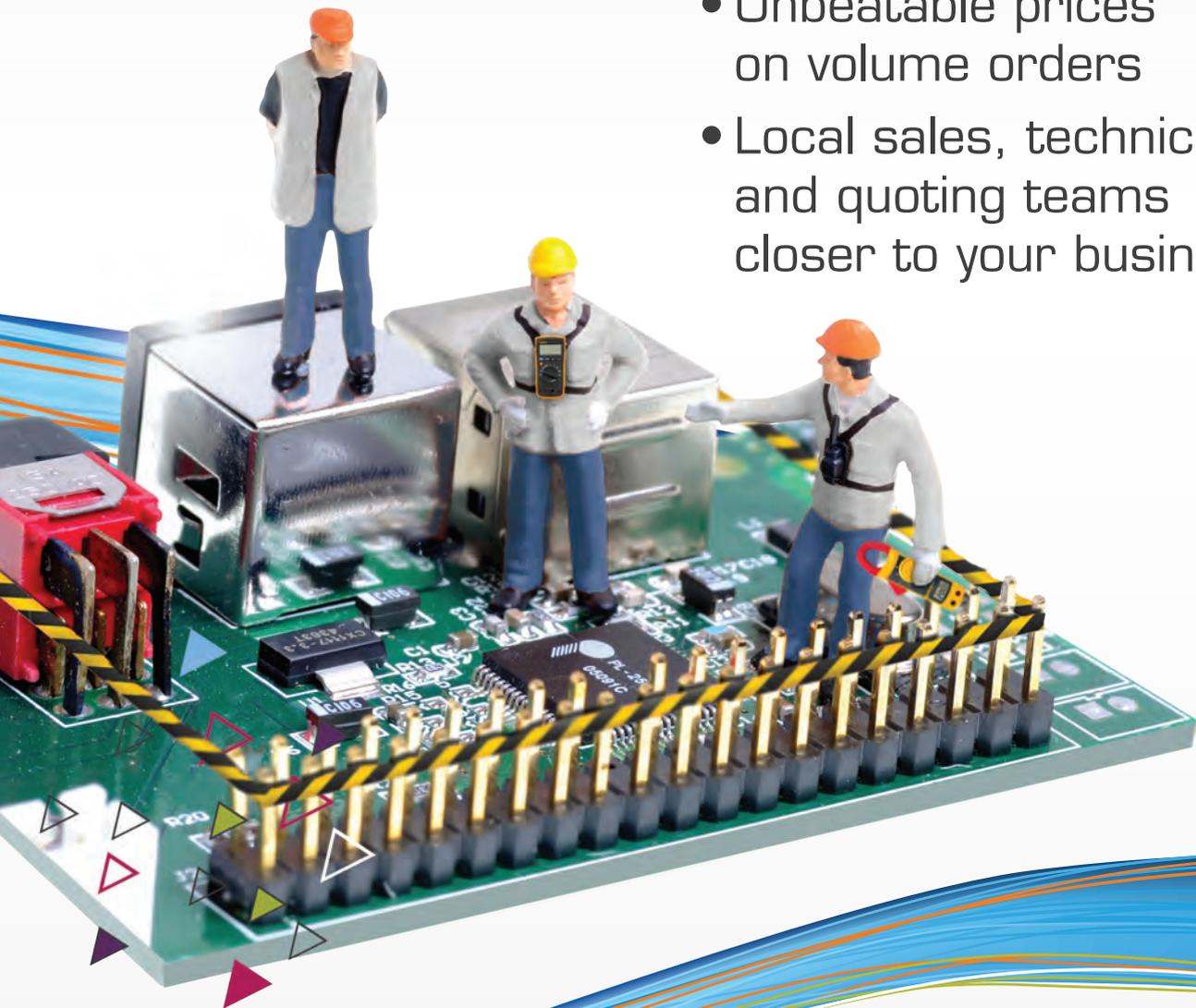


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