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# editor's word



Front cover – June 2017

## Power to the people

As the editor of an electronics magazine, my focus on obsolescence issues has always been on PCB-based components. So, you will probably be surprised that recently my thoughts about obsolescence have started turning to a much larger component: the internal combustion engine.

I've always been a petrolhead. From a pre-parental GSXR 1100 to a mid-life crisis TVR Cerbera, my garage has always oozed oil. I've lost count of the number of engines I've rebuilt. During each engine project I was always reminded of the complexity and inefficiency of a machine designed to turn a liquid energy store into rotary motion. Try turning any engine by hand. A 1m breaker bar on the crankshaft might just do it. The energy wasted in mechanical friction alone is saddening.

I knew the day would come when internal combustion engines would give way to electric engines. I just wasn't sure when. Recently, myself and two of my closest petrolhead friends have announced that our next vehicle purchases will be hybrid, plugin hybrid and full electric respectively.

I think this tells me something: demand for the internal combustion engine is about to tank.

From this magazine's perspective this means one thing. Where once there was an internal combustion engine, there will now be a new bill-of-materials dripping with power electronics components. And it doesn't stop there. Lone petrol stations will have to give way to a national infrastructure of power generation and distribution on a gargantuan scale. Que new investment in electrical technology.

And the loser? The oil industry. It had an awesome 100-year run. Let's hope those involved invested their profits well.

*Jon Barrett*

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# The *Upside* of Industry Consolidation

There is much talk about the risks associated with a consolidating supply base, but there are rewards for buyers, too—most notably in selection and service



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

Consolidation • By Victoria Kickham

**A** consolidating supply channel is often met with skepticism and frustration on the part of buyers, and with good reason. Price increases, a loss of negotiating power, and product availability are often chief concerns, leading to renewed requirements to manage risk. Given the frantic pace of acquisitions in the semiconductor market over the last two years—and a flurry of activity in the distribution sector as well—electronics buyers are wise to focus on the issue.

But there are pros to balance out the cons—especially in today’s evolving electronic components landscape. Rob Lineback, an analyst with Arizona-based industry researcher IC Insights, points to a shift in the market away from specialization and toward providing a more complete solution—a trend that brings pluses in the form of broader product selection, a wider service offering, and a more streamlined development process. The changes are being driven by a combination of factors: suppliers’ need for expansion in an era of slow growth and an evolving desire to serve Internet of Things demands.

“In the ‘90s, the trend was toward more specialization. Companies became focused on certain areas and you saw a lot of divesting of businesses. Now we’ve swung back to where companies are looking to provide complete solutions,” explains Lineback. “The IoT has played a big role in this. No one really knows what the IoT is, yet it’s everywhere and it’s everything—and it has caused companies to scramble and grab what they can.”

Suppliers’ efforts to broaden their portfolios and capabilities—especially in hot IoT areas such as sensors and MCUs—can be a good thing for buyers who consider the opportunities along with the pitfalls of the new landscape.

## One-Stop Shopping

Brian Matas, vice president of market research at IC Insights, says consolidation has brought some stability to the semiconductor

market, and he emphasizes the value of accessing a broader range of solutions from fewer sources. He points to On Semiconductor’s 2016 purchase of Fairchild Semiconductor as a case in point.

“Where ON had strength in high-voltage parts, and Fairchild in low-voltage parts, combined the company now has a broad portfolio of solutions,” he says, adding that instead of providing a ‘bag of parts’ to customers, the merged company has the potential to bring design services and system-level solutions to the table. “You hear the term one-stop shopping; that’s kind of the way things are beginning to transition.”

Essentially, buyers can support more of their engineering teams’ needs in one place—a scenario that makes sense in a world where customer needs and demands are growing.

“What I’m seeing from system designers is that they are demanding more,” adds Matas. “They want parts, design help, validation, and testing.”

Component distributors play an important role as well, in many cases stepping in to help buyers navigate a broader offering of products and services following a merger. Minnesota-based distributor Digi-Key emphasized this aspect of the business to customers following Analog Devices’ recent acquisition of Linear Technology, for instance.

“We’ve had long-standing, successful relationships with both Analog Devices and Linear Technology for many years, which enable us to help our customers understand their extensive product portfolios,” said David Stein, the distributor’s vice president, global semiconductor. “Our strong stocking position with both companies covering a global footprint will allow us to continuously exceed customer expectations from a service perspective.”

## Enhancing Efficiency

Another service “plus” is the growing availability of software solutions, which Matas says is a byproduct of greater

collaboration in the supply channel. Suppliers and customer are working more closely to develop solutions and speed time-to-market requirements, making software tools that allow greater flexibility in product development a more and more attractive option.

“Chip companies are now providing almost ‘plug-and-play’ with different components online, so that you can see what your output is—so you can do the validating in advance, so you know what kind of parts you want to buy,” says Matas. “It promotes a smoother process. A lot of cooperation on that back end just makes the whole process go a bit smoother.”

The end result? Efficiency.

“Suppliers are trying to make it easier for their customers to roll out products quicker and be more successful in the market faster,” Lineback adds. “They’ll do everything they can to help them succeed.”

The challenges and opportunities in this new landscape are still developing, as it takes a few years to work out the kinks and fully integrate consolidated entities. But the bottom line is that buyers need to pay attention to both sides of the coin, taking advantage of the opportunities and minimizing the challenges.

“It’s never totally negative, it’s never totally positive,” Lineback says of a consolidating marketplace. “For buyers, this means the potential for having a more complete solution from one vendor—which makes it easier and faster to put products together and get them out the door.

“The downside is that it’s harder to negotiate good pricing, and there’s also a challenge in dealing with new companies and the potential for disruption. Buyers have to look at all the trade-offs.”



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## Eliminate industrial IoT headaches

Digi-Key Electronics is to distribute the VersaSense MicroPnP line of wireless sensing and actuation products for the industrial internet of things. They will be available for immediate shipment following a new distribution agreement between the two companies.

The MicroPnP product line boasts several benefits including zero configuration, 99.999 per cent wireless network reliability and up to a decade of battery life. IoT solutions based on this product are already used by industrial, consumer goods, technology, telco and agriculture companies for applications such as: infrastructure monitoring, building energy management, and precision animal farming.

Vice president, global semiconductors at Digi-Key, David Stein, said: "In the past an industrial IoT solution would require design engineers to undertake low-level programming that ended up with minimal connectivity. VersaSense's self-configuring hardware system will allow engineers to easily design data acquisition and control solutions to enable their innovation."

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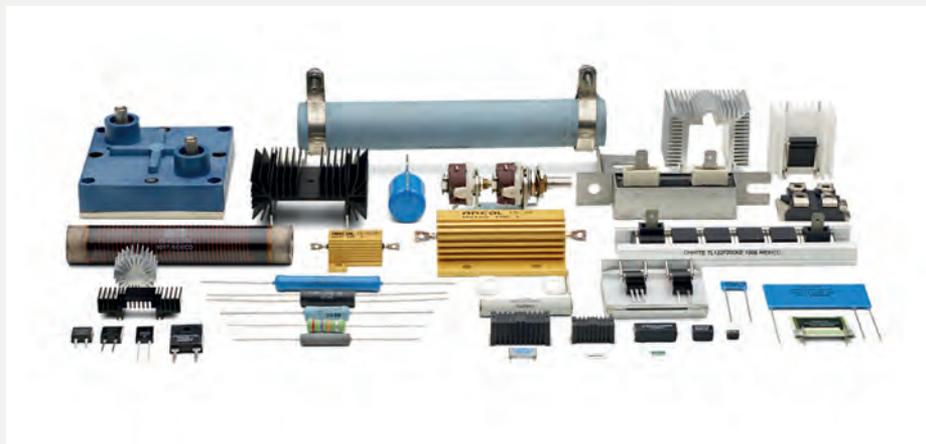
## Mosfet line mixes power and precision

Mouser Electronics has announced a global distribution agreement with super junction power mosfet supplier, D3 Semiconductor. Mouser now stocks D3 Semi's 650V super junction power mosfets designed for a variety of demanding uses, including enterprise computing power supplies, motor control, lighting and other challenging power management applications.

The +FET 650V range features proprietary technology designed to fuse the power and efficiency of super junction architectures with mixed-signal precision. For maximum performance and reliability, all +FET mosfets in the portfolio target a 650V node, which helps improve the power density of applications traditionally served by insulated gate bipolar transistors such as inverters and motor drives.

For improved performance in low-frequency applications, the +FET super junction power mosfets feature an ultra-low on-state resistance ranging from 32 to 1,000milliohm. This also supports fast-switching capabilities, enabling the devices to perform rapid transfers of the gate charge in a short period of time.

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



## Over 500 resistor lines added

RS Components is building on its global agreement with Ohmite Manufacturing to expand its portfolio of Ohmite brand resistors. This will add more than 500 lines of Ohmite products including ceramic composite 'pulseaters,' metal-element current sense, wirewound rheostats, and Slim Mox precision thick-film type devices. In total, more than 4,500 Ohmite and Arcol products are now stocked and available to order online from RS.

According to RS, the expansion emphasises its broader support for resistor technologies and offers customers fast access to a range of technologies and resistance values for high-power requirements.

Global head of interconnect, passive and electromechanical at RS, Eric Smith, explained: "RS has furthered its relationship with Ohmite Manufacturing to provide customers with technical excellence and access to market-leading products for use across many sectors, including electronics, automotive, industrial, transport and computing and communications."

President of Ohmite Manufacturing, Greg Pace, added: "RS offers world-class e-commerce and logistical capabilities, enabling us to reach a wider base of customers."

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## 5-a-side Football Tournament

Electronics Sourcing held a 5-a-side football tournament on Thursday 25 May at Culver Road - home of Lancing Football Club and the Sussex FA. We would like to thank ECSN and G English for sponsoring the event.

Congratulations to Premier Farnell who beat Avnet in the final to win the Sourcing Cup, and to G English who edged out their rivals to claim the Sourcing Shield.





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## News



### New deal on industrial memory

Display Solutions has been appointed sole UK distributor for Cervoz, a manufacturer of industrial storage and memory products for professional, critical and diverse industrial applications.

The company's industrial flash and DRAM modules target a range of markets including embedded computing, factory automation, telecom and networking, transportation, information and entertainment and server and cloud computing.

Commercial manager at Display Solutions, Brendan O'Reilly, said: "Cervoz offer a range of high quality embedded products with legacy and mainstream technology, long-term availability, bill of material control, high reliability and top compatibility. We are delighted to supply their range to our customers in the UK."

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

### Portfolio expansion supports wireless development

Future Electronics has signed a global distribution agreement with Rigado, a provider of integrated internet of things solutions, including certified wireless modules, configurable IoT gateways and cloud-based management tools. The full Rigado portfolio will be supported by Future's radio frequency, wireless division, Future Connectivity Solutions.

Vice president, marketing for Future Connectivity Solutions, Matthew Rotholz, said: "The addition of Rigado allows us to better support the NXP Semiconductor family of wireless chipsets. The need for embedded technology is continuously advancing as customers are under pressure to shorten design cycles."

Chief revenue officer of Rigado, Kevin Tate, added: "Future Connectivity Solutions' model and structure will significantly boost our global footprint."

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

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# Plan ahead to end procurement struggles

*Balancing product lifecycles with component availability is difficult, especially in long life sectors such as military, aerospace and medical. Independent distributor, 4 Star Electronics, believes proactive obsolescence management can help*

Obsolescence of electronic components is a growing problem because the lifecycle of components has become very short in comparison with the life of the equipment that manufacturers need to support, especially in the military, aerospace and medical industries.

Unfortunately, the lifecycle of electronic components is often dictated by the commercial market, where short lifespans are prevalent. Over the past 20 years, typical component lifecycles have decreased dramatically and it's not unusual for parts to be discontinued within 18 months

of introduction. This makes it difficult for program managers to forecast future requirements.

### Avoid reactive purchasing

A proactive diminishing manufacturing sources and material shortages program can reduce costs and reactive actions. It works by forecasting future requirements for the end-product and determining the lifecycle and availability of each component. This makes it possible to schedule end-of-life purchases and explore re-design options, as well as working with suppliers to handle any unforeseen circumstances.

There are various resources available to support this process. The center for advanced life cycle engineering at the University of Maryland, for example, has developed algorithms to help forecast future obsolescence dates and determine the optimum time for product redesign.

Component manufacturers and their authorized channels provide product discontinuance notices so buyers can schedule end-of-life purchases and there are various tools from data providers such as SiliconExpert Technologies and HIS that offer a one-stop shop for component data. They aggregate change notices, discontinuation notices, cross reference tools and other data from multiple component manufacturers.

Lastly, working with independent distributors and suppliers who are expert at dealing with shortages, obsolescence and end-of-life electronic components, can help handle any unforeseen circumstances.

### Enlist specialist support

Reducing procurement risk by focusing on original component manufacturers and authorized distribution partners is important, but it isn't always possible as parts are often scarce when they're needed most. One way to plan ahead is by aligning with specialist suppliers.

Aftermarket manufacturers are authorized by the original component manufacturer to produce and sell replacement parts, using materials that have been either transferred from the OCM, or produced by the aftermarket manufacturer



Director of operations, 4 Star Electronics, Scott McKee

using OCM tooling and intellectual property. They can also sometimes produce parts that meet OCM specifications by reverse engineering or redesigning a part without violating the OCM's intellectual property rights.

Where other options are unavailable, independent distributors can procure material from the open market. Top tier distributors in this category have processes in place for bill of materials and lifecycle analysis, vendor management, kitting and full purchasing outsourcing. These distributors provide fully validated material and support counterfeit avoidance through in-house inspection and test, or by partnering with established test labs.

Director of operations at independent distributor, 4 Star Electronics, Scott McKee, concluded: "We recognize customers come to us as a last resort, in dire need of a particular part, but we can also help as they develop their obsolescence programs. We provide market analysis and lifecycle information based on our relationships with vendors and data providers. Then, if we need to procure obsolete parts for them, we can also provide counterfeit avoidance inspection and test to ensure the material integrity."

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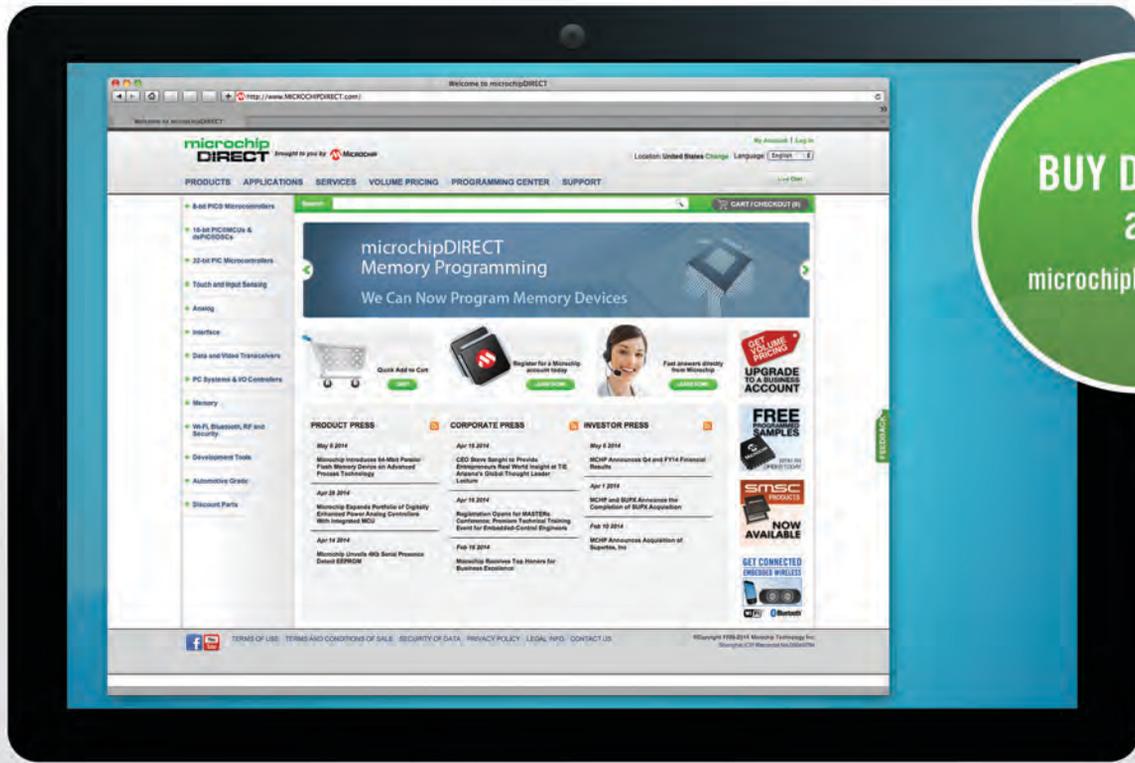
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# Button down the alternatives

*With last time buys issued on high-temperature button tantalums, buyers will need to find alternatives for a package that has no direct drop-in replacement, warns Charcroft Electronics*

If you know where to look, you can find an alternative to virtually any obsolete capacitor, whether it has an axial, radial or surface-mount package. Finding an alternative is just a matter of matching the electrical and environmental specifications of the original part to that of a different part in the same, or similar, package. Unfortunately, that's where managing last time buys issued for Vishay's high-temperature Castanet wet tantalum capacitors is different because no other capacitor uses this iconic 'button' package.

Originally manufactured by Arcotronics, before being acquired by Vishay, these unique capacitors have previously been manufactured in three temperature grades: 85, 125 and 150°C. The recent LTB notices affect only the higher temperature grades offered in the CS2, CH2 and ANP2 series.

### High-temperature alternatives

For customers who can easily change to the lower temperature specification, the solution will simply be to use

the CA2C series, which is rated for 85°C. In applications where a higher temperature rating is critical, however, buyers and engineers will face more of a challenge.

One possibility could be to substitute the button with a high-temperature tubular axial wet tantalum. Although this solution would need a change of board layout, it could match the capacitance values and voltages of the button tantalums. As an additional advantage, this alternative would extend the high-temperature capability up to 200°C and, as a relatively new series, it would also offer long-term continuity of supply.

### Space-constrained applications

In applications where board-space is a priority, mounting a standard axial capacitor in a capacitor clamp or a metal cradle could provide a space-saving surface-mount footprint. Soldering the cradle also ensures additional stability to withstand the elevated levels of shock and vibration that can often be a factor in high-temperature applications. Where the

clamp or cradle cannot meet the required footprint, a custom fixing, designed and assembled at Charcroft's UK-based manufacturing facility, could offer a practical solution.

As a replacement for the non-polar ANP2 series, a solid tantalum may be an easier alternative, although there is a series of non-polar axial tubular wet tantalums available. In any of these scenarios, alternative capacitance values, as well as close or higher voltages, may have to be considered to find the best alternative.

Partnering with the right supplier can also help in finding the most appropriate alternative. Button tantalums have been part of this industry since the 1970s and, over that time, Charcroft has followed their history and archived many legacy drawings and datasheets from the Arcotronics and Vishay brands. These will provide a rich resource for customers sourcing suitable long-term replacements for these iconic devices.

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



Director, Charcroft Electronics,  
Debbie Rowland



Cradles can be used to surface-mount axial capacitors

# Save time sourcing know-how

Buyers rely on Mouser Electronics to provide the newest semiconductors and components, but to really get the most from these parts, they also need up to the minute information and specifications

Automotive applications and technologies are rapidly evolving

To keep customers ahead of the technology curve, Mouser hosts a number of applications and technologies sites, accessed via the Mouser.com website. They provide information on industry trends, tutorials, videos, white papers and articles covering more than 30 vertical markets — all in a user-friendly format that can save hours of research.

### Get info early on

Senior vice president of marketing, Kevin Hess, said: “Technology is rapidly evolving and customers need to know about the latest technical advancements as they happen. This is most important at the beginning of the design cycle, when engineers are focusing on system-level plans rather than on components.”

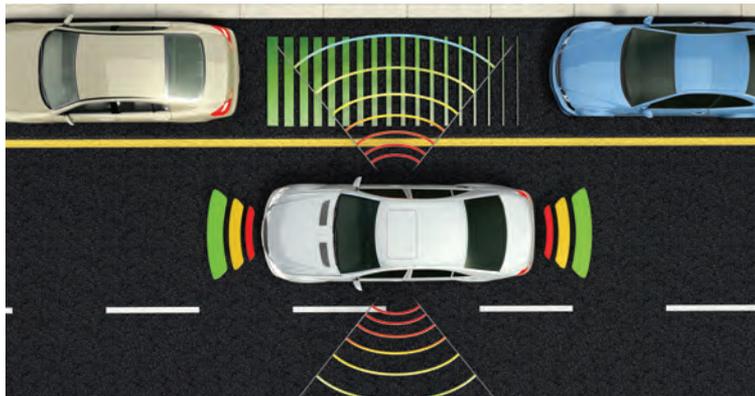
The sites therefore focus on today's most relevant topics including: automotive, industrial, robotics, open source hardware, lighting, energy harvesting, harsh environments, low power, motion control, test and measurement, programmable logic, radio frequency wireless, sensor, solar, touch and wireless

mesh networking. They are continually updated to provide the newest information, which can speed time to market on new designs.

Each site features original content, videos, application notes and technical articles, plus the latest relevant products. Technical resources include articles covering industry trends and design issues, as well as application design notes, tutorials, white papers, videos and other solution-based material.

Kevin Hess continued: “The sites highlight solutions based on specific applications. For example, we feature block diagrams of popular products, with clickable navigation that takes users to recommended components for specific system functions. In this way, we strive to help both buyers and design engineers maximize their time.”

In addition to the applications and technologies sites, Mouser keeps buyers and engineers in the know with technical e-newsletters, each providing key information around a specific application or area of technology development.



Mouser also works closely with its 600 manufacturer partners to coordinate new product launches and provide all the technical documentation customers need.

### Search smart

To further support customers looking for specific information, Mouser recently introduced several new ways to locate product data on-line, including searching and browsing by datasheets, images and newest products. Customers can also find products through the site's parametric product search. A new 'Scope Search' function allows customers to instantly focus part searches by product category, or search Mouser's entire inventory.

Once the right part has been identified, Mouser provides various tools to help buyers order products easily. EZ Buy, project manager and cart/project share tools can all help customers prepare projects and purchase components efficiently, with staff on hand in 22 locations worldwide to offer personalized technical support.

Even with all these features and services, it still comes down to Mouser having the right parts in stock and delivering accurate orders. With today's design constraints, there's no room for error. To this end, Mouser aims to provide same-day shipping and fast order delivery to nearly every corner of the globe.

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# Expect steady prices for discrete chip tags despite growing demand

Demand for MOSFETS and IGBTs will be especially strong from automakers and their suppliers *By James Carbone*

The discrete semiconductor market will post 3.5 per cent to 4 per cent sales growth annually over the next five years as revenue rises from \$20.4 billion in 2016 to \$24.3 billion in 2021, according to researcher IHS Markit Technology.

"The discretetes market yo-yos," said Richard Eden, senior analyst II, power semiconductors for IHS, who is based in Wellingborough, United Kingdom. "It may rise for five to seven quarters and then decline for three or four quarters. In a typical 10-year period, it would have declined in two or three of the years, but will end up higher than it started at the beginning of the period," said Eden.

The discretetes market, which includes RF and microwave devices, power transistors, thyristors, power rectifiers and small signal transistors, is cyclical and can be impacted by overly optimistic forecasts by OEMs, electronics manufacturing services providers and distributors.

"With forecasting, there is a tendency to be slightly overoptimistic," said Eden. So, if an OEM is "slightly optimistic and their EMS provider and other global supply partners are optimistic, by the time the forecast gets to the chip maker it is higher than it should be," said Eden. As a result, the chipmaker may over invest in capacity and when the optimistic forecast does not result in orders, prices fall and the market declines.

While the discretetes business may be cyclical, it appears it will be in a growth period for the next several years. Researcher IC Insights forecasts 3 per cent sales growth in 2017 and then 5 per cent growth in 2018 and 6 per cent growth in 2019.

According to IC Insight's forecast discrete unit shipments will post similar growth rates. In 2016, the number of discrete semiconductors shipped totaled 377.7 billion. Discretetes shipments will have a compound annual growth rate of 5 per cent through 2020 when 478.3 billion discrete chips will ship, the researcher said.

One component manufacturer reporting healthy discretetes demand is Vishay Intertechnology, based in Malvern, Penn. Dave Valletta, executive vice president, worldwide sales, said Vishay saw 4.5 per cent revenue growth for discretetes in 2016 and demand has been strong so far in 2017.

A "crazy" market  
"The market in general right now is going crazy," he said. "All products are growing including discretetes. Orders are going through the roof." He said there is inventory buildup occurring because "customers are trying to make sure that they have enough stock. Generally, we have seen very strong book to bills," said Valletta. In fact, the book-to-bill ratio for some discretetes used by the auto industry is 1.5, he said.

One reason for strong discretetes demand is the automotive business. "Automotive for sure is driving

business right now in discretetes, but automotive has always been strong for Vishay," said Valletta.

Eden said automotive is driving a lot of demand for discretetes especially for power transistors and rectifiers.

"The trend is toward more electrification both in car engines but also within the cars such as automated electric windows, power steering and so on," he said. "We see automotive as being one of if not the fastest sectors for power discretetes."

Valletta added, somewhat surprisingly, Vishay saw an uptick in demand for discretetes from the



"The market in general right now is going crazy. customers are trying to make sure that they have enough stock," said Dave Valletta, executive vice president, worldwide sales for Vishay

## By The Numbers

The compound annual growth rate of the global discretetes market through 2021 *Source: IHS Technology*

3.5%

5%

The percentage growth rate of unit shipments of discrete semiconductors in 2017 *Source: IC Insights*

The size of the global discrete semiconductor market in 2016 *Source: IHS Technology*

\$20.4 billion

396.6 billion

The number of discrete semiconductors expected to ship 2017 *Source: IC Insights*

The forecasted size of the global discrete semiconductor market in 2021 *Source: IHS Technology*

\$24.3 billion

\$0.0589

The expected average selling price for discrete semiconductors in 2017 *Source: IC Insights*

### Discrete unit shipments to rise steadily

Unit shipments of discrete semiconductors will rise from 377.7 billion to 492.6 billion in 2021 fueled by strong demand from automakers and the industrial market

Source: IC Insights



### Discrete chip revenue to rise

Global discrete semiconductor revenue will increase from \$20.4 billion in 2016 to \$24.3 billion in 2021

Source: IHS Technology



computer industry. “That was kind of unexpected. It was in decline but now has started to show some signs of life,” said Valletta

However, growth in discretely demanded from the computer segment may be an anomaly and may be short lived. Eden said that while computing had historically been a huge market for discretely it has been “flat or declining for the last four or five years,” said Eden.

“The boom in sales of laptops and PCs has dwindled. It’s not a big driver now,” said Eden. Communications had also been a driver for discretely, but has been flat.

However, consumer electronics has been a strong segment for discretely and the industrial segment is the largest segment for discretely, said Eden.

**Strong demand for MOSFETs**  
While demand for discretely is rising from several segments, some discretely are in more demand than others. For instance, demand is healthy for metal oxide semiconductor field effect transistors (MOSFET) and insulated gate bipolar transistors (IGBT).

“Demand for rectifiers is just behind MOSFETs,” said Eden. “Rectifiers are fairly stable. Rectifiers tend to be the follower not the leader. When you design your circuits, you use the best MOSFET and the best IGBT you can find. Then you pick the

rectifier accordingly. You don’t design in the rectifier first, but you need them so there is stable demand,” he said.

With demand increasing, Valletta said there is “a little bit of concern in the industry with what is going on with the supply base. There’s been a significant amount of consolidation in the semiconductor industry including among discrete semiconductor suppliers and more consolidation is likely.

There are benefits to consolidation in the discretely industry for suppliers, according to Eden. “Consolidation will probably make the supply base more stable because fewer companies will get inflated forecasts,” said Eden.

He notes when there are shortages, large OEMs and EMS providers sometimes place orders with multiple suppliers to guarantee they get the parts they need and then cancel the orders if the forecasts are inaccurate and the parts are not needed. The practice often results in an inflated view of what real demand for the parts is.

“With consolidation, discrete suppliers will have a more objective view of demand from their customers,” said Eden. “The same orders will not be sent to loads of suppliers,” he said. “It will increase stability.”

**Less competition**  
With consolidation, some semiconductor buyers are concerned

there will be fewer supplier choices and less competition for their business. However, Eden said consolidation doesn’t necessarily mean less competition.

“The devices made by the consolidated companies were never the same,” he said. For example, ON Semiconductor purchased Fairchild in 2016. Both companies made MOSFETs, but their products don’t overlap much, said Eden. “Fairchild’s MOSFETs are higher power and more current while ON’s MOSFETs are lower current and lower power,” he said. Only about 5 or 10 per cent of their products overlap even though they both make products with similar names” according to Eden.

The situation is similar with Infineon and International Rectifier (IR). Infineon acquired IR in 2015. “IR was an American supplier within the American market and with some business in Asia, while Infineon was stronger

in Europe and stronger and in Asia, said Eden.

“Geographically they did not overlap much and their products don’t match each other,” he said. “They complement each other. Customer side may end up getting better value,” said Eden.

However, while buyers may appreciate value they are also concerned about discretely prices. The good news is despite rising demand and consolidation, average prices should remain essentially flat in 2017 and 2018, according to IC Insights. For instance, the average price for a discrete was \$0.0586 in 2016 and would be \$0.0589 in 2017, the researcher said.

There is a chance that prices could increase if there is more consolidation and capacity shrinks and there are shortages. However, price increases would be temporary. “The overall long-term trend is a slow price decline for discretely,” said Eden.

### Discrete average price to drop slightly in '20, '21

Average prices for discrete semiconductors will be mostly steady until 2020

Source: IC Insights





**Small package delivers wide input range**

XP Power has announced two new series of isolated DC/DC converters in a DIP-16 package, said to offer a power density of up to 50W/in<sup>3</sup>. Featuring ultra-wide input voltage ranges, they are said to be ideal for any application that requires DC/DC converters compliant with global information technology equipment safety approvals IEC60950-1 and UL/cUL60950-1.

The JWE06, with 6W total output power, and the JWE08 with 8W total output power, offer 1,500V DC isolation with single or dual output voltages. Both ranges offer devices with either 3.3, 5.0, 12, 15 or 24V DC single, and ±12 or ±15V DC dual outputs. Each series can operate from two input voltage ranges: nine to 36V and 18 to 75V, with up to 87 per cent efficiency and all models feature under-voltage lockout.

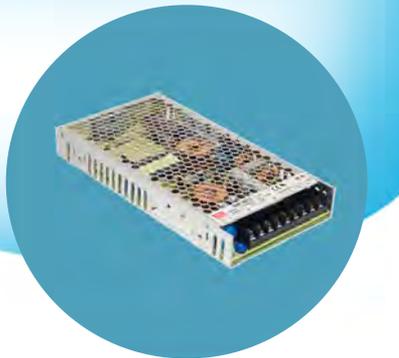
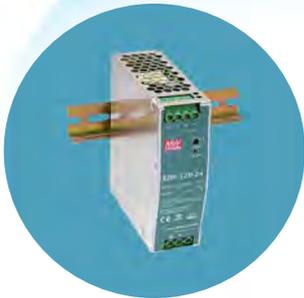
All devices in both series meet EN55032 Level A electromagnetic interference standards, which means no additional external filtering is required. This can save both board space and materials cost. Devices also feature an extended operating temperature range of -40 to 105°C, with no derating or forced air cooling required up to 70°C.

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



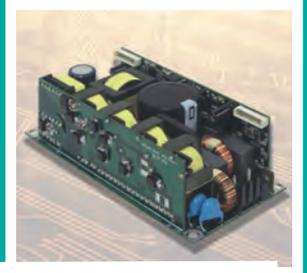
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**Compact supplies feed power-hungry products**

Luso Electronics has introduced Qualstar's new N2Power-branded XL270 family of AC/DC modules, said to provide more power in a compact 50.8 by 101.6mm package than comparable solutions on the market.

The XL270 series constitutes single output combinations of 12, 24, 30, 48 and 56V models. These high-power density supplies are optimised for power hungry broadcast, storage and networking products and are also ideal for many applications in the industrial, gaming and instrumentation markets.

Two digital signal processors are used to control the operation of these power supplies. The DSPs monitor output voltage and current, along with transformer temperature. They then shut down the main output upon command, loss of input power, or whenever excessive loads provide advanced warning of an impending shutdown before output power is lost. With over 100,000 lines of internal code, the XL270 can be modified via software to meet specific OEM needs.

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

# The key to compliance

Sourcing the right power supply is not always easy. Buyers must ensure compliance with relevant industry certifications and worldwide standards, explains Ideal Power

Specifying the ideal product for purpose is not always simple when sourcing power supplies. There are several complications which can arise and it's important to source power supply units with relevant approval certifications to meet both industry and worldwide standards, as well as harmonising the PSU with the end-product.

To ensure compliance for industrial applications, a power supply must be tested to specific electrical and technical parameters and must meet the requirements which define the relevant standard. For example, information technology equipment that needs to

meet IEC 60950 will be put through a series of tests which differ from those of the IEC 60601-1 third edition for medical equipment. It does not stop there, however, and if a product is designed to be distributed overseas, it must also conform to the intended country's requirements.

To help purchasers fulfil these criteria, Ideal Power works closely with product engineers and power supply manufacturers to ensure that approvals are in place. During this process, the company will look at both the end user application and its operating environment.

For those with queries regarding current industry

standards and regulations, the Ideal Power team is on hand to offer advice. Sales and marketing manager of Ideal Power, Jon Vallis, commented: "When it comes to approvals, we do the leg work. This offers our customers peace of mind to source the product which is best suited for their specific application."

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Products should be tested to meet industry-specific standards

It's important to source power supply units with relevant approval certifications



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# Purchasing thoughts on portable power

*Challenging environments require a rugged battery holder solution, particularly in portable applications where shock and vibration prevail. President of Memory Protection Devices, Tom Blaha, explains what to look out for*

Whereas the choice of battery holder is often cost-driven for consumer electronics, industrial equipment requires greater forethought to specify the ideal solution based on the requirements of the operating environment. This can vary significantly, depending on whether the application is stationary or portable.

For example, a data logger located on an 18-wheel tractor trailer must offer protection against the battery becoming dislodged due to

continuous shock and vibration. Extremely corrosive environments also challenge product reliability. The battery, as well as the entire



Due diligence is required when designing a battery-operated power supply for use in harsh environments

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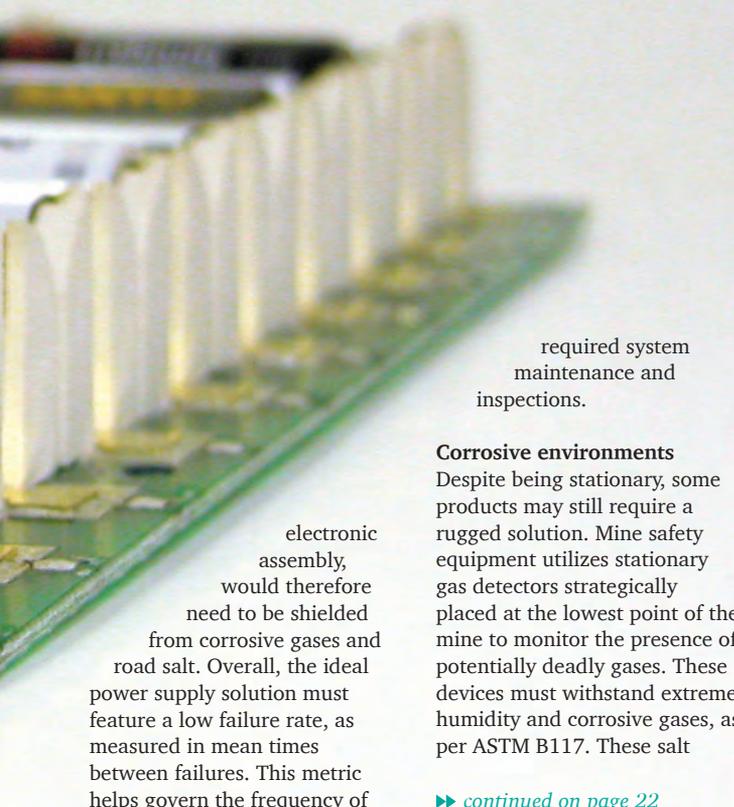
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required system maintenance and inspections.

#### Corrosive environments

Despite being stationary, some products may still require a rugged solution. Mine safety equipment utilizes stationary gas detectors strategically placed at the lowest point of the mine to monitor the presence of potentially deadly gases. These devices must withstand extreme humidity and corrosive gases, as per ASTM B117. These salt

electronic assembly, would therefore need to be shielded from corrosive gases and road salt. Overall, the ideal power supply solution must feature a low failure rate, as measured in mean times between failures. This metric helps govern the frequency of

▶ continued on page 22

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## Power

- ▶ spray tests reproduce a corrosive attack on platings and assemblies in order to evaluate the protective finish.

Battery-powered devices are also utilized throughout the petroleum industry to remotely monitor pumps and pipelines. Equipment used here must withstand extreme temperatures, as well as salt spray and contact wear tests. To ensure this, manufacturers simulate fretting, where repeated surface motion under load can cause mechanical wear and material transfer to contact surfaces.

### Putting safety first

Similar effects can be experienced in portable medical devices such as glucose meters, thermometers, or wearable drug delivery systems. These devices must be designed according to FDA-21 regulations, taking into account human factors such as age and functional capabilities that could impact the safety and efficacy of the device.

Portable medical devices must therefore be highly durable, meet rigorous requirements for MTBE, drop testing, salt spray, thermal and contact wear testing. Certain



medical devices also need to undergo routine sterilization, preferably without having to remove either the battery or battery holder. All sterilization processes involve extreme environments, including: autoclave steam sterilization at 1 to 3.5 atmospheres and 120 to 150°F temperatures; chemical sterilization procedures involving corrosive compounds; and radioactive sterilization using gamma rays or electronic beams.



With these factors in mind, due diligence is required when designing a battery-operated power supply for use in extreme environments. Engineers and procurement professionals must work together to ensure that the device meets and exceeds customer expectations and delivers rugged and reliable performance that increases product operational life to maximize the total return on investment. Paying a few cents more to develop a ruggedized product also helps avoid product failure that can ultimately prove costly to your company's reputation and bottom line.

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# Invest in protection

Don't underestimate the benefit of silicon gaskets, explains business manager for cable assemblies at GTK UK, Tom Hennessey

Silicon gaskets offer great protection for connector and cable assembly designs that are used in harsh or demanding environments, often without adding undue costs.

When designing cable assemblies for use in harsh environments where dust, particle or moisture ingress are a concern, many engineers expend a great deal of energy on specifying the connector, the connector hood and the cable used to manufacture the assembly. Adding a custom-made gasket helps to provide an extra sealing element and usually can be done at a relatively low incremental cost.

### Material choice

The choice of material and its shore hardness properties are

critical for the engagement of the seal in the assembly. This is an area where technical experts, such as those at GTK, can provide guidance to customers on the most suitable material for their specific application.

Tom explained: "We work in collaboration with customers through the entire design and manufacturing process. We provide guidance on the choice of gasket material and its location within the assembly, and provide prototypes that the customer can test before going into volume production.

"Robust testing is critical to ensure that the mated connectors are sealed sufficiently and meet any additional industry requirements, such as



Robust testing is critical to ensure that mated connectors are sealed sufficiently

ingress protection rating. We provide cable assemblies that incorporate sealing features for use in a wide range of different applications, including marine electronics, automotive and industrial machinery."

Tooling costs for bespoke gasket designs are said to be relatively low, with a typical tool costing around £1,000. The cost of the manufactured gasket is then

calculated according to the volumes required, ultimately representing a small fraction of the overall assembly cost.

Tom concluded: "Many customers are pleasantly surprised by the relatively low cost of gaskets as part of the overall cable assembly cost."

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

**The cost of the manufactured gasket is then calculated according to the volumes required, ultimately representing a small fraction of the overall assembly cost**

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# Working under stress

*Understanding the environmental characteristics of your application can make all the difference to product selection, as Texcel explains*

There are several vertical markets that are subject to harsh environments including: marine and subsea, oil and gas, and industrial electronics. Understanding the environment in which a finished product will be used is key to its design, as well as to the specification of any electronic sub-assemblies and the outer enclosure.

With extensive experience of designing and manufacturing electronic systems for use in harsh environments, Texcel claims to understand the design considerations engineers face here.

**Choose wisely**  
Commercial director for Texcel, Peter Shawyer,

explained: "There are lots of issues that need to be considered: is the product accessible after it has been deployed, what is the estimated life of the product, what temperature range will it be operating in? These will all impact on the selection and assembly of the components and the outer housing.

"One example of this is bore hole products that are used in the oil and gas industry. Here it is important to specify components that can withstand extremely elevated temperatures. We work in partnership with our customers to clearly define the product requirements and ensure the finished design



will work reliably in the field."

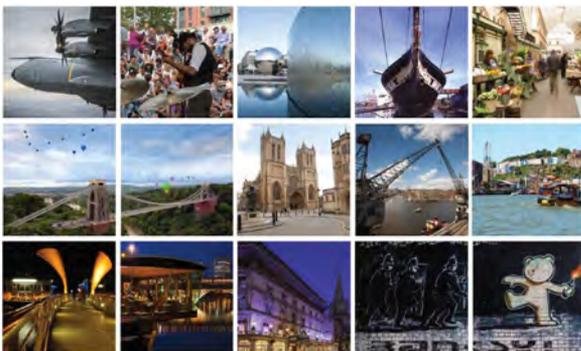
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# When does mil-spec matter?

Connector specialist, ECCO, offers advice on determining whether to specify military standard parts or commercial equivalents

Authorized distributor, ECCO, is often asked when is it appropriate to specify MIL-STD or mil-spec products over commercial counterparts? There are various factors to consider in situations where both types are an option, as well as assessing the worst-case situations that can occur.

Military standard connectors are those approved for use by the US Department of Defense, following rigorous standards regarding factors such as interoperability and reliability. Nowadays, MIL-STD, or MS connectors, are also used in aerospace, industrial, marine and even commercial automotive applications.

Commercial counterparts are often made of the same materials, sometimes they even come off the same production line at the same factory. If this is the case, pricing should be similar, however, supply and demand may dictate variances in the pricing of either part. Where supply is limited, for example, the market price for a commercial part could be higher than its MS cousin. Often, however, commercial

equivalent connectors are justifiably cheaper, due to material changes, such as contacts with less gold content. Lower material costs mean a lower price for the end customer and if the commercial part is produced at a separate factory with lower labor costs, this could also result in a lower final price.

Bearing this in mind, there may be good reasons for specifying a commercial part, particularly where cost is an issue and there is no MS requirement from the end customer. But, when it comes to deciding on MS versus commercial equivalents, what criteria should be used to inform that decision?

**Informed decisions**  
Primarily, it depends on whether the end customer demands MS approved connectors. If they do, buyers need only determine which brands to evaluate and place on print, bearing in mind it's always wise to put two options down.

If the customer can use either product, determine if the application can withstand the relaxed technical specifications of a commercial equivalent.



Find out whether the specs listed are a result of material, process, or labor aspects of the commercial equivalent connector.

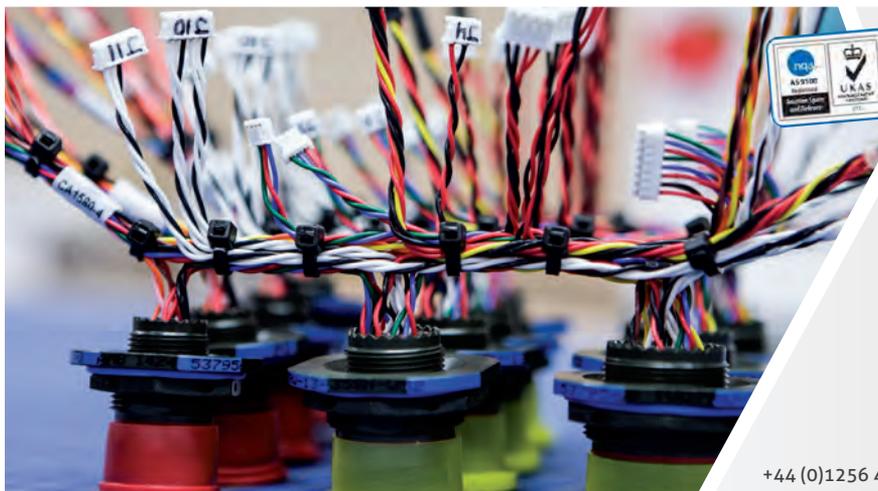
Pricing must also be considered, so get quotes on both the commercial and MS approved parts and determine if the market for supply and demand is driving commercial pricing higher than MS style.

Some buyers may be faced with an existing supplier approvals strategy that dictates their vendor choices. Find out who has demonstrated supply success in that connector category and consult with other stakeholders such as production, engineering

and product management to verify there is support for a given supplier.

Finally, establish whether availability is a prime consideration. There is often a plethora of military style products on a distributor's shelves and sometimes not as much of the commercial equivalents. As a note, many authorized value-added connector assemblers can dual mark a part as commercial or mil spec, which offers greater sourcing flexibility. Speaking to a connector assembler that is on the qualified product list can help with advice and expertise throughout the process.

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### Protect IT equipment from brute force and ignorance

Telegärtner has introduced an RJ45 socket with a defined release force, specially designed for applications with increased public traffic. The AMJ-S DD module Cat.6A releases the connection to the RJ45 connecting cable in case of unwanted pulling forces without latching lever actuation.

Although the release force of this RJ45 jack is below the standard specifications for RJ45 plugs and jacks according to IEC 60603-7, this does, in fact, make the module ideal for protecting expensive and mobile IT equipment against the kind of damage common in local area network connected applications with increased public traffic. This type of application is common in hotels, conference rooms and exhibition areas where equipment needs to withstand temporary, often unstructured connections. The AMJ-S DD module does of course offer sufficient plug-in and pulling force to prevent unintentional disconnection of the patch cord at low tensile forces.

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



### New home for PV connectors

MC4 solar power connectors are now part of the Stäubli Electrical Connectors brand. These photovoltaic units were branded as Multi-Contact before the company's change of name earlier this year and in fact, more than one billion MC4 family connectors have been installed worldwide over the past 20 years, often operating in the harshest of environments.

Snap-fit MC4 units are suitable for cable cross-sections from 1.5 to 10mm<sup>2</sup> and are rated for currents up to 45A. Resistance to UV, ammonia and salt spray enables the IP68 rated devices to operate in harsh environments.

The latest addition to the MC4 range is the MC4-Evo2, which boasts a high voltage rating of up to 1,500V DC, such that solar power operators can benefit from longer cable strings when linking solar fields. It also has a current carrying capacity of up to 69A and a streamlined design said to improve heat dissipation.

[www.staubli.com/electrical](http://www.staubli.com/electrical)



### Delivering end-to-end automation connectivity

Bulgin has launched a new range of industrial automation components designed to offer flexible connectivity for a variety of rugged automation applications. The M-series includes a range of sizes and pin configurations, from three to 19-pins, and is designed for use in industries requiring exceptionally reliable and robust connections, from automotive production and machine building to food and beverage processing.

A variety of connector types and keying options are available, including A-, B- and D-coded configurations. In addition to straight and right-angled field installable versions, Bulgin's M5, M8 and M12 variants also offer PVC/PUR overmoulded cable options to provide end-to-end automation connectivity for almost any situation.

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



### Add extra space with new enclosure design

OKW has unveiled a new series of flat/high Railtec B DIN rail enclosures that accommodate connections at different levels and offer extra space.

Targeted at machine-building and motor industry applications, Railtec B is a universal DIN rail enclosure that can be mounted on TH35 DIN rails or directly on walls for applications such as control equipment, especially lighting systems.

Various versions are available for PCB terminal blocks, plug headers, front connectors and D-sub connectors. The new flat/high variant is available in two, four, six and nine modules, offering sizes from 35 by 86 by 58mm to 157 by 86 by 59mm. The enclosures are also fully insulated and protected to VBG 4.

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

# Buyers have options with component obsolescence

*The rate of component obsolescence has increased over the last 15 years, but component manufacturers are doing a better job of notifying buyers when they plan to discontinue a part*

Component obsolescence is an issue that electronics buyers will always have to manage, but the good news is with diligence and careful planning buyers can mitigate the impact that end-of-life parts have on their companies.

Researchers say that obsolescence is becoming more of a challenge because semiconductor manufacturers are discontinuing production of chips at a faster rate than in the past. For instance, in the year 2000 component manufacturers issued 1,164 EOL or product discontinuance notices, according to researcher IHS Technology. By 2014, the number of such notices soared to 5,506 notices. The good news is in the short term the number of notices declined to 4,327 in 2016 and IHS forecasts about 4,270 notices will be issued in 2017.

The increase in the number of EOL notices over the last 17 years can be attributed to technology changes,

government regulations, economic slowdowns and catastrophic events such as earthquakes and severe floods that knocked out electronics production.

“For instance, in 2006 there was a spike in EOL notices because of the European Union’s Restriction of Hazardous Substances (RoHS) law which went into effect,” said Gregory Wood, director, parts content for IHS. RoHS restricted the use of lead, mercury, cadmium and several other substances in electronics equipment and components which resulted in semiconductor and other component manufacturers discontinuing parts that contained those substances.

“We also had EOL spikes in 2010 and then in 2013 related to changes in REACH legislation,” said Wood. The Registration, Evaluation, Authorization and Restriction of Chemicals law requires companies manufacturing or importing chemical substances into the European Union in quantities of one ton or more per year to register



**Fewer EOL/PDN notices will be issued**  
The number of end of life and product discontinuance notices will fall from a high of 5,804 in 2013 to 4,279 in 2017

these substances with the European Chemicals Agency. The regulation requires companies to communicate information on chemicals up and down the supply chain in an effort to ensure that manufacturers and customers are aware of information relating to health and safety of the products supplied.

There was also an increase in EOL notices because of the banking crisis in 2008

and 2009 as the industry “probably overreacted a little bit and obsoleted a lot of product,” said Wood.

“You also see a lot more end-of-life activity when the semiconductor industry is not doing well,” he said. “If chip manufacturers are not selling as many parts you will see more obsoleting of components as they shut down less profitable lines,” Wood said.

► continued on page 30



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▶ The increase in obsolescence impacts some industries more than others. Industries with short product lifecycles, such as smart phones, are not impacted as much as industries with longer lifecycles such as defense and aerospace, medical and industrial equipment. Products in those industries can be built for 20 or more years and outlast the lifecycles of some of the components that the products use.

## Prone toward obsolescence

While certain industries are more impacted by obsolescence, so are certain product families. For instance, memory ICs and programmable logic chips have shorter lifecycles because technology with those products changes quickly. With memory, the architectures and density changes every several years and memory chipmakers devote more production to the newer densities and architectures because they are most in demand.

Wood said while obsolescence is an ongoing challenge for electronics buyers, there are a number of strategies that can be employed to reduce the risk that EOL parts adversely impact their companies' production.

For example, buyers involved in design activity at their companies need to encourage design teams to use technologies and parts that have been well-established in the industry and have very long projected lifecycles, according to Wood.

He added buyers also need to "make sure to monitor very closely end-of-life notices and look for doing last-time buys if a critical component comes up with a last-time purchase date," said Wood.

## Buying for future demand

Some buyers will look to authorized distributors for help monitoring EOL notices and some distributors also do

last-time buys of components after a manufacturer issues an EOL notice.

"For the last 23 plus years Arrow has systematically invested in end-of-life parts when our suppliers close their factories," said Tyler Moore, director, supply assurance for Arrow Electronics. "We are essentially buying for future demand before they close the factory."

He said that Arrow does not make a last-time buy every time an EOL notice is issued. "We do it when the data says it makes sense," said Moore. "A lot of parts have substitutes so you don't really need to do" a last-time buy for them, he said. For parts that don't have substitutes "we will go in and make an investment so customers have those parts available for five or 10 years."

He said that Arrow has nitrogen storage capability, which is important because many customers are worried about the long-term degradation of parts that need to be stored for a long time. "Storing them in an environment like that is really helpful," said Moore. Arrow stores both finished semiconductors and wafers for customers.

Nitrogen storage "grew out of our military business. Those customers often use parts much longer than many manufacturers are willing to build them," he said. "It was a necessity for customers."

Besides storing obsolete parts, Arrow helps customers manage obsolescence. It sends customers EOL notices when they are issued for parts that customers purchase from Arrow.

Moore said in most cases, suppliers give plenty of notice when they decide to cease manufacturing a part. When a supplier issues an EOL notice, "typically our suppliers give customers one year to decide if they need

to make a life-time buy and another year to take delivery on it," said Moore. "If they are getting those notifications in a disciplined fashion they hopefully will have enough time to deal with the problem," he said.

## Buying from independents

Wood noted that many buyers will also look for obsolete parts from independent distributors. "Of course, if you do that you have to be a little bit careful about the proper testing because you don't want to buy counterfeit or substandard parts," said Wood.

Independent distributors have a long history of being sources for obsolete parts.

"Obsolescence is still a big part of most independent distributors business," said Paul Romano, chief operating officer for Fusion Worldwide, based in Boston.

"Obsolete parts lend themselves perfectly to what we do. They are parts that just aren't available from regular distribution or the manufacturer," said Romano. "By their nature obsolescence is a big part of independent distribution business."

Romano said component obsolescence can ebb and flow and is "driven by a number of factors" including natural disasters such as earthquakes, tsunamis and flooding, which knock out production of electronic components. When such events happen, component manufacturers may decide not to bring back production of certain components that may not be as profitable as they were in the past.

As with authorized distributors, some buyers look to independent distributors for both obsolete parts and for help in managing obsolescence issues.

"They look for help managing their life-time buys," said



"Typically, our suppliers give customers one year to decide what if they need to make a lifetime buy and another year to take delivery on it," said Tyler Moore, director supply assurance for Arrow Electronics



"Some buyers 'exhaust all avenues before coming to Lansdale. Some find us purely by luck, but most who have been in this business for any length of time know the product lines that Lansdale supports and come to us when these products are needed," said Lee Mathiesen, operations manager at Lansdale

Romano. "We may go out and procure the inventory, bring it in and ship it to them as they need it."

He said some customers may not want to keep the inventory at their facility. "We can manage it at our facility or we keep it in a cage on their shop floor. They can have it right there and pull the products as they are needed," said Romano.

Carleton Dufoe, CEO of independent distributor NewPower Worldwide, based in Nashua, NH, said customers also come to his company for assistance with obsolete parts and with last time buys.

"Sometimes they want us to do the last time, but they don't want to guarantee that they will take products," said Dufoe. "This is not an equitable solution."

He said in some cases NewPower may have two or three customers that use the same obsolete part. NewPower can combine the expected usage requirements of the customers and do a life-time buy for them. If the customer usage is less than what the customers forecast, "we can give them a solution to resell the product before the product has decreased a lot" in value, said Dufoe.

Obsolete components are also part of Smith and Associates' business, said Todd Burke, vice president of business development for the Houston-based independent distributor. "Folks come to us for obsolete parts, shortages and long lead time components," said Burke.

#### Managing inventory of old parts

He said many customers come to Smith for help in managing inventory of obsolete parts. Burke noted that defense and aerospace equipment have very long lifecycles and parts used in those systems may need to be stored for 15 or 20 years.

Customers come to Smith not only for the sourcing of parts but for the logistics and warehousing of the parts. "We will take the part, keep it in an electro-static discharge, humidity and temperature-controlled environment. We'll

put it in nitrogen storage if customers want that. It gives them security that the parts will be good if they are needed years from now," said Burke.

He said incredibly, some customers "store parts in file cabinets or gun safes. That is just not the proper way to store components."

Smith will do a lifetime buy for customers depending on the customer and the part that is going obsolete. "We get requests for life-time buys quite often. We do them, but it's more of a value add with a customer," said Burke. "It is for companies that we are deeply engaged with and have a good long-term standing working relationship."

He noted that it is one thing for a distributor to hold inventory for 90 or 120 days, "but another thing to tie up millions of dollars of capital for an indefinite amount of time."

#### The aftermarket connection

While buyers often can find obsolete parts from distributors, there are times when the availability of EOL components is very limited if not nonexistent. In such cases, many electronics companies turn to aftermarket component manufacturers.

"If you have some type of core device that goes obsolete and there are no replacements then you can look at going to aftermarket parts manufacturers such as Lansdale Semiconductor

or Rochester Electronics," said Wood. Such companies acquire the manufacturing rights of parts and build them to the same specifications as the original component manufacturer.

Lansdale, based in Phoenix, Ariz., manufactures semiconductors for the telecommunications, defense and aerospace, and wireless communications industries.

Lansdale manufactures more than 3,000 semiconductors in the original package which were originally built by chipmakers such as AMD, Fairchild, Freescale Semiconductor, Harris, Intel, Motorola, National, Philips and Raytheon. The aftermarket manufacturer produces a variety of obsolete semiconductors, including linear, analog, memory and CMOS products.

"What we see is that TTL digital logic devices and PROMs (programmable read-only memory) are our major sellers today, but it has changed year to year," said Lee Mathiesen, operations manager at Lansdale. "Sometimes it has been analog in industrial applications, sometimes HTL for nuclear power stations, sometimes TTL for the P-3 Orion aircraft."

Lansdale's customers range from large OEMs to small subsystem and board manufacturers.

He said it is not just military OEMs that turn to Lansdale for obsolete parts. "Other



"Last-time buys are for companies that we are deeply engaged with and have a good long-term standing working relationship with," said Todd Burke, vice president of business development for Smith and Associates

high-reliability industries such as power generation and telecommunications have been going down the same path as the military for years," said Mathiesen. "For instance, one of Lansdale's old product lines which was originally designed in the 1960s is still used in nuclear power stations."

He said some buyers "exhaust all avenues before coming to Lansdale. "Some find us purely by luck, but most who have been in this business for any length of time know the product lines that Lansdale supports.



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James Carbone  
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# Buyers leverage distributors' services to compete

OEMs and EMS providers, big and small, are increasingly turning to distributors for support in new product introduction, production, inventory management and product obsolescence *By James Carbone*

More electronics purchasers are leveraging the capabilities of distributors, using them not just as a source for components, but for value-added, supply-chain and design services to reduce cost, improve time to market and enhance profitability.

While buyers have long taken advantage of distributor- provided supply chain and value-added programs, demand for such services is rising as supply chains become more complicated and customers need to boost productivity and operate leaner.

"Today, more than 50 per cent of TTI's component sales involve some sort of value-add service," said Michael Knight, senior vice president, Americas for TTI. Such services range from supply chain solutions to custom connector configuration to integration of components into a sub-assembly for the customer.

Small OEMs and electronics manufacturing services (EMS) providers have long been primary customers for distributors, but it isn't just small companies that are looking to leverage distributors services and other capabilities.

"Very large OEMs that were once exclusively direct customers for

component manufacturers are almost all hybrids today, buying both direct and from distribution," said Knight. Large companies are buying from distributors because there are benefits including "assured supply, logistics services, extended payment terms, product return privileges, guaranteed pricing, and reduced MOQ (minimum order quantity) requirements among them, said Knight. "All of which help them with their total cost of ownership."

Component manufacturers also benefit when large companies purchase from distributors to leverage their capabilities. A distributor can greatly reduce a component manufacturer's total cost to service large OEMs.

"Distributors pay faster, smooth the inconsistencies in an OEM's material planning, provide in-person, local support wherever the OEM needs it, including at the EMS providers they may use," said Knight.

While OEMs may benefit from buying from both component manufacturers and distributors, such hybrid relationships can be challenging for distributors. An OEM may negotiate a direct cost with a component manufacturer and then buy from distribution "at the lowest possible mark-up they

"Today, more than 50 per cent of TTI's component sales involve some sort of value-add service," said Michael Knight, senior vice president, Americas

can find over the direct cost," said Knight.

"Often the OEM expects a price from distribution that has no mark-up on it, or worse, a price from distribution lower than the price that has been quoted on a direct basis," he said. The OEMs are trying to gain the services that a distributor provides, which the component manufacturer can't or won't, "at a direct cost effectively valuing the distributor's services at zero," said Knight.

#### Wanted: More services

One distributor that has seen an increase in demand for services is Arrow Electronics. "The number of customers that are using us for value-added services is growing dramatically," said Alan Bird, president Americas for Arrow. Demand for such services is not just coming from startups and the maker movement. "The traditional distribution customer base is also tapping into the services and



capabilities that we have in design and supply chain," said Bird.

Such services include traditional value-added services such as IC programming, kitting, cable assembly, parts labeling, inventory management and other supply-chain and design services. He said Arrow provides customers with a solution from new product introduction to production to aftermarket.

"We leverage our engineering infrastructure and use our supply chain or set up a supply chain to help customers get their product to market," said Bird. He said customers are leveraging distributors' capabilities to improve time the market, to operate lean and reduce cost. Customers are under "incredible pressure to get products to market fast," said Bird. New product development from concept to production may have been 18 months, two years or 36 months in the past.

“Now we have customers that want to go from idea to production in six months,” said Bird. At the same time, customers ranging from startups to established OEMs are “being challenged to do more with less” and need help from distribution, he said.

Customers are focusing on their own core competencies, which traditionally have been design and marketing and looking for help from distributors for the rest. “We are helping them with engineering, supply chain, and production, or helping them through end of life,” said Bird.

**The need for speed and inventory**  
One distributor capability that buyers value is inventory. Dave Doherty, president and chief operating officer at Digi-Key Electronics, said that many customers do business with Digi-Key because of its large inventory and its ability to ship parts the same day that they are ordered.

“Customers of all sizes typically have a long tail of products on their bills of material,” he said. Digi-Key is often “the preferred franchised source” for a wide range of required products that don’t fall into the manufacturer’s or broad line distributor’s “A & B classifications.”

He said a growing segment of North American and European customers have a business model around “speed and not low cost. Whether it’s the OEM trying to quickly build prototypes of their new concept directly or through a quick turn

EMS provider, it creates the need for a responsive partner with available inventory and reliable service level to meet their aggressive timelines,” he said.

Doherty said more customers require just in time solutions. “This is our core competency and we are seeing our customers coming to us more and more for high mix/low volume production requirements,” he said.

He added the design community uses Digi-Key to have access to the latest technology. “We provide awareness and access to all new devices which is valued within the community and aids the design roadmap processes for both our customers and suppliers,” said Doherty.

Some customers use Digi-Key because of cost of ownership concerns. “Customers producing a wider range of varied products with unique component requirements do not want to sit on excess quantities of products with infrequent use,” he said. “Buying the exact quantity in the packaging form they require in their manufacturing process is important.”

Because Digi-Key carries a large amount of inventory, many customers come to Digi-Key during times of shortages. “At any given time, there is almost always an unforecasted shortage of something,” said Doherty. “Shortages cause huge potential financial disruptions for customers, and providing solutions



“Where customer volumes are large with key designs and a clean supply chain, suppliers deal directly with customers in many cases,” said Rich Davis, president WPG Americas

to the same core elements of availability and service is highly sought,” said Doherty.

**The impact of lean**  
Rich Davis, president, WPG Americas said about 35 per cent of WPG Americas’ customers look to the distributor for supply chain services as more companies are operating leaner and have “fewer people than they did years ago.” Startups also operate lean and leverage distribution “because they are small and don’t have the ability to buy direct and need distribution’s support services,” he said.

Many component manufacturers are looking to service fewer OEMs and EMS providers directly because of the support that is required to do so. “Where customer volumes are large with key designs and a clean supply chain, suppliers deal directly with customers in many cases,” said Davis. However, even with customers that have large volumes, “we have seen an uptick in opportunities because suppliers have cut back their own support of those models,” he said.

One distributor capability that OEMs and EMS providers appreciate is assistance with component obsolescence. “This has become an expectation from the customer base,” said Davis. “We do have a process to advise our customers of EOL parts as well as part changes,” he said. “We provide services for the customer to mitigate EOLs in their supply chain while

they upgrade their existing projects,” said Davis. (See related story p. 22)

Besides help with obsolescence, more OEMs and distributors are also looking to distributors for assistance with other issues such as import-export compliance, conflict minerals and environmental regulations.

“The administrative costs associated with things like date codes, export compliance and conflict mineral reporting are a challenge, especially as that service is expected to be complimentary in exchange for the parts order,” said Knight. This has become a pressing issue in the supply chain,” said Knight. He said distribution in general is struggling to keep pace with the growing administrative and data demands. “Where the data comes from, how it is presented and delivered, and how each customer wants it served up varies greatly and is very inefficient, adding to the strain,” said Knight.

“Competing on the basis of the quality of your information is becoming as critical as having the product itself,” said Doherty. Export and import logistics expertise has become a requirement because customers “judge your ultimate lead time from your shipping dock to their receiving dock.” He said customers want a single source to find the answers to compliance questions placed on them around environmental regulations or a growing number of political and legislative restrictions such as conflict minerals.



“We leverage our engineering infrastructure and use our supply chain or set up a supply chain to help customers get their product to market,” said Alan Bird, president Americas for Arrow Electronics

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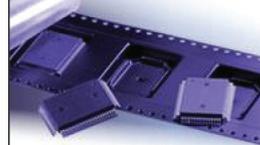
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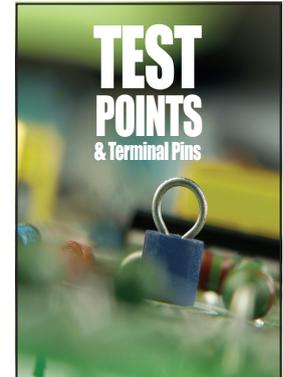
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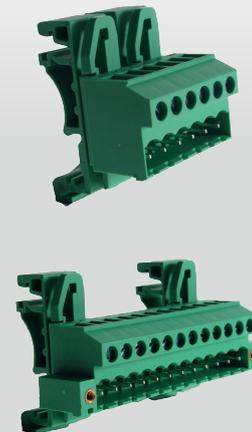
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Davies Molding, LLC.  
DecaWave  
Delta Electronics  
Delta Electronics / EMI  
Delta Electronics / Fans  
Delta Electronics / Power  
Desco  
DEUTSCH Connectors /  
TE Connectivity  
DEUTSCH ICT / TE Connectivity  
DFRobot  
Dialight  
Dialog Semiconductor  
Dielectric Laboratories (Knowles)  
Digi International  
Diligent, Inc.  
Digital View Inc.  
Diodes Incorporated  
Displaytech  
DLP Design, Inc.  
Draloric / Vishay  
dresden elektronik  
Dynastream Innovations Inc.  
E Ink  
EasyBraid Co.  
Eaton  
ebm-papst Inc.  
Echelon  
Econais  
ECS Inc. International  
EDAC Inc.  
Elco (AVX)  
Elcon Connectors / TE Connectivity  
Electric Imp  
Electro Corp (Honeywell Sensing  
and Productivity Solutions)  
Electro-Films (EFI) / Vishay  
Electronic Assembly GmbH  
Electroswitch  
Elna America  
Embedded Artists  
Emerson Connectivity Solutions  
Emerson Embedded Power (Artesyn  
Embedded Technologies)  
EMIT  
Energizer Battery Company  
Energy Micro (Silicon Labs)  
EnerSys  
enmo Technologies  
EnOcean  
EPC  
EPCOS  
Epcos / RF360

Epson  
Equinox Technologies  
EREM  
Essentra Components  
ESTA / Vishay  
E-Switch  
E-Z-A  
Ethertronics  
Eupec (Infineon)  
Eveready (Energizer Battery Company)  
Everlight Electronics  
EverSpin Technologies, Inc.  
Exar Corporation  
Excelitas Technologies  
Excelsys Technologies Ltd.  
Cree  
E-Z-Hook  
Fairchild/ON Semiconductor  
Fan-S Division / Qualtek  
Electronics Corp.  
FCI (Amphenol FCI)  
FCT Electronics - a Molex company  
FDK America  
Finisar Corporation  
FIT (Foxconn Interconnect Technology)  
Flamar - a Molex company  
Flambeau, Inc.  
FLIR  
Fox Electronics  
Foxconn Optical Interconnect  
Technologies  
Free2move  
Freescale Semiconductor, Inc.  
(NXP Semiconductors)  
Fremont Micro Devices  
FTDI (Future Technology Devices  
International, Ltd.)  
Fujitsu Electronics America, Inc.  
Future Designs, Inc.  
Future Technology Devices  
International, Ltd.  
GainSpan Corporation  
GC Electronics  
GE Critical Power  
General Cable  
General Semiconductor (Vishay)  
GeneSiC Semiconductor  
Genuino (Arduino)  
Global Power Technologies Group  
Global Specialties  
Grayhill, Inc.  
Greenlee Communications  
GWConnect - a Molex company  
H&D Wireless  
Hamlin / Littelfuse  
Hammond Manufacturing  
HARTING  
Harwin  
Heatron  
HellermannTyton  
Henkel/Loctite  
Heraeus Sensor Technology USA  
HiRel Systems / Vishay  
Hirose  
Hittite (Analog Devices)  
Holsworthy Resistors /  
TE Connectivity  
Holt Integrated Circuits, Inc.  
Honeywell Microelectronics &  
Precision Sensors  
Honeywell Sensing and Productivity  
Solutions  
I/O Interconnect  
IAR Systems Software Inc  
ICCNexergy (Inventus Power)  
IDT (Integrated Device Technology)  
Illinois Capacitor  
ILLUMRA  
Industrial Fiber Optics, Inc.  
Infineon Technologies  
Initial State Technologies, Inc.  
Innovasic Semiconductor  
Inphi  
Inspired LED  
Integrated Device Technology (IDT)  
Integrated Silicon Solution, Inc. (ISSI)  
Intel® Programmable Solutions Group  
Intematix

Interconnect Systems -  
a Molex company  
Interlink Electronics  
International Rectifier (Infineon  
Technologies)  
Intersil  
InvenSense  
Inventek Systems  
Inventus Power  
IR (Infineon Technologies)  
IRC / TT Electronics  
IRTOUCH Systems Co., Ltd.  
Isocom Components  
ISSI (Integrated Silicon Solution, Inc.)  
ITT Cannon, LLC  
ITT Interconnect Solutions  
ITW Chemtronics (Chemtronics)  
IXYS Corporation  
IXYS Integrated Circuits Division  
J.W. Miller / Bourns  
JAE Electronics, Inc.  
Jinlong Machinery & Electronics  
Co. Ltd.  
JKL Components Corporation  
Johanson Dielectrics, Inc.  
Johanson Technology  
Johnson / Cinch Connectivity  
Solutions  
Jonard Tools  
JRC Corporation / NJRC  
JST  
Judco Manufacturing, Inc.  
Keil (ARM)  
KEMET  
Kester  
Keystone Electronics Corp.  
Khatod  
Kilo International  
Kilovac Relays / TE Connectivity  
Kingbright  
Kings (Winchester Electronics)  
Klein Tools  
Knowles  
Knowles / Syfer  
Knowles Voltronics  
Kyocera  
Kyocera Display  
Laird - Embedded Wireless Solutions  
Laird Technologies  
Laird Technologies - Antennas  
Laird Technologies - EMI  
Laird Technologies - Signal Integrity  
Products  
Laird Technologies - Thermal  
Products  
LAPIS Semiconductor  
Lattice Semiconductor  
LeCroy (Teledyne LeCroy)  
LED Engin  
LEDynamics, Inc.  
LEDiL  
LEM USA, Inc.  
LEMO  
Lighting Science  
Lime Microsystems  
Linear Technology / Analog Devices  
Link Labs  
Linx Technologies  
Lite-On, Inc.  
Littelfuse  
LMB Heeger, Inc.  
LOCTITE / Henkel  
Logic PD, Inc.  
Logical Systems  
LSR  
LTW (Amphenol LTW)  
Lumex, Inc.  
LUMILEDS  
Luminary Micro / Texas Instruments  
Luminus Devices  
Luna Optoelectronics  
Luxo  
MACOM Technology Solutions  
Macraigor Systems LLC  
Macronix  
Maestro Wireless Solutions  
Mag-LED Solutions

Magnasphere Corp.  
 Mallory Sonalart Products  
 Marktech Optoelectronics  
 Martel Electronics  
 Master Appliance Corp.  
 Matrix Orbital  
 Maxim Integrated  
 Maxwell Technologies, Inc.  
 MCB Industrie / Vishay  
 Measurement Specialties /  
 TE Connectivity  
 MEC switches  
 Mechatronics  
 MegaChips  
 Melexis  
 Memory Protection Devices  
 MEMSIC  
 Menda  
 Mentor Graphics  
 Metelics (MACOM Technology  
 Solutions)  
 MG Chemicals  
 Micrel / Microchip Technology  
 Micrium  
 Micro Commercial Components (MCC)  
 Microchip Technology  
 microEngineering Labs Inc.  
 Micro-Measurements /  
 Vishay Precision Group  
 Micron Technology  
 Micronas  
 Microsemi  
 Microwave Technology  
 Midcom / Würth Electronics  
 Mide Technology  
 Midwest Microwave / Cinch  
 Connectivity Solutions  
 MikroElektronika  
 Mill-Max  
 Mills / Vishay  
 Milwaukee / Vishay  
 MMB Networks  
 Molex  
 Molex Affinity Medical Technologies  
 Molex Beau Interconnect  
 Molex Brad  
 Molex FCT Electronics  
 Molex Flammar  
 Molex GWConnect  
 Molex Interconnect Systems  
 Molex NuCurrent  
 Molex Oplink Communications, LLC.  
 Molex Phillips-Medizise  
 Molex PolyMicro Technologies  
 Molex Temp-Flex  
 Molex Woodhead  
 Monolithic Power Systems  
 MPD (Memory Protection Devices)  
 MPS (Monolithic Power Systems)  
 Mueller Electric Co.  
 Multicore / Henkel  
 Multi-Tech Systems, Inc.  
 Murata Electronics  
 Murata Power Solutions  
 Nakagawa Manufacturing USA, Inc.  
 National Semiconductor /  
 Texas Instruments  
 Navman Wireless (Telit Wireless  
 Solutions)  
 NDK  
 Nearson  
 Neohm Resistors / TE Connectivity  
 Nesscap Co., Ltd  
 NetBurner, Inc.  
 Newava Technology  
 Newhaven Display, Intl.  
 Nexperia  
 Nichicon  
 NimbleLink  
 Nippon Chemi-Con  
 NJR Corporation / NJRC  
 NKK Switches  
 NMB Technologies Corp.  
 NorComp  
 Nordic Semiconductor  
 NovaSensor / GE Measurement &  
 Control  
 NuCurrent - a Molex company

Nuvoton Technology Corporation  
 America  
 NVE Corporation  
 NXP Semiconductors / Freescale  
 Octavo Systems  
 OEG Relays / TE Connectivity  
 Ohmite  
 OK Industries (Jonard Tools)  
 Olimex  
 Omron  
 Omron Automation & Safety  
 ON Semiconductor  
 ON Semiconductor/Fairchild  
 On-Shore Technology, Inc.  
 Oplink, a Molex company  
 Optek Technology / TT Electronics  
 Option NV  
 Opto Diode Corporation  
 Opulent Americas  
 O'Reilly Media, Inc.  
 Orion Fans  
 OSRAM Opto Semiconductors, Inc.  
 Packet Digital LLC  
 Paladin Tools (Greenlee  
 Communications)  
 Panasonic  
 PanaVise  
 Panduit  
 Parallax, Inc.  
 Parlex Corp.  
 Patco Electronics  
 Patco Services  
 PCD / Amphenol  
 Peerless by Tympany  
 Pentair  
 Peregrine Semiconductor  
 Pericom Semiconductor Corp.  
 (Diodes Incorporated)  
 Pervasive Displays  
 PHIHONG USA  
 Phillips-Medizise - a Molex company  
 Phoenix Contact  
 Phoenix Mecano  
 Phoenix Passive Components /  
 Vishay  
 Phytion, Inc.  
 Pimoroni  
 PolyMicro Technologies -  
 a Molex company  
 Polytech / Vishay  
 Pomona Electronics  
 Pontiac Coil, Inc.  
 Portescap  
 Potter & Brumfield Relays /  
 TE Connectivity  
 Power Integrations  
 Powerex, Inc.  
 Power-One (Bel Power Solutions)  
 PowerStor (Eaton)  
 PRD Plastics  
 Preci-Dip  
 Precision Design Associates, Inc.  
 Precision Electronic Components Ltd.  
 ProAnt  
 Products Unlimited Transformers &  
 Relays / TE Connectivity  
 Protektive Pak  
 PUI Audio, Inc.  
 PULS  
 Pulse Electronics Corporation  
 PulseCore Semiconductor /  
 ON Semiconductor  
 Q-Cee's / TE Connectivity  
 QT Brighttek  
 Quadcept  
 Qualcomm  
 Qualcomm (RF360 - A Qualcomm &  
 TDK Joint Venture)  
 Qualtek Electronics Corp.  
 Quatech / B+B SmartWorx  
 Radial Magnet, Inc.  
 RAFI  
 Ramtron (Cypress Semiconductor)  
 Raspberry Pi  
 Raychem Cable Protection /  
 TE Connectivity  
 RECOM Power  
 Red Lion Controls

REDEL / LEMO  
 Renesas Electronics America  
 RF Digital  
 RF Solutions  
 RF360 - A Qualcomm-  
 TDK joint venture  
 Richco, Inc. (Essentra Components)  
 Richtek  
 Riedon  
 Rigado  
 Roederstein / Vishay  
 ROHM Semiconductor  
 Rose Bopla  
 Rose Enclosures  
 Rose+Krieger  
 Roving Networks / Microchip  
 Technology  
 RPM Systems  
 Rubycon  
 Sagrad  
 Samsung Electro-Mechanics  
 America, Inc.  
 Samsung Semiconductor  
 Samtec, Inc.  
 Sanken Electric Co., Ltd.  
 Sanyo Denki  
 Sanyo Semiconductor /  
 ON Semiconductor  
 Schaffner EMC, Inc.  
 Schrack Relays / TE Connectivity  
 Schroff / Pentair  
 Schurter  
 SCS  
 Seeed  
 Segger Microcontroller Systems  
 Seiko Instruments, Inc.  
 Semflex / Cinch Connectivity  
 Solutions  
 Semtech  
 Sensata Technologies, Airpax  
 Sensirion  
 Sensitron Semiconductor /  
 SMC Diode Solutions  
 Seoul Semiconductor  
 Serious Integrated  
 Serpac Electronic Enclosures  
 Sharp Microelectronics  
 Sierra Wireless  
 Sigma Designs  
 Sigma Inductors / TE Connectivity  
 Signal Transformer  
 SIL Semiconductor Corporation  
 Silicon Labs  
 SINE Systems / Amphenol  
 Siretta  
 SiTime  
 SkyTek  
 Skyworks Solutions, Inc.  
 SL Power Electronics - Manufacturer  
 of Conдор / Ault Brands  
 SMC Diode Solutions  
 Soberton, Inc.  
 SparkFun  
 Souriau Connection Technology  
 Spansion (Cypress Semiconductor)  
 SparkFun  
 Spec Sensors  
 Spectra Symbol  
 Sprague Goodman  
 SSI Technologies, Inc.  
 Stackpole Electronics, Inc.  
 Staco Energy Products Co.  
 Standex-Meder Electronics  
 Stanley Electric  
 Steinel  
 steute Wireless  
 Stewart Connector  
 STMicroelectronics  
 Storm Interface  
 Sullins Connector Solutions  
 Sunlida Corporation  
 SunLED  
 Sunon  
 Susumu  
 SV Microwave (Amphenol SV  
 Microwave)  
 SWANSTROM Tools  
 Swissbit

Switchcraft / Conxall  
 Syfer  
 Synapse Wireless  
 Tag-Connect  
 Taitien  
 Taiyo Yuden  
 Talema  
 Tallysman Wireless  
 Tamura  
 Taoglas  
 TAOS / ams  
 TDK Corporation  
 TDK RF360  
 TDK-Lambda Americas, Inc.  
 TE Connectivity  
 TE Connectivity Aerospace Defense  
 and Marine  
 TE Connectivity ALCOSWITCH  
 Switches  
 TE Connectivity AMP Connectors  
 TE Connectivity Corcom Filters  
 TE Connectivity DEUTSCH Connectors  
 TE Connectivity DEUTSCH ICT  
 TE Connectivity DEUTSCH  
 INDUSTRIAL & COMMERCIAL  
 TRANSPORTATION  
 TE Connectivity Measurement  
 Specialties  
 TE Connectivity Potter & Brumfield  
 Relays  
 TE Connectivity Raychem Cable  
 Protection  
 TE Connectivity Raychem Circuit  
 Protection / Littelfuse  
 TE Connectivity's Agastat Relays  
 TE Connectivity's Axicom Relays  
 TE Connectivity's Buchanan  
 Terminal Blocks  
 TE Connectivity's CGS Resistors  
 TE Connectivity's CII  
 TE Connectivity's Elcon Connectors  
 TE Connectivity's Holsworthy  
 Resistors  
 TE Connectivity's Kilovac Relays  
 TE Connectivity's Neohm Resistors  
 TE Connectivity's OEG Relays  
 TE Connectivity's Products Unlimited  
 Transformers & Relays  
 TE Connectivity's Q-Cee's  
 TE Connectivity's Schrack Relays  
 TE Connectivity's Sigma Inductors  
 Teccor / Littelfuse  
 Techflex  
 TechNexion  
 Techno / Vishay  
 TechTools  
 Tecodium  
 Teledyne LeCroy  
 Telit Wireless Solutions, Inc.  
 Temp-Flex - a Molex company  
 Tensility International Corporation  
 Terasic Technologies  
 Test Products International (TPI)  
 Texas Instruments  
 t-Global Technology  
 Thermometrics / GE Measurement  
 & Control  
 ThingMagic  
 Thomas Research Products  
 TOKO / Murata  
 Torex Semiconductor Ltd.  
 Toshiba Semiconductor and Storage  
 Touchstone Semiconductor  
 TPI (Test Products International)  
 TPK America LLC  
 Transphorm  
 Trenz Electronic  
 Triad Magnetics  
 TRINAMIC Motion Control GmbH  
 Tripp Lite  
 Trompeter / Cinch Connectivity  
 Solutions  
 Tronics

TRP Connector  
 TT Electronics  
 TT Electronics / BI Technologies  
 TT Electronics / IRC  
 TT Electronics / Optek Technology  
 TT Electronics / Welwyn  
 Tuchel / Amphenol  
 Twin Industries  
 TXC Corporation  
 Tyco Electronics  
 Tympany (Peerless by Tympany)  
 U.S. Sensor  
 UD00  
 Ultra Librarian®  
 Ungar / Weller  
 United Chemi-Con  
 US-Lasers, Inc.  
 Varitronix International Ltd.  
 VCC (Visual Communications  
 Company)  
 VEAM  
 Vector Electronics & Technology,  
 Inc.  
 VersaLogic Corporation  
 Vicor  
 Vifa (Peerless by Tympany)  
 Virtium Technology Inc.  
 Vishay  
 Vishay / BCComponents  
 Vishay / Beyschlag  
 Vishay / Dale  
 Vishay / Huntington Electric, Inc.  
 Vishay / Semiconductor -  
 Diodes Division  
 Vishay / Semiconductor -  
 Opto Division  
 Vishay / Sfernice  
 Vishay / Siliconix  
 Vishay / Spectrol  
 Vishay / Sprague  
 Vishay / Thin Film  
 Vishay / Vitramon  
 Vishay Foil Resistors  
 Vishay Precision Group  
 Vishay Precision Group /  
 Micro-Measurements  
 Visual Communications Company, LLC  
 Vitelec / Cinch Connectivity  
 Solutions  
 Volgen / Division of Kaga  
 Electronics USA  
 Voltronics (Knowles)  
 VPG / Micro-Measurements  
 Wakefield-Vette  
 Walsin Technology  
 Wandboard  
 WeEn Semiconductors Co., Ltd  
 Weidmuller  
 Weller  
 Welwyn / TT Electronics  
 Wickmann / Littelfuse  
 Wiha  
 Winbond Electronics Corporation  
 Winchester Electronics  
 Wintec Industries  
 Wiss  
 WIZnet  
 Woodhead - a Molex company  
 Würth Electronics  
 Würth Electronics Midcom  
 Xcelite  
 Xeltek  
 Xilinx  
 XMOS  
 XP Power  
 Xsens  
 Yageo  
 Zentri  
 Zetex Semiconductors  
 (Diodes Incorporated)  
 ZF Electronics  
 Zilog



# DIGIKEY.CO.UK LINECARD

## 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	
<b>CABLE ASSEMBLY &amp; HARNESSING</b>												
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y	
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	97%	50	1,500+	Y	
<b>CIRCUIT PROTECTION</b>												
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y	
EPCOS/TKD	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	
<b>DISPLAYS &amp; LEDs</b>												
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y	
<b>ELECTROMECHANICAL</b>												
CUI 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	
TKD 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	
<b>ENCLOSURES</b>												
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	
<b>FREQUENCY MANAGEMENT</b>												
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	
<b>HEATSINKS</b>												
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-heatsinks.co.uk	Y	3,000+	N/A	£150	100%	50	500+	Y	
<b>ICs &amp; SEMICONDUCTORS (continued on next page)</b>												
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	



**MOUSER  
ELECTRONICS**



**TEXAS  
INSTRUMENTS**

*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
Infineon	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
<b>ICs &amp; SEMICONDUCTORS</b> (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	4,500	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
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### INTERCONNECTION

<b>INTERCONNECTION</b> (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

### OPTO ELECTRONICS

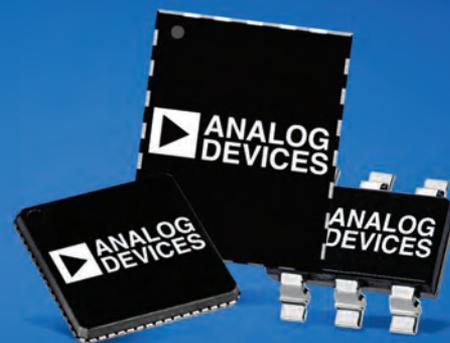
Avago Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	8,200	N/A	£0	89%	50	1,500+	Y
Cree, Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	22,500	N/A	£0	74%	50	1,500+	Y
Dialight	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	9,800	N/A	£0	99%	50	1,500+	Y
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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## 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
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	digkey.co.uk	Y	11,098	N/A	£0	93.56%	150	3,400	Y
ROHM SEMICONDUCTOR CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	63,003	N/A	£0	99.85%	150	3,400	Y
Samsung Electro-Mechanics	Digi-Key	0800 587 0991	digkey.co.uk	Y	21,522	N/A	£0	100.00%	150	3,400	Y
TAIYO YUDEN	Digi-Key	0800 587 0991	digkey.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	digkey.co.uk	Y	275,942	N/A	£0	88.52%	150	3,400	Y
WURTH CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	22,245	N/A	£0	100.00%	150	3,400	Y
Wurth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO CORPORATION	Digi-Key	0800 587 0991	digkey.co.uk	Y	141,986	N/A	£0	83.67%	150	3,400	Y

### POWER & BATTERIES

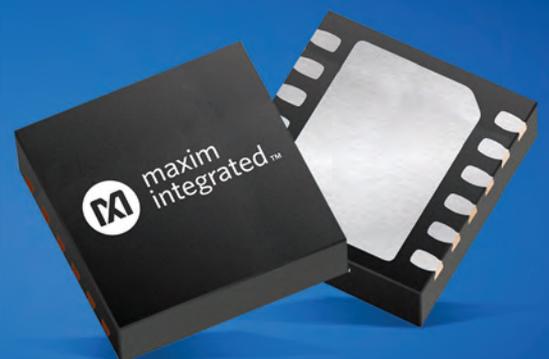
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI 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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## 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
<b>SWITCHES &amp; KEYBOARDS</b>											
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
<b>TERMINAL BLOCKS</b>											
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
<b>THERMAL MANAGEMENT</b>											
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
<b>TRANSFORMERS &amp; INDUCTORS</b>											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
<b>WIRELESS SOLUTIONS</b>											
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 4-10/10-20/20-30	Metal PCBs	Flex / Flex-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, UL	SML	Y	4-16	Y	Y	Y	Y	Y
Cleveland Circuits Ltd	01287 651991	www.pcb.co.uk	M	NE	ISO9001:2008 UL	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
Photonix Group	01903 231901	www.photonix.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	430	11	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	Y	Y	Y	Y	Y	Y
Axiom Manuf. Services	01495 242130	www.axiom-ms.com	£40m	SW	300	3	ISO9001, AS9100, ISO13485, ISO14001, SC21, IPC610E, BSI Kitemark, NADCAP, ISO27001	Y	Y	Y	Y	Y	Y
Briton EMS Ltd (OSI Electronics)	01234 266300	www.britonems.co.uk	£12m	Bedford & Singapore	100	3	ISO: 9001, 13485, 14001, AS9100, BSI Kitemark, IPC610	Y	Y	Y	Y	Y	Y
Challenger Solutions Ltd	01245 325252	www.challengersolutions.com	£5M	Essex/SE	55	7	ISO 9001, 14001, UL IPC-610, SC21	Y	Y	Y	Y	Y	Y
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, 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, IPC-J-STD-001, IPC7711/7721, BSEN 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.iwew.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	Y	Y
JJS Manufacturing	01455 555500	www.jjsmanufacturing.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	£11.25m	SE	120	6	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, TUV, UL, TickIT	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	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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