

ELECTRONICS

JUNE 2018

sourcing

UK & IRELAND

**Component
obsolescence:**

*where old
meets new*

ALSO INSIDE: Rail • Power • Internet of Things • Market Watch • Purchasing

AN MMG PUBLISHING TITLE



Access to
6.8 Million+
Products Online

DIGIKEY.CO.UK

In Stock. On Your Doorstep. 48 Hours.*

Free Shipping on Orders Over £33 or \$50 USD*



0800 587 0991
DIGIKEY.CO.UK



6.8 MILLION+ PRODUCTS ONLINE | 750+ INDUSTRY-LEADING SUPPLIERS | 100% FRANCHISED DISTRIBUTOR

*A shipping charge of £12.00 will be billed on all orders of less than £33.00. A shipping charge of \$18.00 USD will be billed on all orders of less than \$50.00 USD. All orders are shipped via UPS, Federal Express, or DHL for delivery within 1-3 days (dependent on final destination). No handling fees. All prices are in British pound sterling or United States dollar. Digi-Key is a franchised distributor for all supplier partners. New products added daily. Digi-Key and Digi-Key Electronics are registered trademarks of Digi-Key Electronics in the U.S. and other countries. © 2018 Digi-Key Electronics, 701 Brooks Ave. South, Thief River Falls, MN 56701, USA



On the cover – June 2018

Component obsolescence: where old meets new
page 25

Contents

04

Industry trends

Channel continues strong run

06

News

Tough switches now in stock

12

Purchasing

Shortages a thorn in the side

32

Logistics

Facilitating the future

36

Buyers' Guide

All the facts and figures to help you buy

Editor's Word



Introducing Roborep

For the last 20-years I've worked with a media salesperson (no names mentioned) who has the nickname Roborep. It's a term of endearment for their love of the media sales process. Their focus, dedication and subject knowledge is almost machine-like.

Which is why I nearly fell off my seat while listening to a podcast of Google's latest Duplex demonstration. Duplex is described as an extension of Google Assistant that allows it to carry out natural conversations by mimicking human voice. During the demo the assistant helped a woman book a hair appointment and without forewarning I would not have been able to differentiate between the two voices.

It was like I was listening to Roborep V2 but this time it was more robot than human. If, at this stage, Duplex can help someone book a hair appointment why not in the future talk an electronics purchaser through the buying process or advise an engineer on component selection.

In all the discussions regarding future automation, the predicted job losses are not in blue collar manufacturing applications (the core of that process took place decades ago) but white collar managerial roles.

Robots are already writing articles (sports reports I'm told) so I guess my days are numbered. Am I worried? Not really, I'm happy to take the robot writers on. I'll secretly develop new robot-unfriendly editorial styles that are more interesting and useful, slip in under their radar, and create a new audience of people who like the nostalgia of reading human written words.

And the reps? I guess they will get new jobs selling the next generation of robots.

Jon Barnett

Contact

Electronics **sourcing** **mmg** PUBLISHING LIMITED

EDITORIAL

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

ADVERTISING

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

CIRCULATION

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

DESIGN

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

PUBLISHER

Mark Leary
mark.leary@electronics-sourcing.co.uk
Office Manager: Denise Pattenden
denise.pattenden@electronics-sourcing.co.uk

Issue 156, Vol.14 No.6

Published 12 times per year
by MMG Publishing Limited
ANNUAL SUBSCRIPTION:
EU Countries £60 Rest of World £90

MMG PUBLISHING LTD
Suite 2, 1-3 Warren Court, Park Road,
Crowborough, East Sussex TN6 2QX
Tel: +44 (0)1892 613400
Fax: +44 (0)1892 613402
Printed by: Pensord Press Ltd
Electronics Sourcing is printed on
sustainably sourced paper stock
ISSN 2043-9504
© 2018 MMG Publishing Ltd



ELECTRONICS SOURCING IS INDEPENDENTLY ABC AUDITED 2005/2017



Articles appearing in this magazine do not necessarily express the views of the Editor or the publishers. Every effort is made to ensure the accuracy of information published. No legal responsibility will be accepted by the publishers for loss arising from articles / information contained and published. All rights reserved. No part of this publication may be reproduced or stored in a retrieval system or transmitted in any form without the written consent of the publishers. Cover image - ©istockphoto.com/photographicssolutionsuk

Electronic Components Channel

Continues Strong Run



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

The good times will continue to roll in industrial and electronic segments for the remainder of 2018—especially as automation and IoT trends drive the need for more electronic parts

Industry Trends • By Victoria Kickham

Buyers and supply chain executives across the industrial and manufacturing channel remain optimistic about the U.S. economy, which they say shows no signs of slowing down in 2018. This spring's semi-annual economic outlook from the Institute for Supply Management predicts an average of 6.6 percent revenue growth for manufacturers this year—1.5 percentage points above the group's December estimate and 2.5 percentage points above actual revenue growth in 2017.

"With operating rate at 85.8 percent, an expected capital expenditure increase of 10.1 percent, an increase of 5 percent for prices paid for raw materials, and employment expected to increase by 1.8 percent by the end of 2018 compared to the end of 2017, manufacturing is positioned to grow revenues while managing costs through the remainder of the year," the group said in its early May report.

Earnings reports for some of the industry's publicly traded distribution companies bear this out, and point to continued strong business growth throughout the electronics supply channel. In particular, Arrow Electronics reported a strong first three months of 2018: sales grew 22 percent to \$6.9 billion for the quarter and profit grew 22 percent, to \$139.1 million. The distributor cited strength in IoT, industrial automation, and smart cities, homes and vehicles as key business drivers. This was Arrow's fifth straight quarter of record results. Sales in Arrow's global components business grew 21 percent. Regionally, components sales in the Americas grew 15 percent; Asia-Pacific's components sales grew 20 percent; and Europe's components sales grew 32 percent year-over-year.

Avnet Electronics reported solid sales results for the first three months as well. For its fiscal third-quarter ended March 31,

the company saw an 8 percent increase in year-over-year sales—reaching \$4.8 billion. Sales in the Americas fell 4 percent, but sales in Europe, the Middle East and Africa grew 12 percent, and sales in Asia grew 14 percent.

Automation and the Internet of Things continue to drive much of the growth throughout the channel, especially for those serving industrial sectors. Data from the robotics sector helps illustrate the point: The global industrial robotics industry was estimated at \$25.68 billion as recently as 2013 and is expected to reach \$40 billion by 2020, according to one recent study. This comes directly from organizations' desire to control and automate processes such as testing, assembly, packaging, welding, product inspection and painting—factors driven by organizations' desire to improve quality and meet growing end market demand.

At the component level, recent statistics show that the IoT and connectivity trends in general continue to boost growth. Earlier this spring, market researcher IC Insights pegged growth in the O-S-D market at 11 percent in 2018—its highest rate since 2010—driven by higher demand for sensors, actuators, CMOS imaging devices, light sensors, laser transmitters and power discretes across a range of applications. The researcher estimates the sector will grow 7.3 percent between 2017 and 2022, "driven by strong demand for laser transmitters in optical networks and CMOS image sensors in embedded cameras, image recognition, machine vision, and automotive applications as well as the proliferation of other sensors and actuators in intelligent control systems and connections to the Internet of Things (IoT)."

All of this translates to strong business opportunities across the supply channel over the next few months.

Many distributors make claims

We simply have the largest selection of products in stock



ORDER WITH CONFIDENCE

View current editions online

www.electronics-sourcing.co.uk



Tough switches now in stock

RS Components has introduced two new series of switches designed to support intuitive machine safety control in a variety of industrial applications. Developed by EAO, Series 61 emergency-stop switches and Series 45 industrial switches are ideal for use in harsh environments.

Designed to reliably protect people and equipment against injury and damage, the Series 61 E-Stop is ideal for use in handheld control units; alternatively, it can be mounted directly on to a machine. Featuring a robust build quality that meets IP69K, with IP67 protection, typical applications include production and plant machinery, construction and agricultural machinery, as well



as control panels in a range of industrial equipment and devices.

Ideal for use in space critical applications, the Series 61 also features a fool-proof trigger action compliant with EN 60947-5-5 and EN 13850, as well as a green indication ring to show switch actuation.

Series 45 switches are designed for easy assembly and installation into 22 or 30.5mm cut-outs and are available in a plastic, shiny metal or matt metal finish. Again, robust construction offers IP69K protection, with a mechanical life of one million switching cycles and reliable switching from 5 to 500V. www.rs-online.com

Partnering for better air quality

Acal BFi's new partnership with gas-sensor specialist, Cubic, will provide customisable products and solutions to meet rising air-quality-monitoring demands.

Air quality affects everything from local environments to industrial processes, human health and global climate change. As such, the air-quality-monitoring market is set for growth. With its non-dispersive infrared CO2 sensors, laser particle dust sensors and indoor and outdoor quality gas-sensor modules, Wuhan Cubic Optoelectronics provides much needed solutions to these challenges.

As Cubic's sole European technical partner, Acal BFi can now offer bespoke air-quality-monitoring solutions by customising Cubic's products with sensors from Acal BFi. There is also the expertise to add wireless technologies, including Bluetooth, Wi-Fi and LoRaWAN, enabling fast wireless deployment of data-critical quality monitoring.

Business development director at Acal BFi, Martin Kemp, commented: "With a portfolio of leading gas-sensing and wireless technologies and the complete design support to develop custom designs, Acal BFi is now a leading partner for customers in the air-quality-monitoring market."

www.acalbfi.com

Creating smarter solutions

TT Electronics has completed its acquisition of Stadium Group, a supplier of connectivity solutions, power supplies, human machine interface solutions and electronic assemblies. With its emphasis on products for applications such as smart homes, industrial robotics and medical equipment, Stadium brings complementary technologies in industries where TT already operates.

Chief executive officer, TT Electronics, Richard Tyson, commented: "By combining our power electronics capabilities and R&D expertise we will drive growth and opportunity for the newly enlarged TT Electronics. We are committed to providing value, adding engineering solutions and outstanding service and working with our customers to create smarter solutions together."

www.ttelectronics.com



YOUR SOURCE FOR GLOBAL FRANCHISE DISTRIBUTION

In addition to our supply chain services, cost-saving programs, and inventory solutions, **America II provides a wide range of franchise lines** for industries ranging from telecommunications, industrial and lighting to healthcare, automotive and military.

44-1462-707070

www.americaii.eu

A2Efranchise@americaii.com



AMERICA II
EUROPE LTD

The power of distribution

In Brief

Oscillators on quick delivery

Euroquartz is offering delivery of one to two weeks on its latest oscillators. The new EQJF and EQVJF products offer phase jitter of 150fs typical, with frequencies ranging from 50 to 2,100MHz and a choice of outputs including LVPECL, LVDS and CML differential. High current steering logic differential outputs are also available for oscillators up to 700MHz. www.euroquartz.co.uk

EV solutions step up

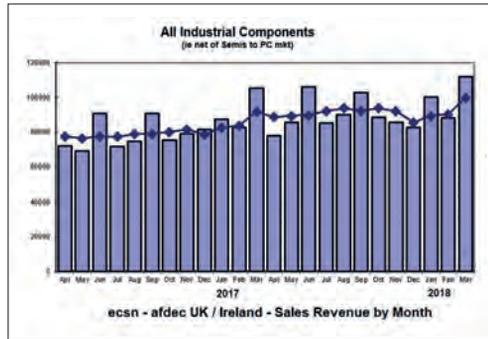
Inelco Hunter can now supply Amphenol's complete range of electric vehicle connectors and cables, for applications from charging to motor control and power distribution. The EV range includes power connectors, signal connectors, rugged cables and complete cable harnesses. Products are IP2X touch-proof as standard, sealed to IP67 / IP6K9K and can accommodate shielded or unshielded cables. www.inelcohunter.co.uk

Search facilities upgraded

LEM has re-launched its website with a focus on providing quick access to product documentation. The intuitive new site now features a technical query facility and easy to navigate menu. Currently available in English, Russian and Japanese, the site can be accessed via computer, smart-phone or tablet. www.lem.com

Control fan efficiency

RS Components is now stocking a new series of low-cost, credit-card-sized, energy-efficient fan controllers from ebm-papst. DCP controllers optimise power consumption by providing temperature-sensitive speed control, while the EC range offers temperature control for fans with energy-saving motors. Both offer a choice of pre-set temperature profiles and a 2m temperature sensor lead, enabling alarm functions. www.rs-online.com



Distributors enjoy stable growth

Authorised distributors enjoyed a strong finish to the first quarter of 2018 according to the Electronic Components Supply Network. Results for the quarter were at the lower end of the association's forecast guidance of ten to 16 per cent growth, yet the outlook remains positive.

ECSN chairman, Adam Fletcher, explained: "Whilst UK customers remain positive about their business prospects in 2018, the Q1 result does suggest a slowing in the underlying growth rate.

"The uptick in inventory levels reported by members of our Association of Franchised Distributors of Electronic Components is further evidence that customer billings are lower than market expectations, but as we move into Q2, I'm confident that the eight to 12 per cent growth range our members forecast will be achieved." www.ecsn-uk.org



Driving automotive

Now available from TTI, Panasonic's LP series power choke coils and ZE series conductive polymer hybrid aluminium capacitors are ideal for demanding automotive applications.

Rugged LP series power choke coils boast inductance stability over a broad temperature range, with low power losses and a low audible noise. The products use a metal composite core and are ideal for automotive applications, where high reliability and compact size are necessary. Application examples include noise filters for various drive circuitry requiring high temperature operation and peak current handling capability.

Combining the advantages of electrolytic capacitors with those of solid polymer capacitors, ZE series hybrid capacitors boast low leakage current and long life, in combination with low equivalent series resistance. These surface mount, ultra-high temperature products have a high endurance of 2,000 hours at 145°C and are vibration proof up to 30G, making them ideal for a broad spectrum of automotive applications including input/output filtering in power converters and voltage regulators, power and battery decoupling and clock circuitry. www.ttieurope.com

Powerful transistors ready to ship

Mouser Electronics is now stocking gallium nitride on silicon carbide transistors from Qorvo, designed to deliver the high signal integrity and extended reach essential for L-band avionics and friend or foe identification applications. Operating with 1.8kW at 65V, the QPD1025 is described as the industry's highest-power GaN-on-SiC radio frequency transistor. Furthermore, the proven reliability of GaN technology makes it an ideal choice for infrastructure, defence and aerospace applications such as radar, communications, navigation and similar applications. Specifically, the Qorvo QPD1025L is a high-electron-mobility transistor that supports both pulsed and continuous wave operations. The device offers 22.5dB linear gain and a typical power-added efficiency of 77.2 per cent. www.mouser.com



Looking for more news?

Receive the weekly electronics e-newsletter for Electronics Purchasing Professionals. Register now to receive your free industry news, components releases, announcements and developments within the global electronics supply chain. Register for free at www.electronics-sourcing.co.uk/newsletter



See Charcroft at
Rail Live
20-21 June 2018
Stand No W74

Charcroft accepts any challenge

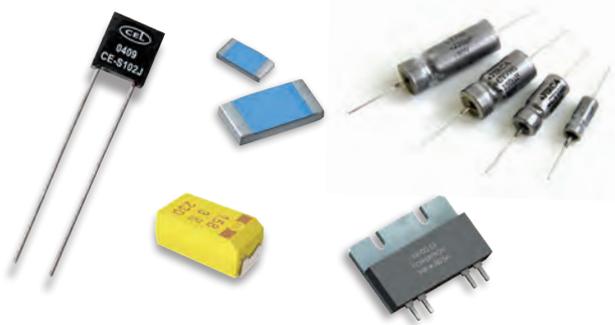
It's simple. At Charcroft, we accept any challenge and go the extra mile to find a solution. By providing specialist support when you need it most, we help engineers to design more reliable systems and buyers to source parts faster and more efficiently.

For buyers

- Auditing BoMs to improve continuity of supply
- Establishing second-source alternatives for allocated passives
- Getting a fast response from franchised manufacturers
- Investing in inventory to minimise back-to-back ordering
- Active inventory planning based on potential demand
- Minimising inventory liability for customers
- Fast prototyping in our Vishay Approved Precision Centre

For engineers

- Trouble-shooting design challenges
- Taking responsibility for delivering a total solution
- Thinking outside the box to find a different approach
- Supporting design-in for continuity of supply
- Enabling specialist though-life support
- UK-based manufacture of custom passive assemblies
- Bespoke assembly service



.....
Call 01591 610408

Chat Online at www.charcroft.com

Click request@charcroft.com



Charcroft: Challenge Accepted



Email: request@charcroft.com Tel: 01591 610408
Passives, power, interconnect, emech and more



Debbie Rowland
Director
debbie.rowland@charcroft.com



Jeff Gurr
Electromechanical Product Specialist
jeff.gurr@charcroft.com



Chris Leek
Power Specialist
chris.leek@charcroft.com



Roger Tall
Passive, Hi-rel Semi & Opto Specialist
roger.tall@charcroft.com

Innovation without delay

ESUK asked Mouser's vice president of marketing, EMEA, Graham Maggs, about the complexities of supporting emerging technology trends in a market dominated by shrinking product lifecycles

Q How have purchasing trends shifted since you joined Mouser eight years ago?

A) There have been several interesting trends. New markets, which can all be described loosely as internet of things platforms, are not being driven by traditional electronics companies, so those involved need different levels of support. It's important to supply the whole ecosystem and Mouser has recognised that by stocking more devkits.

Having inventory available to sell is also vital. Other companies stock against the forecasts of their top customers, but Mouser is continually increasing the available stock we hold. Product lifecycles are reducing, so as one project moves from design to purchasing, another one is starting. This means that the stock we hold must be the latest technology and again, this is different to other distributors who can be slow to stock new technology parts because there is no order history.

Q When a new component is launched, who leads the marketing, Mouser or the principal manufacturer?

A) We work collaboratively with our franchised suppliers, discussing which new parts to stock and how to market them. Of course, large 'blue-chip' companies will have experience, but newer, smaller suppliers with a niche or even disruptive technology may need more guidance. That's why we employ a technical marketing

team who can spot emerging markets and work with a range of suppliers to promote that application.

Q How is Mouser managing extending lead-times to ensure purchasers are not let down?

A) When you see lead-times extending beyond a year, it is time to admit that we are looking at an 'allocation' scenario, however, this is not how Mouser operates. Firstly, we hold a huge amount of stock: over 880,000 unique supplier part numbers. Secondly, that stock is freely available for anyone to purchase. Glenn Smith, our chief executive officer, was quick to foresee and react to the situation and we placed orders of more than double the normal quantity at the end of last year to ensure our customers are not disappointed.

Q When a new product is scheduled to launch, what happens to ensure stocks keep up with demand?

A) A lot of activity! Our supplier marketing teams work directly with the franchise to determine the stock profile and we do no promotion until we have stock on the shelves because we don't want customers to have the negative experience of waiting.

Q What impact do mergers and acquisitions have with overlapping product lines?

A) Some merger and acquisition activity has impacted product availability,

however, Mouser represents almost all the first and second tier electronic component names, so we can offer alternatives and our website makes this easy. In the case of Analog Devices buying Linear Tech, for example, this was good for Mouser's customers, as we added Linear to our linecard.

Q What challenges do you envisage for the electronics supply chain in the future?

A) Predictions are always tricky, but it seems a safe bet that over the next 10 years we'll see at least one more cycle of shortages and lead-time extensions, possibly two. Experienced buyers should have tactics in place for those by now! Counterfeiting is always a problem, but if you buy from an authorised distributor, which only deals direct with component manufacturers, that issue goes away. Also, be aware that when electric and hybrid electric vehicles take off, that will suck up a huge number of components.

Q Finally, what advice would you give to readers sourcing components who are facing extended lead times?

A) Call Mouser!

www.mouser.co.uk



New markets are not being driven by traditional electronics companies, so those involved need different levels of support

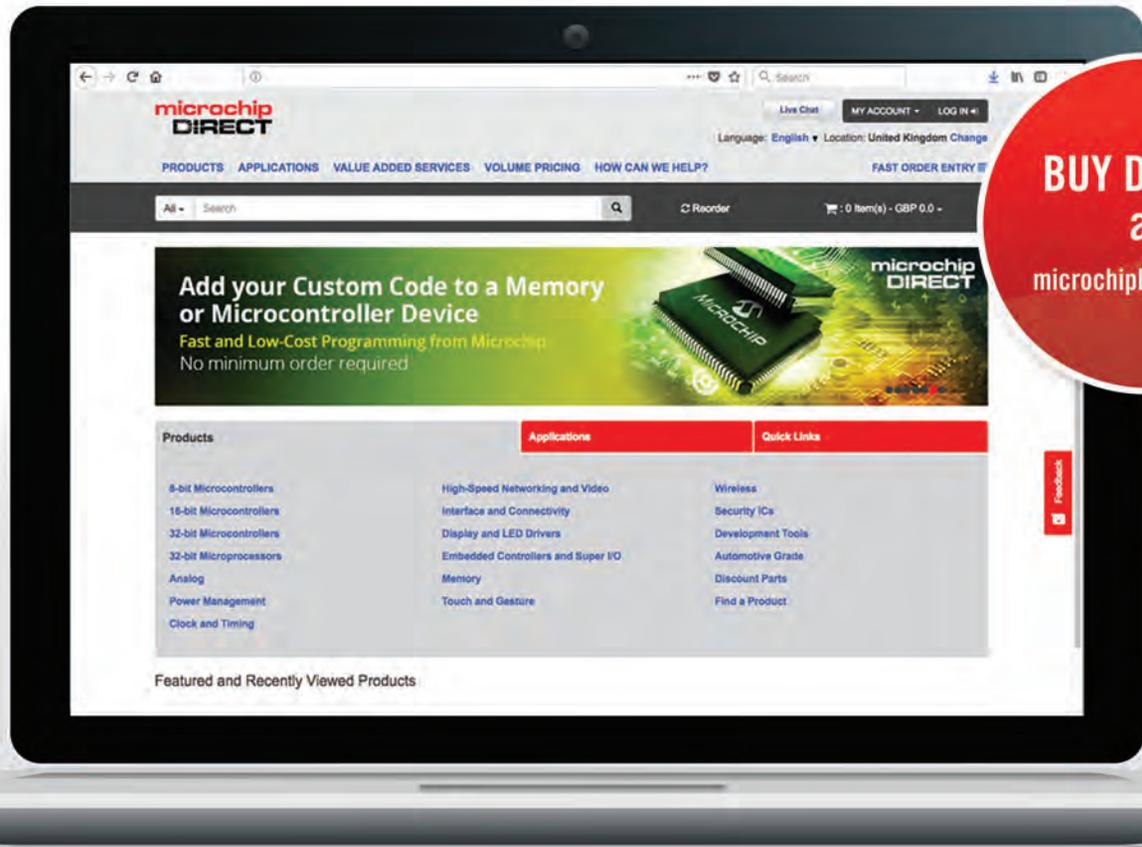


Vice president marketing, EMEA, Mouser Electronics, Graham Maggs



Counterfeiting is always a problem, but if you buy from an authorised distributor, which only deals direct with component manufacturers, that issue goes away

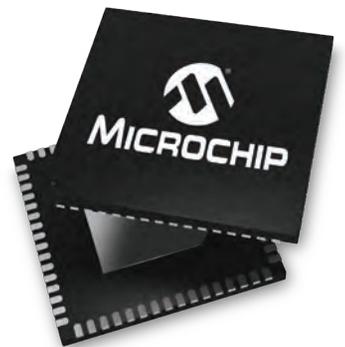
microchip DIRECT



microchipDIRECT offers access to the world's largest inventory of Microchip products and the most comprehensive online resource for pricing and support directly from Microchip Technology. We invite you as a valued Microchip customer to experience our service 24 hours a day, 7 days per week.

Visit www.microchipDIRECT.com and enjoy the confidence and convenience of buying from microchipDIRECT and take advantage of the following features:

- ▶ Direct stock from factory
- ▶ Direct customer service
- ▶ Secure ordering
- ▶ Volume pricing
- ▶ Credit lines
- ▶ Long-term orders and scheduling
- ▶ Programming and value add services
- ▶ Ability to adjust open orders
- ▶ Ship to your sites globally
- ▶ Online order status and notifications



microchip
DIRECT
www.microchipdirect.com

 **MICROCHIP**
www.microchipDIRECT.com

Shortages are proving to be a thorn in the side for buyers

Electronics purchasers are employing a variety of tactics and strategies to manage current component shortages
By James Carbone

For the last eight months or so, many electronics buyers have been struggling with shortages of capacitors, resistors and discrete semiconductors because of strong demand and the lack of investment in new capacity by component manufacturers.

By most accounts, shortages and allocations that began in the third quarter of last year will continue through this year and perhaps into the second half of 2019. Some component manufacturers have long backlogs and are no longer accepting orders. As a result, buyers are hard-pressed to find parts needed for production.

Some are working closely with their component engineering departments trying to determine if there are readily available alternate parts that can be used in a design that could replace a shortage component. Other buyers are searching for little known second- or third-tier suppliers in China or elsewhere in Asia that may be manufacturing a needed part.

Most buyers are scouring all the links in the electronics supply chain and using all the sourcing tools that are at their disposal, including online search platforms such as ECLAauthorized.com, Findchips.com, netcomponents.com among others.

Richard Kelly, vice president of supply chain management at electronics manufacturing services (EMS) provider MC Assembly, based in Melbourne, Fla., said such services are helpful, but can be “redundant to each other.” Online parts

search services that include component brokers often have “inventories that have already been consumed or were ‘bait’ inventories held by brokers to attract you to their business,” said Kelly.

“These types of services often do not validate the accuracy and timeliness of the reported inventory and can lead buyers on a wild goose chase that does not produce positive results,” he said. MC Assembly also uses other design-for-supply-chain platforms such as Silicon Expert for inventory availability and cross referencing.

During the current shortages, some buyers are turning to sources they have not used before. Some of those sources are authorized distributors that they do not regularly buy from, or non-franchised independent distributors.

Many buyers look to catalog distributors for shortage parts. Catalog houses usually sell small quantities of components to engineers for prototype builds. Catalog distributors such as Mouser, Digi-Key, allied and Newark often have a wide breadth of product.

Solving shortages
“At times we utilize authorized catalog distributors for solving shortages,” said Kelly. “Most of them not only service engineering quantities, but production volumes as well for certain devices.”

He said catalog distributors are a very important part of MC Assembly supply chain. Many are integrated into the EMS provider’s supply chain business systems

and its F.A.S.T platform (Forward Alert Solutions Tool), which is a proprietary blend of software services and internally developed processes which supports MC Assembly and its customers’ needs.

EMS provider Vexos also buys a lot of components from catalog distributors during shortages, according to Stephanie Martin, senior vice president global supply for Vexos, based in Markham, Ontario, Canada. She said she can buy thousands of parts from catalog houses noting that Vexos does high-mix, low-volume manufacturing and does not need millions of parts.

To help mitigate shortages, Vexos’ buyers also work with the EMS provider’s sales teams, urging them to provide as much visibility into how many systems Vexos will need to build.

Martin noted that lead times on every bill of material are out over 24 weeks and most of them have components that are over 40 weeks. “So, we are pushing back hard on our program managers, sales teams and going back to customers asking for their best guess forecast so we can get parts on order,” said Martin.

Going gray
But getting extended forecasts is not enough. Vexos is also buying on the gray market “where we can find material although it is drying up rapidly,” said Martin. Vexos has a list of approved independent distributors that have good quality systems,” said Martin.

▶▶ *continued on page 14*



Independent distributors help locate hard-to-find components, carry inventory, and offer third-party testing

– Richard Kelly, vice president of supply chain management at electronics manufacturing services (EMS) provider MC Assembly

**80 years of Creative Links to World Electronics
with more than 50,000 connectors...**



- **Compact: 75% smaller in size than a RJ45**
- **Robust: 5000 mating cycles**
- **High-speed: Ethernet 1Gbps/10Gbps**
- **High EMC resistance**
- **Complies with IEC/PAS61076-3-124**

- **FFC/FPC**
- **PCB-to-PCB**
- **Wire-to-PCB**
- **Wire-to-Wire**
- **Backplane**
- **Mezzanine**
- **RF Coaxial**
- **Interface**
- **Circular**
- **Modular**
- **Optical**
- **Power**
- **Automotive**



Kelly said that MC Assembly also buys from a handful of independent distributors. “They help locate hard to find components, carry inventory, and offer third-party testing,” said Kelly. “At times they have what we need. The good ones can vet out market availability quickly and work toward meeting our target price,” he said.

The EMS provider has a “precise set of business rules for engagement and risk avoidance” when buying from non-franchised distributors. However, some of MC Assembly’s customers do not allow deviating from franchised distributors, while others allow MC Assembly to buy from specific independent distributors.

“We have partnered with a few and avoid buying from a large number as they typically are working from the same inventory pools,” said Kelly.

However, independent distributors are not “our first choice in solving shortages. We prefer working through franchised channels at all times,” said Kelly.

Providing advice, not just parts

While non-authorized sources for parts may not be the first choice for many buyers, they often have hard-to-find parts in stock or know where they can be found. They can also offer advice to buyers who may be inexperienced purchasing components on the open market. For example, a buyer may call a dozen or more independent distributors and brokers looking for a shortage part, said Chris Kolodko, sales manager, Americas for Fusion Worldwide, based in Boston.

Those distributors and brokers may not have the parts stock and in turn call four or five potential sources that may have them. However, with so many people calling about the parts, it creates an inflated idea of demand which

drives up the price for the components.

“This is not the best strategy,” said Kolodko. “It’s more strategic if you go to two or three specific sources for the parts,” from the beginning, he said.

Some buyers at OEMs and EMS providers have evaluated, audited and qualified a handful of independent distributors and developed close relationships with them. Global independent distributors say such buyers have learned that independent distributors can do more than just provide components during shortages.

They say larger OEMs with sophisticated supply chain organizations rely on leading independent distributors to provide visibility and flexibility in the electronics market. Because of their position in the supply chain, independent distributors often can give customers a heads up about emerging supply chain issues. Such issues could include when certain parts are about to go into a shortage, an imminent port closure or worker strike, or if a specific supplier may be at risk because of financial trouble. Often, independent distributors can also suggest options to manage such situations.

“A global independent distributor can be thought of as an authorized franchised distributor without a line card,” said Andrea Klein, CEO of Rand Technology, based in Irvine, Calif. She said there are only about 10 large global independent distributors that can provide visibility into the supply chain. “That kind of visibility helps you manage risk and to make better business decisions,” she said. “We create flexibility for them.”

Forging partnerships Klein said while some customers may turn to Rand and other independent distributors when there

are shortages, “the top most sophisticated OEM supply chains have strategic partnerships with independent distribution. Anyone who doesn’t now is kind of old-fashioned,” said Klein.

Many top-tier OEMs partner with Rand providing not just parts during shortages, but critical market intelligence. Klein said every week she meets with senior leadership at top-tier companies either in person or on conference calls and “gives them an overview of the market, the sectors, the supply chain, challenges that different companies have had to overcome and some of the solutions,” she said. I’m helping set their expectations so that they can make decisions. It’s very strategic,” said Klein.

Rand has been in business for 26 years, but even newer, global independent distributors have strategic partnerships with some customers. For instance, NewPower Worldwide, based in Nashua, NH, has been in business for just three years, but has grown in sales to \$100 million, said Carleton Dufoe, founder and CEO of the company “Our number of strategic customers is growing and that has been an ongoing trend,” he said.

Buyers are taking a strategic approach to their approved vendor list and to understanding the market, according to Dufoe. They are looking for market intelligence and “want data points when the market is good and when it’s not,” he said.

One way NewPower works with customers strategically is by providing them with market intelligence when customers are about to go into yearly negotiations with component manufacturers. “They want to know what we are hearing about the price points with certain components and where



The top most sophisticated OEM supply chains have strategic partnerships with independent distribution

- Andrea Klein, CEO of Rand Technology



Fusion wants to be more than just the “go-to guy” when there is a shortage. We want to be truly part of customers’ supply chain, but it takes time and work

- Paul Romano, chief operating officer for Fusion Worldwide

suppliers may be lowering prices or increasing them,” said Dufoe.

He said strategic customers will audit NewPower to make sure that all the “capabilities that we claim are partner embedded, vetted and intact from our ISO-certification to all of our quality processes,” he said. Customers that are considering partnering with NewPower want to make sure they will get good quality components from the distributor.

“In today’s world it’s not enough just being able to detect counterfeit parts and have good quality,” said Dufoe. “You have to have good relationships and you have to be able to demonstrate that you can deliver product in time of need,” he said.

Paul Romano, chief operating officer for Fusion Worldwide, said the majority of the independent distributor’s customers view Fusion as a strategic partner. Such customers earmark a certain amount of their spend for the open market.

“They use us for inventory and for information about the market so they can intelligently plan and forecast,” said Romano.

He added that Fusion is further trying to develop strategic relationships with customers. “We are trying to show them the value of all the different value-added programs,” said Romano. “Those programs can help them better manage risks and the bumps and inefficiencies that occur because we can see what is happening over the entire market, not just their little patch,” he said.

Romano said that not all customers view Fusion as a strategic partner, but the “vast majority do because we very proactively provide them” with market intelligence and value-added programs. Fusion wants to be more than just the “go-to guy” when there is a shortage. “We want to be truly part of their supply chain, but it takes time and work,” said Romano.

Shortages: a competitive advantage

While shortages are a thorn in the side for many buyers, Kelly believes they are an opportunity for MC Assembly. “As the

electronics market has moved into a constraint/allocation mode, our capability at locating difficult to find components has translated to a competitive advantage for MC Assembly,” he said.

He said the EMS provider differentiates itself with its “total supply chain approach, which integrates experienced buyers, state of the art procurement systems and years of experience

in the high-mix, low-volume market (HMLV) market.”

Kelly noted MC Assembly often must purchase parts that have long lead times because the components are based on older technology or the parts have already gone end-of-life.

“This has required our purchasing team to develop extreme capabilities for searching out difficult-to-get components on a

regular basis,” said Kelly. Such capabilities mean buyers have “knowledge oriented around specific electronic components,” including sources for a specific part that has gone EOL.

“These are the situations where a seasoned buyer with a creative aptitude can bring true value beyond tactical execution of an MRP order sheet,” said Kelly.

DESIGNER DIECAST ENCLOSURES

Perfect for your industrial electronics

aluCASE

aluDISC

aluPLUS

aluCLIC

conTROL

handCASE

conFORM

IP66 / IP67 ENCLOSURES

Highly sophisticated aluminium enclosures with many unique features. These include recessed lids for keypads, lid retaining straps and clip-on trims which hide all of the fixing screws. Huge range of sizes and styles.

Tel. 01489 583858

www.rolec-enclosures.co.uk

Fully customised to order!



Despite growing chip integration, demand for discretes will rise

However, unit shipments and revenue in 2018 won't be as strong as 2017 when sales and shipments increased by about 11 per cent



James Carbone

The discretes semiconductor market will rise 3.1 per cent annually over the next five years and will be less volatile than in the past, according to researcher IC Insights.

Discretes revenue growth will be slow, but steady compared to previous years when revenue would spike upwards one year and decline the next. The worldwide discretes market will increase from \$24.6 billion in 2017 to \$28.7 billion in 2022, said IC Insights.

Discretes revenue will grow despite modest declines in average selling prices. The overall average price for discrete device from 2017 to 2022 will decline 0.9 per cent from 5.8 cents to 5.6 cents, the researcher said.

Unit shipments of discretes will increase about 4.1 per cent during that time rising from 421.2 billion in 2017 to 513.8 billion in 2022.

"We are seeing huge demand across all discrete product lines, including MOSFETs, rectifiers,

thyristors and IGBTs," said Andrea Tranchida, director of marketing power and discrete devices for STMicroelectronics, based in Geneva, Switzerland. "Demand is strong across all segments" especially for power MOSFETs. "We are seeing a relentless increase in demand and there is not any sign demand is slowing down," he said.

The discretes market includes diodes, small signal transistors and switching transistors, power transistors, rectifiers, thyristors, varactor tuning diodes, and selenium rectifiers. Power transistors is the largest product category accounting for 58 per cent of discretes revenue in 2017, according to the researcher. Power transistors include MOSFETs, bipolar power transistors insulated gate bipolar transistors (IGBT), RF and microwave power transistors and Darlington power transistors.

Ron Lineback, senior market research analyst for IC Insights, said discretes unit demand increased 11 per cent and sales grew 11.4 per cent in 2017, which

was "four times greater than its average growth rate over the last 20 years." As a result, lead times stretched and prices increased for some discretes, including MOSFETs. The good news for buyers is demand won't be as robust in 2018 as unit shipments will rise about 6 per cent and sales 5 per cent. The average price of a discrete will decline by about 1.2 per cent, said Lineback.

Slower growth rate

Discrete sales growth will continue in 2018, although at a slower rate, because of healthy economic growth in different regions of the world, he said.

The discretes market is often volatile because many discretes are low-cost products and there are often multiple sources for them. For the most part, there's little concern that discretes will be available even if there is a sharp increase in demand.

Buyers will often purchase large volumes of parts when there is strong demand for the systems that their companies build, but then cut back purchasing

discretes when the forecast for end products slows.

"Purchasers at system makers cancel purchase orders as soon as they think there may be some economic slowdown or some problem in the marketplace," said Lineback. "They will then come back and build up inventories" when demand for their end systems increases, he said.

That's what happened last year. "We saw some of the inventories being built up last year," said Lineback. "We don't think we'll see that going on this year and that's why the growth rate is going from almost 12 per cent to 5 per cent. But we don't see a hard fall," he said.

In the longer term, "we still see discretes growing even though the common wisdom is everything is getting integrated onto an integrated circuit," said Lineback. Despite the trend towards more chip integration, demand for power discretes will continue and "we are seeing a whole range of new applications emerging" that need discretes.

By the Numbers



3.1%

The compound annual growth rate for discretes through 2022



5.6 cents

The average selling price for discrete semiconductors in 2022



\$28.7 billion

The projected size of the worldwide discretes market in 2022



448 billion

The number of discrete semiconductors that will ship in 2018



0.9%

The average annual price decline of a discrete semiconductor from 2017-2022



"The fact is can't you cannot build a product without discretes," he said.

Discretes needed for automotive
One growing customer segment for discretes is automotive. It's no secret that electronics content, including discretes, in vehicles is increasing in conventional gasoline-powered vehicles as well as electric vehicles and hybrids.

Tranchida said "new generation of cars particularly EV and hybrid will boost adoption" of discretes, especially IGBTs and MOSFETs, said Tranchida.

"With EVs it is not just about the car itself. It is also about the infrastructure that goes around the EV," said Tranchida. He noted that fast-charge stations will need to be built "which is an opportunity for power discretes."

Other customer segments that will drive demand for discretes include consumer, industrial, computer, and communications. Consumer is the biggest segment for discretes accounting for 26 per cent of discretes revenue followed by industrial, 23 per cent and automotive, 19 per cent, according to IC Insights.

For the rest of 2018, buyers can expect tight supply and long lead times for many discretes, especially MOSFETs because of growing demand from multiple

customer segments. However, suppliers are adding capacity and after 2018 there should be enough capacity in place to meet the requirements of systems manufacturers over the next five years, said Lineback.

He noted that there are many established discrete manufacturers for discretes including Infineon, ON Semiconductor, STMicroelectronics, Rohm, Renesas, Vishay, Nexperia, Fuji Electric, Microsemi and Toshiba. With demand remaining strong manufacturers should increase capacity. In addition, there are growing number of discrete manufacturers in China which could further boost supply.

Emerging Asian discrete manufacturers may help mitigate the impact on capacity caused by recent consolidation among discrete semiconductor manufacturers. In recent years, Infineon bought International Rectifier, ON acquired Fairchild and QUALCOMM purchased NXP.

Growth for GaN discretes
While consolidation is one trend that semiconductor buyers should watch, they should also keep an eye on emerging use of gallium nitride and silicon carbide in discretes, according to Lineback.

"Gallium nitride and silicon carbide make MOSFETs much more efficient, but the problem is the cost of those materials is

Unit shipments of discrete semiconductor will post slow but steady growth through 2022 when more than 513 billion discrete chips will ship
Source: IC Insights

Discrete unit shipments to post steady growth



higher than silicon," said Lineback. Despite the cost, "gallium nitride is getting a lot of momentum with most major discretes manufacturers making gallium nitride MOSFETs," said Lineback.

GaN transistors have about one-tenth the resistance of silicon-based transistors, according to Cambridge Electronics, which develops GaN chips. Such lower resistance results in higher energy efficiency and faster switching so that power electronic systems can be manufactured much smaller.

Increased energy efficiency means computers and data centers will use less electricity reducing energy costs. Gallium nitride transistors used in electric cars can boost the power output of the car, make it more energy efficient and lighter, allowing the car to drive farther per charge.

Gallium nitride discretes can be used in power supplies, wireless charging systems, solar power systems in computers and telecommunications equipment.

Some manufacturers are manufacturing silicon carbide discretes because SiC devices can sustain higher voltages and currents than silicon. In addition, SiC chips can be shrunk in size reducing resistive losses and operate up to 400 degrees C compared to 150 degrees for silicon.

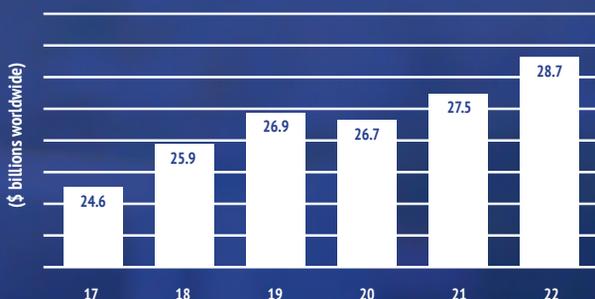
SiC chips are also better able to handle other disturbances besides heat, including radiation and intense electromagnetic fields. They can be useful in military applications.

Because they are more efficient and the cost is falling, the GaN/SiC power transistor market will grow over the next five years. Sales were just \$105 million in 2017 and are forecast to reach \$870 million in 2022, which is a compound annual growth rate of 52.6 per cent, said IC Insights.

GaN/SiC power transistors, excluding RF and microwave power transistors, represented just 0.8 per cent of total power transistor sales in 2017 and are projected to reach 5.5 per cent in 2022, the researcher said. Total GaN/SiC power transistor and diode sales were \$216 million in 2017. SiC-based diodes have been on the market since early last decade, while GaN/SiC power transistors have been available for about six years.

The bad news for buyers is there are fewer second sources for GaN and SiC discretes than silicon products, which might be holding back growth in addition to the higher cost of compound semiconductor (wide-bandgap) technology when compared to conventional silicon devices, IC Insights said.

Discretes revenue to grow 3.1%/year



The worldwide discrete semiconductor market will increase from \$24.6 billion to nearly \$29 billion by 2022
Source: IC Insights

Keeping ahead of expectations

Although the global economy shows signs of improvement, budgets are still tight, and buyers remain under pressure to control costs, while also increasing competitive edge through customization

Over the past five years, CamdenBoss has increasingly been asked to supply its high standard terminal blocks at more competitive prices. This market-driven request led directly to the development of the CamBlock Plus range, a comprehensive family of terminal blocks from 2.54 to 10.16mm pitch. Designed specifically to address highly competitive markets where cost savings are mandatory, the range boasts lower prices without the disadvantages of sacrificing quality or approval level.

The new CamBlock Plus 2.54mm pitch rising clamp terminal block, for example, is designed for use in applications with limited space or for low power products and is ideal for research and development, lighting, or fire and security products where space is at a premium. Described as competitively priced, it offers two to 12 poles and is UL approved. Development of more CamBlock Plus ranges is continuous, with products holding UL and VDE approvals where the industry deems it appropriate.

Tackling harsh environments

Thanks to the implementation of innovative technology CamdenBoss has introduced a range of water and dust proof products, approved to ingress protection IP68. This rating means no dust can get into the products, which can also be submerged under water up to specific pressures. Equipped with this total dust ingress protection rating, the CPWP3 range of connectors meets this standard and offers further benefits

including an ingenious one-piece construction. Not only does this aid ingress protection, it also reduces the possibility of incorrect assembly.

In total, there are three models available: a waterproof field assembly T-connector, a waterproof field assembly in-line connector and a three-pole waterproof panel mount connector. Furthermore, the robust CPWP3 range features an integrated terminal block design so there are no small parts that might be dropped. This makes them ideal for use in field wiring applications where losing parts would create difficulties. The compact one-piece construction also supports ease of installation with color-coded screws or terminals making wiring up easy. The inclusion of Braille points further ensures correct identification of connections in low light conditions.

Staying with the waterproof theme, other new releases include circular connectors in the premium CamCirc IP68 multi-pole range, which are ideal for a multitude of applications. A rugged, high quality and high-performance interconnection solution from two to over 20 poles, CamCirc products are designed not to disconnect when the cable is under load or stress and are color coded to ensure correct mating.

Creating custom solutions

Another increasingly important trend is customization, whether in terms of functionality, dimensions, appearance or construction.

According to design manager at CamdenBoss, Dan Smalley: "CamdenBoss is experiencing an increase in demand for both customizing 'off-the-shelf' products and for completely bespoke designs. On our standard products, this can range from something as simple as different color end caps or corners to match a customer's corporate colors, to adding printing using digital printing technology, or even LED light pipes, to make the product look less generic."

To meet the requirement for completely bespoke designs, CamdenBoss has developed an approach called flat sheet plastic technology, which allows custom cases to be made quickly and cost effectively. An experienced



The IP68 rating means no dust can get into the products, which can also be submerged under water up to specific pressures

Circular connectors include the premium CamCirc IP68 multi-pole range





The CamBlock Plus range is designed to address highly competitive markets where cost savings are mandatory

team of in-house design engineers allows CamdenBoss to offer this service.

Dan Smalley continued: “One engineer is assigned to the project from sample to production, which helps to ensure a smooth and seamless customer experience.”

Custom enclosures get tough
These custom enclosures can now be made suitable for use in harsh environments thanks to a joining technique developed by CamdenBoss to ensure that the enclosures are completely watertight. This enhancement, capable of offering up to IP68 rating, enables purchasers to specify custom enclosures in many more applications than were previously possible, including outside environments. Other benefits that can be incorporated into the range include anti-microbial, UL rated self-extinguishing, or translucent materials.

The ability to offer a one-stop-shop service that includes design and customization as well as an extensive range of standard products enables CamdenBoss to cater for a multitude of applications such as broadcasting, military, energy, marine, food processing, industrial, automotive, autosport, medical, oil and gas, rail, robotics, agriculture and security. Not only this, CamdenBoss believes it also supports its efforts to focus on providing excellent customer service.

www.camdenboss.com

ECOPAC POWER LTD

Info@ecopacpower.co.uk | www.ecopacpower.co.uk
Sales: 01844 20 44 20 | Technical: 01844 20 44 30

Power Supplies

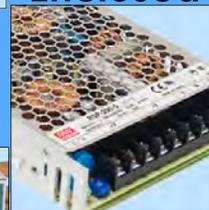
LED Drivers



External



Enclosed



IP Rated



Din Rail



Open Frame

Distributor of



Power Supplies



DC/DC converters reliably deliver up to 300W

Powersolve's TZL series high performance DC/DC converters feature a 2:1 input range and provide between 60 and 300W from a chassis-mounting metal cased unit. They are designed for applications requiring a reliable power source with a long mean time between failures.

There are 14 models in the series with input voltages ranging from 18 to 72V DC and outputs of 12 and 24V DC. All models feature 1,500V DC I/O isolation and offer input reverse polarity protection, overload and short circuit protection, soft start and low inrush current.

Manufactured by Tracopower, the supplies meet international EMC and safety standards and are fully compliant with the low voltage directive. www.powersolve.co.uk



Medical grade adaptors deliver on flexibility

Luso Electronics is now offering a range of medical grade power adaptors with various flexible options from Adaptor Technology.

Available in 12 and 20W families, these EN60601-1 certified wall mount units feature two times MOPP rating. Units require a universal input of 100 to 240V making them suitable for use globally. They are also offered with a variety of plugs including UK, EU, US, Australian and a 'changeable' unit with all versions supplied. Adding to the flexibility, units are available with a range of connectors and custom labelling. www.lusoelectronics.com



Robust converters provide efficiency in rail settings

XP Power has unveiled a new family of high-power density DC/DC converters for railway traction, rolling stock and harsh environment applications. Units provide power handling capability from 50 up to 600W, with all models available in industry-standard brick formats.

Designed to meet increased demand for on-board electronics systems, the converters are suitable for a variety of railway applications, including: drive and power control; warning and protection systems; video surveillance and radio/communication systems; access and ticketing machines; as well as door control and lighting.

All four series in the family are approved to EN50121-3-2 and EN50155 standards for EMC and safety compliance in railway applications.

Units are said to deliver high efficiency, leading to a reduced need for cooling, however, with the addition of baseplate cooling, the converters can be used in equipment with sealed housings. This makes them ideal for traction and rolling-stock environments. An operating temperature range of -40 to 100°C further enables year-round operation in diverse and thermally challenging environments. www.xppower.com

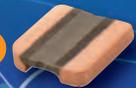
From Power to Precision

Isabellenhütte low ohmic, precision & power resistors with excellent long-term stability, high current & pulse load handling capabilities across the range

Through-hole and surface-mount power resistors available in various packages including 2 and 4-terminal options for current sensing applications

INTRODUCING THE NEW ...

BVF series of maximum performance, minimal size, AEC-Q200 qualified precision shunt resistors



PRECISION ELECTRONIC COMPONENTS, PRESSURE & TEMPERATURE SENSORS, CONNECTORS



RHOPOINT
COMPONENTS

www.rhpointcomponents.com

Now offering Live Chat on our website

01342 330470

LIGHTING

POWER SUPPLY

TRANSPORTATION



WORLD CLASS

ELECTRONIC SOLUTIONS. COMPONENT TO PRODUCT.

Components Bureau provide a range of passive, opto & wound component solutions for the lighting, power supply and transportation markets.

Visit www.componentsbureau.com | Call + 44 (0) 1480 412233 | Email info@componentsbureau.com

Wire and Cable Markers



Many Styles & Materials...

Select from heat shrinkable, tie-on markers, adhesive labels, plus hardware and software.

Spend £2,050 on TE identification sleeves and get a T200 printer free. T&Cs apply please see web link.



Quote ELECTROSOURCE



AUTHORIZED DISTRIBUTOR

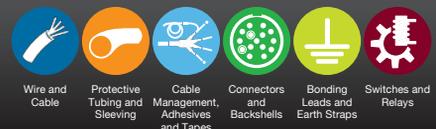


Harnessing Products & Electro-Mechanical Solutions for Demanding Environments

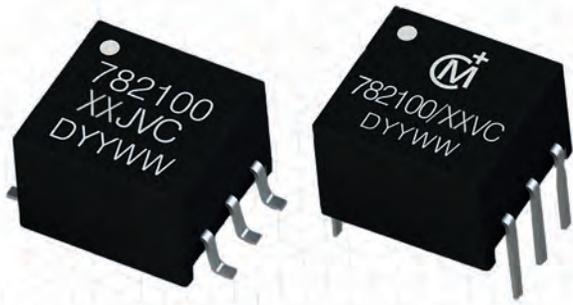


Website: www.is-rayfast.com
Telephone: +44 (0)1793 616700
Email: sales@is-rayfast.com

for promotions and catalogue requests...
www.is-rayfast.com/esource



New customer discount applies to the first order placed only



Pre-approved transformers cut qualification time

Murata's new 782100 series transformers are designed specifically for use with Peregrine PE22100 push-pull DC/DC converter driver ICs. This combination of driver IC and transformer allows easy implementation of an isolated DC/DC converter rated up to 1W, typically used for powering the secondary side of an isolated data interface such as RS232, RS485 or CAN bus.

Surface mount and through hole versions of the transformers are available in industry standard footprints with various input/output options. Output voltages are as specified after external rectifier diode drops and all transformer variants have a 4kV DC isolation rating featuring tightly controlled toroidal construction for high efficiency, close magnetic coupling and low EMI.

pSemi, a Murata company, has tested and approved the transformers for use with its ICs. Product manager at Murata Power Solutions, Andrea Polti, explained: "The collaboration between Murata Power Solutions and pSemi means users do not need to separately qualify a magnetics source when using the peregrine IC, saving time and expense."

www.murata.com



Medical supply boasts ultra high density

Power conversion specialist, Gresham Power Electronics, has introduced a new micro-footprint, ultra high density 225W output power supply designed to meet the requirements of medical, LED lighting, telecom and industrial applications.

OF(M)225 series open frame switching power supplies utilise advanced circuit topology to deliver 225W with fan cooling and 120W when convection cooled. Supplies are housed in an industry standard package measuring 50.8 by 101.6 by 25.4mm.

Gresham boasts that the supplies feature cutting edge power density of 28W/in³, typical efficiency up to 94 per cent and a universal AC input with active power factor correction. Output voltages of 12, 15, 24, 30, 48 and 56V DC are available.

www.greshampower.com



**WE WANT
A DC DC CONVERTER
FOR OUR SOLAR POWERED
INSTALLATIONS**



**YOU NEED
A CONDUCTION COOLED
RELEC CONVERTER**



- High Reliability (>1000k hrs)
- Operation to 100 degrees
- Custom integrated solution
- Adjustable outputs
- Detailed application notes
- Choice of input ranges
- Overseas CEM support
- UL / CE safety reports

... and that's just the beginning!

01929 555800

sales@relec.co.uk relec.co.uk

RELEC

STANDARD IS JUST THE BEGINNING THE SPECIALIST IN POWER CONVERSION AND DISPLAYS

Power & Batteries



Portable supplies target intelligent automotive testing

Telonic Instruments has announced the UK release of Kikusui's PWR-01 series benchtop programmable DC power supplies. Ideal for use in the automotive, aerospace and energy industries, the series consists of 12 instruments, with models offering 400, 800, and 1,200W rated power output and maximum rated voltages up to 650V. Supplies are equipped with a four-times voltage and current variable ratio, providing flexible current and voltage for a variety of applications.

The PWR-01 can be used as an alternative power source to batteries, for agility testing of engine control units, on-board electronic components or for driving power sources for sensors.

Variable internal impedance also allows for various types of simulations in automotive test and other battery-driven applications as well as solar-panel evaluation.
www.telonic.co.uk

Hot-swap connections ensure no break power

PULS Power has introduced two new Din-Rail power supplies featuring an integrated mosfet based decoupling function facilitating N+1 redundant operation without an external decoupling unit or use of inefficient 'OR-ing' diodes.

The CP10.241.R2 and CP20.241.R2 offer output power of 240W and 480W respectively and both feature hot-swap connectors ensuring no-break power in mission critical applications. Other standard features include universal AC input, active power factor correction, minimal inrush current surge and standard output voltages of 12, 24, 36 and 48V DC. Units also feature a 20 per cent 'power reserve' for peak load demands, safe HiccupPLUS overload protection and internal DC OK contact.

Various international safety agency requirements are met and the PULS CP series also complies with the demands of hazardous locations. Typical applications therefore include transportation, industrial systems, semiconductor manufacture, renewable energy systems, drives and controls, robotics and medical.

UK country manager for PULS, Marco van der Linden, said: "These new N+1 redundant, hot-swappable DIN-Rail power supplies reduce system complexity and cost, offer shorter installation times and space savings of more than 45 per cent over conventional power solutions."
www.pulspower.com

WILSON

PROCESS SYSTEMS

ELECTRONICS MANUFACTURING SERVICES

In-house processes including:

Oversized PCB Capability

Automated SMT/Through-Hole Assembly

Hand Assembly/Box Build

Design For Manufacture

Environmental Testing

Wide Range of Coatings/Encapsulation

Full Test Services

IPC Certified Staff



AN AGILE, RESPONSIVE, RELIABLE CONTRACT MANUFACTURER BUILDING ON YOUR DESIGN

Visit our website to see our full capabilities
and videos of our main processes

www.wps.co.uk

01424 722222

enquire@wps.co.uk





Challenge our Quotes team today

- Price stability
- Rapid response
- Competitive pricing on large quantities
- Inventory management

Not in the catalogue? Above our end column? Not a problem! We welcome the chance to beat your current prices by quoting you on volume orders, sourcing items from our suppliers' extended ranges or those not available in our product catalogue. We will hold quotes for 30 days, protecting you against future price rises. Contact our dedicated quotes team today to save money on large quantities. Alternatively using our online quotation service could not be easier.

www.rapidonline.com/Quotation • Quotes@rapidonline.com • 01206 751166



Rapid

helping you make it
www.rapidonline.com

Rapid part of the **CONRAD** Group

Why substitutes won't solve EOL

When semiconductors reach end-of-life, substitutes claim to offer a form, fit, function replacement. In fact, they can introduce inconsistencies that lead to premature failure, explains Rochester Electronics

As every component purchaser knows, semiconductor end-of-life is an ever-present problem. The goal is always to purchase a replacement device that replicates the exact form, fit, and function as the original. Aftermarket 'substitute' solutions claim to meet this description, but often fall short of that promise.

Logistically as well as technically, substitutes are often short-lived patches rather than comprehensive,

permanent solutions. The life expectancy of many components, substitutes included, can be less than three to five years, so obsolescence is always just around the corner.

End-of-life strategy

So, what course of action is open to purchasers when faced with an end-of-life notice. Usually the most expeditious response is to make a last-time-buy to stockpile the components necessary for the life of the

program. As a bare minimum, an LTB of the semiconductor wafer-level product should be made. Unfortunately, inventory is not always available; sometimes manufacturers miss the window of opportunity; sometimes they don't have the finances; or the facilities to safely store inventory.

As for purchasing components on an as-needed basis, manufacturers are warned to avoid counterfeit

▶▶ continued on page 26



The life expectancy of many components, substitutes included, can be less than three to five years, so obsolescence is always just around the corner



High Quality Panel Mount Indicators

CML IT continues to be the number one supplier of panel mount indicators, LED lamp replacements and LED tower lamp solutions. PMI highlights include:

- Plastic and metal bezels with a wide range of options in stock.
- IP40 and IP67 ratings.
- Development of custom solutions.
- UK manufacturing facility.



"Contact our Customer Services department to discuss your requirements today"

Visit our website at: www.cml-it.com

CML Innovative Technologies Ltd,
69/70 Eastern Way, Bury St Edmunds,
Suffolk, IP32 7AB, United Kingdom
Tel: +44 (0)1284 714700
email: uksales@cml-it.com



UK Manufacturing Quality without compromise

- › Custom cables and wire looms
- › FastTrack prototypes delivered within 5 days
- › 100% tested for your peace of mind

+44 (0)1256 472000

sales@gtk.co.uk

www.gtk.co.uk

► and substandard parts by buying only from the original manufacturer or their authorized distributors.

Substitute solutions

Substitutes claim to provide a solution and there are several options available to support ongoing functional needs.

Emulation provides an integrated circuit manufactured using a customized, pre-prepared silicon die. It is manufactured using a silicon technology different from the one used on the original part and is modified to demonstrate operational functionality that mimics that of the original semiconductor. Emulation is expensive, and almost always requires a lengthy trial-and-error foundry process. Ultimately, emulated parts must be re-qualified because the emulation environment simply cannot repeat the system environment for timing, noise sensitivities, power, handling, and

functionality. Application-specific integrated circuits provide another option. To be used as a replacement, ASIC components must be customized using commercial processes to replicate the electrical functionality of the original semiconductor. This manufacturing process is achieved using gate array or standard cell technologies.

Gate array solutions utilise a prefabricated silicon chip integrated circuit made up of digital logic gates. The digital gates remain unconnected and the chip is not intended to have a specific function. Surface layer metal interconnects are added to join the gates and produce the required functionality.

Alternatively, standard cell technologies feature an integrated circuit made of a combination of circuit blocks from previous designs combined to create a new design. Each layer is unique,

which differentiates this from a gate array and makes it one of the most expensive solutions.

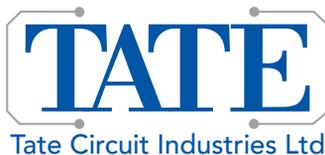
Finally, a field programmable gate array is a programmable part customized by the user through a program resident in a memory device or processor. FPGAs can be a less expensive choice up front, however, they are particularly vulnerable to near-future obsolescence issues.

Manufacturing differences

Substitute solutions are created using state-of-the-art silicon foundry technology. Although this sounds like a good thing, it can have negative implications. The new technology may replace original device functionality, but it almost certainly does not replicate all characteristics. This is because semiconductor manufacturers are always trying to get more functional



Substitute solutions are created using state-of-the-art silicon foundry technology. Although this sounds like a good thing, it can have negative implications



Offshore PCB Manufacture Supported by UK Engineers



Offshore Prices, Excellent Service

We supply low cost, high quality printed circuit boards supported by experienced Tate PCB engineers. We are proud of our reputation for exceptional service.

www.tatecircuits.com
sales@tatecircuits.com Tel: 01543 622 435



Specialists in sourcing hard to find, long lead time, end of life & obsolete components.

- Active, passive and electromechanical components
- Genuine components sourced
- All parts subject to in depth visual inspection
- Full test house facilities available
- Full transparency
- Up to 12 month product guarantee
- Scheduled ordering
- Excess stock management

Working with a global network of manufacturers, franchised distributors, independent brokers & stocking distributors and have access to OEM/CEM's excess stock holdings to source the products you need.



Certificate No. FS617614
 BS EN ISO 9001:2015

www.rhopointsourcing.com
sales@rhopointsourcing.com

T: +44 (0) 1342 330495



elements onto their silicon, and, to do so, they are continually shrinking silicon geometry. This can bring improved performance and lower costs, but it comes with disadvantages that are likely to be significant in high-reliability and safety-critical applications.

The primary difference is the smaller functional cell size, which leads to: higher device switching speeds; different capacitance; different radiation tolerance; and different EMC performance.

Higher switching speeds and different capacitances can cause devices to see spikes in signals, or to produce a rare condition that the original

parts did not. Any of these conditions could lead to equipment malfunction.

Semiconductors based on smaller cell size are usually less radiation tolerant than those produced using older technologies, which can lead to latch-up or data loss. If such a component were used in an avionics system operating at high altitude, aircraft safety would be compromised.

Semiconductors based on smaller cell size are also usually less electrically robust. This can make them more prone to interference from radio and TV transmitter signals and more vulnerable to damage from electrostatic discharges. The latest semiconductor technologies are not designed for 10-year life at the full industrial or military performance limits when it comes to metal migration. Instead, they compromise on environmental temperature limits and voltage ranges to achieve similar lifetime guarantees.

Size brings further complications

because even though the replacement die is smaller, the same size package is required to retain the original component fit. This necessitates longer bond wires or package leads. In some cases, the die simply gets too small to fit in the same package without creating unreliable packaging or a complete package retooling.

Another way
Rochester Electronics aims to provide a more reliable and cost-effective solution. As a continuing manufacturer authorized by over 70 original semiconductor manufacturers, Rochester manufactures components using original silicon technology. These newly manufactured devices are exact form, fit, and function devices that work just as the originals did with no surprises and no compromises.

To achieve this, Rochester maintains an inventory of over 12 billion silicon wafer dice, all of which are either purchased from the original manufacturer or manufactured by Rochester under authorization. When original die is no longer available, Rochester's design and technology groups can re-create a semiconductor device.

Replicated components are physically and electrically identical to the original

device and guaranteed to meet or exceed the original specifications. All Rochester's manufacturing and replication programs are authorized by the original manufacturers and are complimented by storage and distribution programs.

Ultimately, substitute solutions introduce myriad, sometimes hidden inconsistencies that



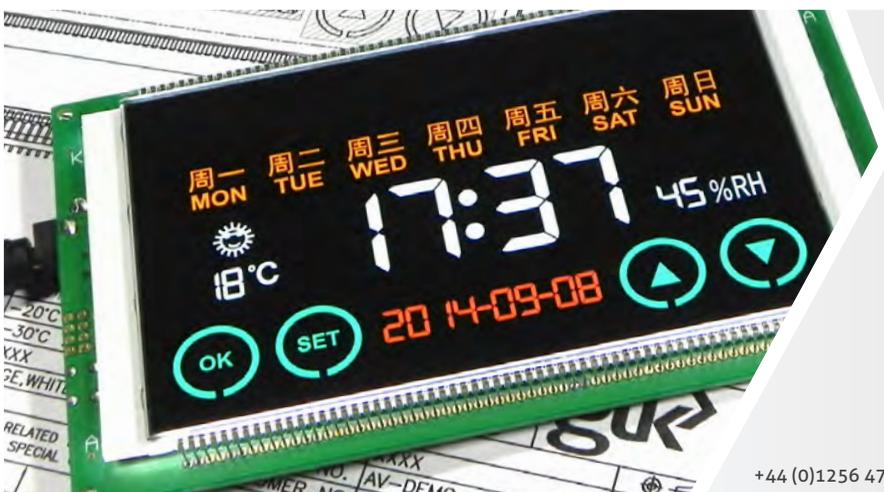
Higher switching speeds and different capacitances can cause devices to see spikes in signals, or to produce a race condition that the original parts did not, which could lead to equipment malfunction



Rochester Electronics' solutions aim to provide an absolute guarantee that a replacement semiconductor device will function exactly as the original

can cause a variety of failures, which are unacceptable in high-reliability and safety-critical applications. In industries such as aerospace, industrial, medical, military, security, space, telecom and transportation, Rochester Electronics' solutions aim to provide an absolute guarantee that a replacement semiconductor device will function exactly as the original.

www.rocelec.com



Custom LCDs
Quality without compromise

- > Latest TFT, PMVA and OLED technologies
- > Optional touchscreens and optical bonding
- > Plug-and-plug display solutions

+44 (0)1256 472000

sales@gtk.co.uk

www.gtk.co.uk

Smart sourcing for industrial IoT

As the internet of things enters the industrial arena, connectivity requirements are increasingly compact and complex. Harting embraces this challenge with connectors that support both IoT and Integrated Industry

Miniaturisation

Thanks to the growth of IoT, complex industrial networks increasingly require compact connectivity solutions for both Ethernet and power. The Harting M8 provides a space-saving Ethernet solution, complete with sockets and overmoulded system cables. Despite being a third the size of a traditional M12 connector, the M8 still provides IP 65/67 protection and 100Mbps to Cat.5 fast Ethernet.

As devices shrink in size, however, it doesn't necessarily follow that their energy demands do likewise. The traditional 7/8in interface is now too large for many applications so Harting has developed the M12 Power in L-coding as the new standard connector for a 63V/16A DC power supply. Standardised to IEC 61076-2-111, the new M12 can provide sufficient power for smaller applications in a more compact, high-performance design.

Integration

Data, signal and power are

the three lifelines of an industrial system. Designed to provide a compact interface for all three capabilities in a single connector, the Han M23 Hybrid combines an efficient, robust design with a range of housings.

The durable ComLock system ensures insertion is both fast and safe, while the closed housings achieve protection class IP 67/69K. With a voltage range up to 630V AC and up to 28A of current carrying capacity, the Han M23 Hybrid is said to transmit significant power, even when installed in a tight assembly space.

In addition, the system protects against vibration as per IEC 61373, can tolerate at least 1,000 mating cycles and can be opened and closed with a short rotational movement. For added security, an optical marking on the housing helps identify whether the connection is open or closed.

Modularisation

Finally, 'smart' connectors are increasingly being used

in the field of predictive maintenance. To this end, the latest Han CAN ID Module can be integrated into power, data and signal interfaces. This allows the modules to determine if units are connected to the right slots, helping to avoid incorrect configuration.

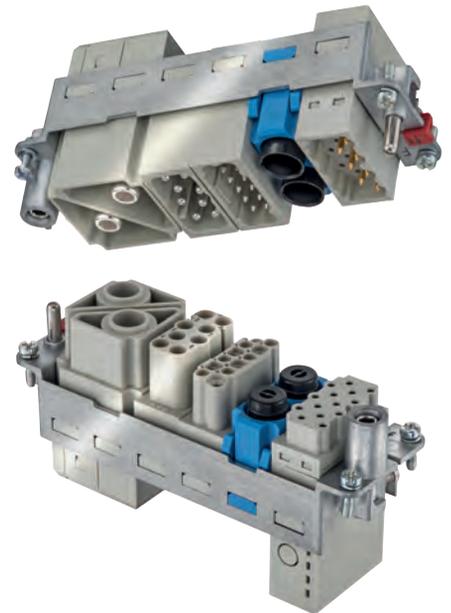
Machine unit data such as last revision status can also be stored and used for predictive maintenance. This potentially delivers time savings, as drive data is available in the module, meaning revision status can be quickly queried, for example during servicing. Individual elements can then be identified and repaired quickly, without the need to start the entire machine.

Furthermore, the CAN ID Module also enables the current drive configuration to be tested and the correct parameters to be transmitted to all other drives and the controller.

www.harting.co.uk



Han M23 Hybrid provides a compact interface for data, signal and power transmission



The Han ID Module supports predictive maintenance

CAMDENBOSS
ELECTRONICS & ENCLOSURES

CAMDENBOSS LAUNCHES THEIR BRAND NEW WEBSITE

It has never been easier to explore the extensive range of enclosures and components from CamdenBoss

www.camdenboss.com



IT'S HERE

CamdenBoss Ltd, 60 James Carter Road, Mildenhall, Suffolk IP28 7DE
T +44 (0)1638 716101 E sales@camdenboss.com

M8 D-coded

The Power of Miniaturisation



Pushing Performance



M8 D-coded. The 4-pole Ethernet Connector in Size M8

- M8 D-coded circular connectors for Fast Ethernet applications
- 30% smaller than conventional M12 connectors
- 100 Mbit/s Cat. 5 Fast Ethernet IEEE 802.3
- Innovative Ethernet interface connections using circular connectors, in accordance with PAS IEC 61076-2-114
- Miniaturisation ensures a maximum amount of space saved when positioning the Ethernet connectors in the device



For more information phone +44 (0) 1604 827500 or e-mail salesUK@HARTING.com



Distributors see growing business from startups

Many startups turn to distributors for help designing a new product, choosing the right parts for the design, and finding capable manufacturers to build the product



James Carbone

Startup companies with innovative ideas for new products are increasingly turning to distributors, not just for components for prototype builds, but for design, supply chain and manufacturing expertise needed to bring products to market.

Startups are looking for distributors to help select the right components and suppliers for design, review designs to make sure the product is manufacturable and to help manage the supply chain once the product goes into production.

Distributors believe that helping a fledgling startup develop and successfully bring a new product to market will result in a loyal, long-term customer that will purchase components from them for years.

The number of startup companies is growing because of the availability of online development tools and data sheets which make it easier to design and the accessibility of crowd funding sites to finance new product projects. "Looking at the list of Arrow's top customers over the past five years, we have customers that didn't even exist five years ago," said Murdoch Fitzgerald, vice president, supplier marketing and engineering for Arrow Electronics.

He said Arrow has invested in programs and resources to support startups at any stage of development from concept

through full-scale production. As part of that effort, Arrow has partnered with crowd funder Indiegogo with its Arrow Certification Program. Through the program, Arrow pairs startups with engineering resources, online design tools and product discounts to help entrepreneurs.

"We have seen nearly 8,000 start-ups enter the program looking for assistance and support to launch their products," said Fitzgerald. "We see startups across multiple customer segments from medical devices to agriculture to communications to automotive," he said. "We have yet to see a limit to the creativity in the technology space."

Lacking resources

Startups often require technical and design help from distributors because they lack resources. "Often startups are resource limited and need to find and leverage external organizations to provide expertise and alleviate some of the workload," said Fitzgerald. They often need help finding the right design partner and "selecting the right quality components," said Fitzgerald.

Once a product is designed and moves into production, startups often require supply chain and value-added services. "Startups will require more assistance in both supply chain set up and in value-added services as they likely need to leverage more external support based on size

Bob Merriman, emerging opportunities specialist at Avnet



With a design review, "many times we are able to increase product performance and lower bill of material cost just because startups are not aware of all the options that exist"

and available resources than a traditional OEM that may have the capability to perform these in house," said Fitzgerald.

Startups often need assistance managing parts availability issues. "While startups have smaller volumes, parts shortages or raw material constraints "can take down a production line" just as they can for an established OEM that may be buying large volumes. Both need help sourcing and planning to "minimize any supply chain hiccups," said Murdoch.

Helping startups develop and bring new products to market builds "trust and loyalty with the inexperienced company and, in many cases, that does translate

into sales. It's a true partnership model," said Fitzgerald.

More business from makers

Another distributor that is seeing an increase in business with startups is Digi-Key. Paul Dosser, vice president, business development for Digi-Key, said more design engineers are starting their own businesses, and the maker and IoT movements are resulting in numerous startups which need "efficient and easy access to information and products in a digital fashion."

However, they also need help with design and production issues and turn to distributors for resources, services and tools. One service Digi-Key offers is



Maker.io, which provides startups with free EDA and design tools, BOM manager, free technical resources, reference designs, product training modules. The service can also suggest venture capital options. Such services are "very much in line" with what startups need, said Dosser.

He noted that in some cases startups have the same needs as established OEMs. "For instance, a startup or a mature OEM doesn't want full reels of parts or standard manufacturing packaging when a new product moves from design to preproduction/new product introduction state, said Dosser.

"Our value-added services of cut tape, Digi-Reels (small volumes of components on a mini reel for plug-and-play on auto insert equipment), and BOM manager kitting help a startup business keep excess inventory costs in check," said Dosser.

When a product moves to production, depending on the volume needs, Digi-Key "can continue to support the requirements with our value add services or bring in our full offering of supply chain tools to aid in assurance of supply," he said.

Help with fundamentals

Bob Merriman, emerging opportunities specialist at Avnet, said that startups may have a lot of technical expertise about a product or technology, but lack the necessary knowledge concerning fundamentals of the

supply chain such as component availability and lead times.

"For instance, in talking to startups, if we asked them 'what are your lead times' they may look at you like they don't understand the question," said Merriman. "The idea it could take 6, 12, or 20 weeks to get certain components is a very new concept to a lot of startups. They need help navigating the process," he said.

Even if a startup is schooled in the technical aspects of the product under development, it may still need help designing the product. For those startups, Avnet offers design services. Merriman noted that with the acquisition of Premier Farnell, Avnet acquired internal design services.

"Avnet is able to do actual design, PCB layout, component design all of the upfront tasks that go into getting a hardware product ready," he said.

In addition, Avnet acquired Dragon Innovation, a company that "helps folks navigate that journey from prototype to large-scale production," said Merriman.

He said Dragon performs a "holistic design for manufacturability review." Its mechanical engineers sit down and look how well the product can be manufactured and "offer some tips and suggestions on getting from making five of the new products to making 20,000," said Merriman.

Paul Dosser, vice president, business development for Digi-Key

"IoT is only going to continue to expand in driving more digital connectivity on a global basis and thus be a perfect environment for new companies to start with new and exciting innovations"



"We definitely recommend a design review to make sure things are good," said Merriman. "Many times, we are able to increase product performance and lower bill of material cost just because startups are not aware of all the options that exist," he said.

Besides providing help with design issues, Dragon Innovation also helps with sourcing materials such as plastics, rubber screws, housings casings, among others. "Dragon will actually help customers find all the materials they need to get their product produced and actually help with factory selection," said Merriman.

"We have a team over in Asia with a request for quotation process from the factory," he said. "They can actually embed in the factory for a startup.

The majority of startups outsource manufacturing because of the expense of setting up a factory. In addition, startups probably lack the understanding of issues such as the quality of order process, how production lines run and the challenges of getting finished products from the factory to customers, said Merriman.

"The majority of startups that we work with are looking for a partner to help with those types of services because they have never done it before and it is very complex," said Merriman.

He added that startups may not be aware of the logistical challenges in bringing a product to market. "When we start to talk to them about their plans, how they are managing their orders, tracking production, we start to find that they may not be prepared for the journey ahead" and may turn to Avnet for help in managing those challenges.

Most distributors say that business with startups will continue to grow for years and will span a wide spectrum of vertical markets including industrial, medical, automotive, consumer and others. Many startups will be developments products for Internet of Things applications.

"IoT is only going to continue to expand in driving more digital connectivity on a global basis and thus be a perfect environment for new companies to start with new and exciting innovations," said Dosser.

Facilitating the future

An emphasis on efficiency and flexibility ensure TTI's extended European headquarters are ready for future growth, thanks to investment in automation and Supply Chain 4.0 technology

TTI is readying its European headquarters in Maisach-Gernlinden for the future with new office buildings and an extension of its existing distribution centre. With the new facilities in place, TTI boasts more than 30,000m² of warehouse space, however, the challenge hasn't only been to extend the space available, but also to use it more effectively.

With a new storage concept in place and investment in innovative technology, TTI has been able to increase the volume of warehouse space used by a factor of three. To be fully prepared for the future, the new buildings have also been planned generously, so that initially, only 60 per cent of the available space will be used, with the remaining space available for use at a later stage.

Warehouse technology
Investment in the latest warehouse technology is budgeted at around 23 million Euros, a figure which includes the implementation of integrated Supply Chain 4.0 software. TTI already communicates with nearly all its suppliers via different electronic data interchange standards and more than 700 customers are also connected with TTI through sophisticated logistics solutions.

Now the supply chain will also be optimised for intralogistics, with an intelligent combination of efficient automation and highly flexible manual elements.

For example, the existing pallet racking will be extended in a format compatible with narrow forklift trucks and reaching to a height of 15 metres. In the first phase, this will offer 21,000 pallet bays, with a possible further extension to 32,000 bays.

In addition to conventional racking, the extension will also include an autostore-system with 110,000 containers, which can also be doubled in a further extension. In the first phase, the autostore-system will consist of 50 robots, powered by silent electric motors, which present goods automatically at the 24 picking stations.

Picking and packing
Order commissioning will continue to be paperless, just as it is today, and this will be supported at picking stations by a put-to-light system, designed to guarantee order accuracy.

From now on, the consolidation of orders during two-stage commissioning will be handled automatically. This

will be managed via a shuttle system with a total of 8,000 container positions, which can be extended to 12,000



Warehouse space now stands at more than 30,000m²

positions in the future. Compared to traditional solutions, the shuttle system is expected to offer high performance and optimal space usage with low service and maintenance costs.

To further increase efficiency, and for optimal use of the transport vehicles in the shipping process, the system will employ automatic volume optimisation and parcel labelling. Not only will this help save shipping costs, it will also be more environmentally friendly.

Risk management
A final, but important, part of the project is an integrated

TTI is extending its European headquarters in Maisach-Gernlinden

risk management program consisting of failure modes and effects analysis and backup solutions to secure delivery capability at all times.

By planning the extension in two stages and combining different storage systems with a mix of manual operations and automation, TTI expects to increase efficiency and flexibility when reacting to future market developments.

www.ttieurope.com

Jauch Quartz goes global with Digi-Key Electronics

Jauch Quartz is proud to announce that we have entered into a worldwide distribution agreement with Digi-Key Electronics, a global electronic components distributor.

The Jauch Group is one of the leading specialists for quartz crystals, crystal oscillators and battery technology. Established in 1954, we are a European market leader in the frequency control products industry, most recently with innovative MEMS timing and RF specific devices. We underline our claim to leadership with our in-depth technical knowledge, high application and certification expertise; alongside in house, advanced test environments with high availability and fast delivery of products.

"A major focus of Jauch Quartz business growth strategy was to team up with a leading distribution channel partner. We

are delighted to join forces with Digi-Key, one of the fastest growing distributors of electronic components in the world. Digi-Key's leadership and market reach will bring our high technology products to a wide range of customers across numerous markets," said Paul Benson, Strategic Business Manager, Jauch Quartz. "The combination of our innovation, including state-of-the-art wireless dedicated solutions, and Digi-Key's expertise with assisting engineers through the entire design process will help customers develop and deliver solutions that enhance the value and performance of their products and help take them to market rapidly."

"We're excited to partner with Jauch Quartz and offer their leading-edge products to



Nik Ribton, Managing Director – Jauch Quartz UK
 Tim Loe, Product Manager – Digi-Key
 Paul Benson, Strategic Business Manager – Jauch Quartz UK

our global Engineering community," said David Stein, Vice President, Global Supplier Management at Digi-Key. "Our worldwide customers will find great value in Jauch Quartz' experience, quality products, and industry expertise."

For more information about Jauch Quartz and to see their entire product listing, please visit their Supplier Center page on the Digi-Key website www.digikey.com/en/supplier-centers/j/jauch

Services Sourcing

CEM



**Contract Electronics Manufacturing
 Repairs • Prototypes • Box-Build
 Cable Assembly • Fast turn-rounds
 Small and Large Runs • Design
 Hand and Machine Soldering**

Telephone 020 8241 6959
 info@justelex.com
 www.justelex.com

Just ask!

**WILSON
 PROCESS SYSTEMS**
 ELECTRONICS MANUFACTURING SERVICES

In-house processes including:
 Oversized PCB Capability
 Automated SMT/Through-Hole Assembly
 Hand Assembly/Box Build
 Design For Manufacture
 Environmental Testing
 Wide Range of Coatings/Encapsulation
 Full Test Services
 IPC Certified Staff

www.wps.co.uk
 01424 722222
 enquire@wps.co.uk

DEVICE PROGRAMMING



device programming & reeling specialists



**I.C. PROGRAMMING
 & LASER MARKING
 SERVICES**

Tel: 00 44 (0)1582 412323
 Email: sales@actioncircuits.com
 www.actioncircuits.com

Advertise here

Contact:
Emma Poole
 emma.poole@
 electronics-sourcing.com
01892613400

TRAINING

IPC Certified Courses
 Plus Practical training for SMD, BGA,
 Hand Soldering and PCB rework.
 Advanced Rework Technology
 Hill Farm, Ford End, Essex
01245 237083

TAPE REELING

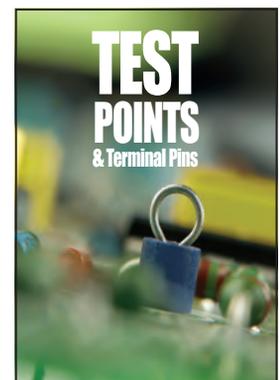


device programming & reeling specialists



**SMD TAPING &
 REELING SERVICES**
 Tel: 00 44 (0)1582 412323
 Email: sales@actioncircuits.com
 www.actioncircuits.com

TEST POINTS & TERMINAL PINS



**For prototype work
 or volume production**

Large loop for easy attachment
 Three sizes

Glass bead in a choice of eight colours
 Unique shape will not damage through-plated holes

Full details and **FREE SAMPLES** on request



Tel: **(01963) 363377**
 www.wmhughes.co.uk

Station Road, Stalbridge, Dorset DT10 2RZ
 Fax: (01963) 363640
 Email: sales@wmhughes.co.uk

THE WORLD'S LARGEST SELECTION OF ELECTRONIC COMPONENTS AVAILABLE FOR IMMEDIATE DISPATCH™

6.8 MILLION+ PRODUCTS ONLINE | 100% FRANCHISED DISTRIBUTOR | 1,400,000+ PRODUCTS IN STOCK

3M
4D Systems
Aavid Thermalloy
ABLIC U.S.A. Inc.
Abracon LLC.
Acconeer AB
ACKMe (Zentri)
ACL Staticide, Inc.
Active-Semi
Adafruit
Adapteva
Adesto Technologies
ADI (Analog Devices, Inc.)
Advanced Linear Devices, Inc.
Advanced Photonix
(Luna Optoelectronics)
Advanced Sensors / Amphenol
Advanced Thermal Solutions, Inc.
Advantech
Aearo Technologies, LLC –
a 3M company
Aeroflex (MACOM Technology
Solutions)
Aerospace Defense and Marine /
TE Connectivity
Affinity Medical Technologies -
a Molex company
Agastat Relays / TE Connectivity
AIM-Cambridge / Cinch Connectivity
Solutions
Airpax / Sensata Technologies
AKM Semiconductor, Inc.
AK-NORD GmbH
ALCOSWITCH Switches /
TE Connectivity
AlfaMag Electronics (AMGIS)
All Sensors Corporation
Allegro MicroSystems, LLC.
Alliance Memory, Inc.
Alliance Sensors Group a div of
HG Schaevitz LLC
Alpha and Omega Semiconductor, Inc.
Alpha Wire
Altech Corporation
Altera (Intel® FPGAs)
AMBER wireless GmbH
Ambiq Micro, Inc.
American Electrical, Inc.
American Technical Ceramics
Ametherm
Amgis
AMI Semiconductor /
ON Semiconductor
AMP Connectors / TE Connectivity
Amphenol
Amphenol Advanced Sensors
Amphenol Aerospace Operations
Amphenol Anytek
Amphenol Audio
Amphenol Commercial (Amphenol ICC)
Amphenol Connex (Amphenol RF)
Amphenol Entertainment
Amphenol FCI (Amphenol ICC)
Amphenol Industrial
Amphenol Information
Communication & Commercial
Amphenol LTW
Amphenol Pcd
Amphenol RF
Amphenol Sine Systems
Amphenol Spectra-Strip
Amphenol SV Microwave
Amphenol Tuchel Electronics
Ampleon
ams
Amulet Technologies, LLC.
Analog Devices, Inc.
Anaren
AnDAPT
Angstrom / Vishay
Antenova
Anytek (Amphenol Anytek)
Apacer
APEM Inc.
Apex Microtechnology
Apex Tool Group
API Delevan
API Technologies Corp.
APM Hexseal
Aptina / ON Semiconductor
ARCOL (Ohmite)
Arcoelectric (Bulgin)
Arcotronics (KEMET)
Arduino
Aries Electronics, Inc.
ARM
Artaflex Inc.
Artesyn Embedded Technologies

Asahi Kasei Microdevices /
AKM Semiconductor
ASSMANN WSW Components
Astec America (Artesyn Embedded
Technologies)
Astro Tool Corp.
Atmel (Microchip Technology)
Atop Technologies
ATP Electronics, Inc.
Auit / SL Power
Avago Technologies (Broadcom
Limited)
Aven
Avery Dennison
AVX Corporation
Axicom Relays / TE Connectivity
Azoteq
Aztronic / Vishay
B B Battery
B&F Fastener Supply
B&K Precision
B+B SmartWorx, Inc.
Bantam Tools
BeagleBoard.org
Beau Interconnect - a Molex company
BEI Sensors / Sensata Technologies
Bel
Bel Fuse, Inc.
Bel Power Solutions
Belden
Belden's Hirschmann
Bergquist
BI Technologies / TT Electronics
Birtcher / Pentair
Bivar, Inc.
BlueCreation
Bluetechnix GmbH
BNS Solutions
Bomar (Winchester Electronics)
Bopla Enclosures
Bosch Connected Devices and
Solutions
Bosch Sensortec
Bourns, Inc.
Brad Harrison - a Molex company
Breadware, Inc.
Bridgelux, Inc.
Broadcom Limited
Buchanan Terminal Blocks /
TE Connectivity
Bud Industries, Inc.
Bulgin
Burr-Brown (Texas Instruments)
Bussmann (Eaton)
C&D Technologies (Murata Power
Solutions)
C&K
Caddock Electronics, Inc.
Cal Test Electronics
Califia Lighting (Bivar)
Calmark / Pentair
Cannon
Cantherm
Capital Advanced Technologies, Inc.
Carclo Technical Plastics
Cardinal Components
Carling Technologies
Carlo Gavazzi
Catalyst Semiconductor /
ON Semiconductor
CEL (California Eastern Laboratories)
Central Semiconductor
Cera-Mite / Vishay
CGS Resistors / TE Connectivity
CH Products
Chemi-Con
Chemtronics
Cherry Americas
Cherry Switches (ZF Electronics)
Chip Quik, Inc.
Cicoil
CII / TE Connectivity
Cinch Connectivity Solutions
Cirronet / RFM (Murata Power
Solutions)
Cirrus Logic
Citizen Electronics Co., Ltd.
Citizen Finedevice Co., LTD.
Clarostat (Honeywell Sensing and
Productivity Solutions)
CMD (ON Semiconductor)
CnC Tech
Coiltronics (Eaton)
Comair Rotron
Comchip Technology
Comus International
Concept Technologie (Power
Integrations)

Conдор / SL Power
CONEC
Connex (Amphenol RF)
Connor-Winfield
Conxall / Switchcraft
Cooper Bussmann (Eaton)
Copal Electronics (Nidec Copal
Electronics)
Corcom Filters / TE Connectivity
Cornell Dubilier Electronics
Cortina Systems (Inphi)
Cosel
Coto Technology
CR Magnetics, Inc.
Cree
Cree Wolfspeed
Crescent
Critical Link
Crouzet
Crowd Supply
Crydom / Sensata Technologies
Crystek Corporation
CSR PLC (Qualcomm)
C-Ton Industries
CTS Electronic Components
CUI, Inc.
Curtis Industries
Curtis Instruments
Custom Computer Services
Belden
Cynergy3
Cypress Semiconductor
Daburn
Dale / Vishay
Datawave Wireless
DAVE Embedded Systems
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
Dielectric Laboratories (Knowles)
Digi International
Diligent, Inc.
Digital View Inc.
Diodes Incorporated
Displaytech
DLI
DLP Design, Inc.
Draloric / Vishay
dresden elektronik
Dynamstream Innovations Inc.
E Ink
EasyBraid/Menda
Eaton
ebm-papst Inc.
Echelon
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
Electrowitch
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
ERP Power
Essentra Components
ESTA / Vishay
E-Switch
E-T-A

Ethertronics
Eupec (Infineon)
Eveready (Energizer Battery Company)
Everlight Electronics
Everspin Technologies, Inc.
Exar Corporation
Excelitas Technologies
Excelsys Technologies Ltd.
Exttech
E-Z-Hook
Fairchild (ON Semiconductor)
Fair-Rite Products Corp.
Fan-S Division / Qualtek
Electronics Corp.
Fanstel Corp.
FCI (Amphenol ICC)
FCT Electronics - a Molex company
FDK America
Fedco Batteries
FERROXCUBE
Finisar Corporation
FIT (Foxconn Interconnect Technology)
Flamar - a Molex company
Flambeau, Inc.
FLIR
Formerica Optoelectronics Inc.
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)
GHI Electronics, LLC
Global Power Technologies Group
Global Specialties
Grayhill, Inc.
Greenlee Communications
GWConnect - a Molex company
H&D Wireless
H.G. Schaevitz, LLC / Alliance
Sensors Group
Hamlin / Littelfuse
Hammond Manufacturing
HARTING
Harwin
Heatron
HellermannTyton
Henkel/Loctite
Heraeus Sensor Technology USA
Hillcrest Labs
HiRel Systems / Vishay
Hirose
Hirschmann
Hittite (Analog Devices)
Hoffman Enclosures, Inc.
Hologram
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)
IDEC
IDT (Integrated Device Technology)
II-VI Marlow
Illinois Capacitor
ILLUMRA
Industrial Fiber Optics, Inc.
Infineon Technologies
Initial State Technologies, Inc.
Innovasic Semiconductor /
Analog Devices, Inc.
Inolux
Inphi
Insight SiP
Inspired LED
Integrated Device Technology (IDT)
Integrated Silicon Solution, Inc. (ISSI)
Intel® FPGAs
Intematix

Interconnect Systems -
a Molex company
Interlink Electronics
International Rectifier (Infineon
Technologies)
Intersil (Renesas Electronics America)
InvenSense / TDK
Inventek Systems
Inventus Power
Io Audio Technologies
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
IXYS RF
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.
Kavlico Pressure Sensors /
Sensata Technologies
Keil (ARM)
KEMET
Kennedy Labs
Kester
Keystone Electronics Corp.
Khatod
Kilo International
Kilovac Relays / TE Connectivity
Kingbright
Kings (Winchester Electronics)
Kionix
Klein Tools
Knowles
Knowles DLI
Knowles NOVACAP
Knowles Syfer
Knowles Voltronics
KYOCERA Corporation
Kyocera Display
Kyocera
Laird - Antennas
Laird - EMI
Laird - Signal Integrity Products
Laird Connectivity
Laird Connectivity (LSR)
Laird Thermal Materials
Lantronix
LAPIS Semiconductor
Lattice Semiconductor
Leader Tech Inc.
LeCroy (Teledyne LeCroy)
LED Engin
LEDDynamics, 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
LTW (Amphenol LTW)
LulzBot
Lumberg Automation
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.

Makeblock
 Mallory Sonalert Products
 Marktech Optoelectronics
 Marlow Industries, Inc.
 Martel Electronics
 Marutsuelec
 Master Appliance Corp.
 Matrix Orbital
 MaxBotix Inc.
 Maxim Integrated
 MaxStream (Digi International)
 Maxwell Technologies, Inc.
 MCB Industrie / Vishay
 McGraw-Hill Education
 MEAN WELL
 Measurement Specialties /
 TE Connectivity
 MEC switches
 Mechatronics
 MegaChips
 Melexis
 Memory Protection Devices
 MEMSIC
 Menda/EasyBraid
 Mentor Graphics
 Metelics (MACOM Technology
 Solutions)
 METZ CONNECT
 MG Chemicals
 Micrel / Microchip Technology
 Micrium
 Micro Commercial Components (MCC)
 Microchip Technology
 microEngineering Labs Inc.
 Micro-Measurements (VPG
 Micro-Measurements)
 Micron Technology
 Micronas / TDK
 Microsemi
 Microwave Technology
 Midcom / Wurth 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 Harrison
 Molex FCT Electronics
 Molex Flamar
 Molex GWConnect
 Molex Interconnect Systems
 Molex NuCurrent
 Molex Oplink Communications, LLC.
 Molex Phillips-Medisize
 Molex PolyMicro Technologies
 Molex Temp-Flex
 Molex Woodhead
 Monnit
 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)
 NDK
 Nearson
 Neohm Resistors / TE Connectivity
 Neonode
 Nesscap Co., Ltd
 NetBurner, Inc.
 Newava Technology
 Newhaven Display, Intl.
 Nexperia
 Nichicon
 Nidec Copal Electronics
 NimbeLink
 Nippon Chemi-Con
 NJR Corporation / NJRC
 NKK Switches
 NMB Technologies Corp.
 NorComp
 Nordic Semiconductor
 NOVACAP
 NovaSensor / GE Measurement &
 Control
 NuCurrent - a Molex company

Nuvoton Technology Corporation
 America
 NVE Corporation
 NXP Semiconductors / Freescale
 O.C. White Co.
 Octavo Systems
 ODU
 OEG Relays / TE Connectivity
 Ohmite
 OK Industries (Jonard Tools)
 Olimex
 Omron Automation & Safety
 Omron Electronic Components
 ON Semiconductor
 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.
 Particle
 Patco Electronics
 Patco Services
 PCD / Amphenol
 Peerless by Tymphony
 Pentair
 Peregrine Semiconductor (pSemi)
 Pericom Semiconductor Corp.
 (Diodes Incorporated)
 Pervasive Displays
 PHIHONG USA
 Phillips-Medisize - a Molex company
 Phoenix Contact
 Phoenix Mecano
 Phoenix Passive Components /
 Vishay
 Phytion, Inc.
 Pi Supply
 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.
 Precision Technology, Inc.
 ProAnt
 Products Unlimited Transformers &
 Relays / TE Connectivity
 Protektive Pak
 pSemi
 PUI Audio, Inc.
 PULS
 Pulse Electronics Corporation
 PulseCore Semiconductor /
 ON Semiconductor
 PulseLarsen Antennas
 Pycom
 Q-Cee's / TE Connectivity
 Qoitech
 QT Brighttek
 Quadcept
 Qualcomm
 Qualcomm (RF360 - A Qualcomm &
 TDK Joint Venture)
 Qualtek Electronics Corp.
 Quatech / B+B SmartWorx
 Rabbit Semiconductor
 (Digi International)
 Radial Magnet, Inc.
 Radiocrafts
 RAF
 RAFI
 Ramtron (Cypress Semiconductor)
 Raspberry Pi
 Raychem Cable Protection /
 TE Connectivity

RayVio
 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
 Rosenberger
 Roving Networks / Microchip
 Technology
 RPM Systems
 Rubycon
 RushUp
 Sagrad
 Samsung Electro-Mechanics
 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 Sensors Thermal Sensors
 and Switches
 Sensata Technologies
 Sensata Technologies - Airpax
 Sensata Technologies - BEI Sensors
 Sensata Technologies - Crydom
 Sensata Technologies - Kavlico
 Pressure Sensors
 Sensirion
 Sensitron Semiconductor /
 SMC Diode Solutions
 Seoul Semiconductor
 Serous Integrated
 Serpac Electronic Enclosures
 SGX Sensortech
 Sharp Microelectronics
 Sierra Wireless
 Sigfox
 Sigma Designs
 Sigma Inductors / TE Connectivity
 Signal Transformer
 Silego Technology
 Silicon Labs
 SINE Systems / Amphenol
 Siretta
 SiTime
 Skyetek
 Skyworks Solutions, Inc.
 SL Power Electronics - Manufacturer
 of Condor / Ault Brands
 SMC Diode Solutions
 Soberton, Inc.
 Socle Technology Corporation
 SolidRun
 Souriau Connection Technology
 Spansion (Cypress Semiconductor)
 SparkFun
 Spec Sensors
 Spectra Symbol
 Spectra-Strip (Amphenol
 Spectra-Strip)
 Sprague Goodman
 SSI Technologies, Inc.
 SST Sensing
 Stackpole Electronics, Inc.
 Staco Energy Products Co.
 Standex-Meder Electronics
 Stanley Electric
 Steinel
 steute Wireless
 Stewart Connector
 STMICROELECTRONICS
 Storm Interface
 Sullins Connector Solutions
 Sumida Corporation

SunLED
 Sunon
 Susumu
 SV Microwave (Amphenol SV
 Microwave)
 Swanstrom Tools
 Swissbit
 Switchcraft / Conxall
 Syfer
 Synapse Wireless
 Tag-Connect
 Taftien
 Taiwan Semiconductor
 Taiyo Yuden
 Talema
 Tallysman Wireless
 Talon Communications, Inc.
 Tamura
 Taoglas
 TAOS / ams
 TDK Corporation
 TDK InvenSense
 TDK Micronas
 TDK RF360
 TDK Tronics (Tronics)
 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
 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
 Techspray
 TechTools
 Telcodium
 Teledyne LeCroy
 Telit
 Temp-Flex - a Molex company
 Tensility International Corporation
 Terasic Technologies
 Test Products International (TPI)
 Texas Instruments
 t-Global Technology
 Thales Visionix, Inc.
 Thermometrics / GE Measurement
 & Control
 ThingMagic
 Thinxtra Solutions Limited
 Thomas Research Products
 TinyCircuits
 TOKO / Murata
 Torex Semiconductor Ltd.
 Toshiba Memory America, Inc.
 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
 TSC (Taiwan Semiconductor)
 TT Electronics
 TT Electronics / BI Technologies
 TT Electronics / IRC
 TT Electronics / Optek Technology
 TT Electronics / Welwyn
 Tuchel / Amphenol
 Twin Industries
 TXC Corporation
 Tyco Electronics
 Tymphony (Peerless by Tymphony)
 U.S. Sensor/Littelfuse
 UDOO
 Ultra Librarian®
 Ungar / Weller
 United Chemi-Con
 US-Lasers, Inc.
 Varitronix International Ltd.
 VCC (Visual Communications
 Company)
 VEAM
 Vector Electronics & Technology, Inc.
 Verivolt
 VersaLogic Corporation
 VersaSense
 Vicor
 Vicotee
 Vifa (Peerless by Tymphony)
 Viking Technology
 Virtium Technology Inc.
 Vishay
 Vishay / BCComponents
 Vishay / Beyschlag
 Vishay / Cera-Mite
 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
 Visual Communications Company, LLC
 Vitelec / Cinch Connectivity Solutions
 Volgen / Division of Kaga
 Electronics USA
 Volttronics (Knowles)
 VPG Foil
 VPG Micro-Measurements
 VPG Sensors
 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
 Wolfsspeed - a Cree company
 Woodhead - a Molex company
 Wurth Electronics
 Wurth Electronics iBE
 Wurth Electronics Midcom
 Xcelite
 Xeltek
 Xilinx
 XMOS
 XP Power
 Xsens
 Yageo
 Zentri (Silicon Labs)
 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
CABLE ASSEMBLY & HARNESSING											
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
Molex	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	97%	50	1,500+	Y
CIRCUIT PROTECTION											
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
EPCOS/TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5000	N/A	£0	58%	50	1,500+	Y
Littelfuse	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	35000	N/A	£0	67%	50	1,500+	Y
DISPLAYS & LEDs											
Lascar Electronics		+44 (0)1794 884567	www.lascarelectronics.com/				£1		10	90	
NLT Technologies Ltd	Review Display System Ltd	01959 563345	www.review-displays.co.uk	Y	All	N/A	£0	N/A	6	25	Y
ELECTROMECHANICAL											
ALPHA WIRE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	26,919	N/A	£0	97.04%	150	3500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
CUI INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	17,410	N/A	£0	92.21%	150	3500+	Y
DELTA PRODUCT GROUPS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	3,215	N/A	£0	99.95%	150	3500+	Y
KEYSTONE ELECTRONICS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	6,315	N/A	£0	95.17%	150	3500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Murata	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	66,179	N/A	£0	99.79%	150	3500+	Y
OMRON ELECTRONICS INC-EMC DIV	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	74,369	N/A	£0	95.47%	150	3500+	Y
Panasonic	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	154,777	N/A	£0	94.42%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	Y
ENCLOSURES											
Bud	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	80%	50	1,500+	Y
Hammond	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	12,500	N/A	£0	100%	50	1,500+	Y
Hammond	Switch Electronics	01482 862255	switchelectronics.co.uk	Y	500	N/A	£0	70%	2	6	Y
Metcase Enclosures	OKW Enclosures	01489 583858	www.metcase.co.uk	N	288	£40,000	£0	N/A	5	22	Y
OKW Enclosures Ltd	OKW Enclosures	01489 583858	www.okw.co.uk	N	1,955	£40,000	£0	N/A	5	22	Y
Rolec Enclosures	OKW Enclosures	01489 583858	www.rolec-enclosures.co.uk	Y	935	£40,000	£0	N/A	5	22	Y
Teko Enclosures	OKW Enclosures	01489 583858	www.teko.co.uk	Y	1,860	£40,000	£0	N/A	5	22	Y
FREQUENCY MANAGEMENT											
ABRACON	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	91%	50	1,500+	Y
AEL Crystals Ltd	AEL Crystals Ltd	01293 789200	www.aelcrystals.co.uk	N	N/A	£200,000	£50	100%	3	15	Y
ECS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	99%	50	1,500+	Y
Epson	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	59%	50	1,500+	Y
Golledge Electronics Ltd	Golledge Electronics Ltd	01460 256 100	www.golledge.com	N	N/A	£800,000	£0	100%	3	24	Y
Jauch Quartz	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	500	£250,000	0	100	15	130	Y
HEATSINKS											
Aavid	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	67%	50	1,500+	Y
ICs & SEMICONDUCTORS											
ALLEGRO MICROSYSTEMS, LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	3,090	N/A	£0	87.22%	150	3500+	Y
Altera	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	60.00%	50	1,500+	Y
ALTERA	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	10,901	N/A	£0	84.86%	150	3500+	Y



widest Selection

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ICs & SEMICONDUCTORS (continued)											
ANALOG DEVICES INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	52,308	N/A	£0	73.79%	150	3500+	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
AVAGO TECHNOLOGIES US INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	16,512	N/A	£0	91.38%	150	3500+	Y
Broadcom	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	69%	50	1,500+	Y
Cirrus Logic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	80.00%	50	1,500+	Y
Cypress Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	63.00%	50	1,500+	Y
CYPRESS SEMICONDUCTOR CORP	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	27,423	N/A	£0	92.54%	150	3500+	Y
DIGI INTERNATIONAL	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	4,355	N/A	£0	95.30%	150	3500+	Y
Diodes Incorporated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,600	N/A	£0	98%	50	1,500+	Y
DIODES INCORPORATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	38,292	N/A	£0	90.02%	150	3500+	Y
Exar	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	95.00%	50	1,500+	Y
Fairchild Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	90.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,500	N/A	£0	42.00%	50	1,500+	Y
FTDI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	97%	50	1,500+	Y
FTDI	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	569	N/A	£0	100.00%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,850	N/A	£0	93.70%	150	3500+	Y
Intel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
International Rectifier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	600	N/A	£0	87.00%	50	1,500+	Y
Intersil	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	50.00%	50	1,500+	Y
ISSI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	98.00%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	Y
Lattice	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	69%	50	1,500+	Y
LINEAR TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,479	N/A	£0	77.62%	150	3500+	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
MAXIM INTEGRATED	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	68,021	N/A	£0	78.22%	150	3500+	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 TECHNOLOGY	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	86,517	N/A	£0	86.12%	150	3500+	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
NEXPERIA USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,513	N/A	£0	99.29%	150	3500+	Y
NXP	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	91%	50	1,500+	Y
NXP USA INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	36,258	N/A	£0	93.55%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	87,298	N/A	£0	85.61%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	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
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	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 INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	19,667	N/A	£0	96.54%	150	3500+	Y
Skyworks	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	300	N/A	£0	91%	50	1,500+	Y
Spanion 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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,201	N/A	£0	97.79%	150	3500+	Y



**MOUSER
ELECTRONICS**



**TEXAS
INSTRUMENTS**

Over 42,000 TI products and 3,500 TI dev kits **in Stock**

Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
ICs & SEMICONDUCTORS (continued)											
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	180,012	N/A	£0	91.94%	150	3500+	Y
Toshiba	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	100.00%	50	1,500+	Y
Vishay	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.71%	150	3500+	Y
XILINX INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	8,213	N/A	£0	51.46%	150	3500+	Y
INDUSTRIAL GRADE MEMORY MODULES											
InnoDisk	Simms	01622 852 848	www.simms.co.uk	N	300+	N/A	N/A	N/A	3	N/A	Y
INTERCONNECTION											
3M	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,100	N/A	£0	16%	50	1,500+	Y
3M	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	62,421	N/A	£0	93.42%	150	3500+	Y
Amphenol	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,600	N/A	£0	53%	50	1,500+	Y
AMPHENOL RF DIVISION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	443,368	N/A	£0	75.92%	150	3500+	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
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Delphi Connection Systems	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,300	N/A	£0	67.00%	50	1,500+	Y
FCI	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,300	N/A	£0	94%	50	1,500+	Y
Glenair	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,900	N/A	£0	76.00%	50	1,500+	Y
HARTING	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,700	N/A	£0	31%	50	1,500+	Y
Harwin	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	79%	50	1,500+	Y
Hellermann Tyton	Lane Electronics	01403 790661	www.fclane.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Hirose Electric	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,100	N/A	£0	99%	50	1,500+	Y
HIROSE ELECTRIC CO LTD	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,215	N/A	£0	90.98%	150	3500+	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 Electronics	0800 587 0991	www.digikey.co.uk	Y	5,109	N/A	£0	84.32%	150	3500+	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, LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	120,034	N/A	£0	97.98%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	54,845	N/A	£0	99.99%	150	3500+	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
SAMTEC INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	427,448	N/A	£0	99.99%	150	3500+	Y
Souriau	Lane Electronics	01403 790661	www.fclane.com	Y	1,929	£806,000	£0	100%	6	38	Y
Switchcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,200	N/A	£0	69%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	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.americaiiurope.com	N/A	1,900	\$1B	£0	75%	59	500+	Y
	Cyclops Electronics	01904 415 415	www.cyclops-electronics.com	N/A	177,232	£5M	£100	75%	3	78	Y



AHEAD OF WHAT'S POSSIBLE™

same-day Shipping

mouser.co.uk

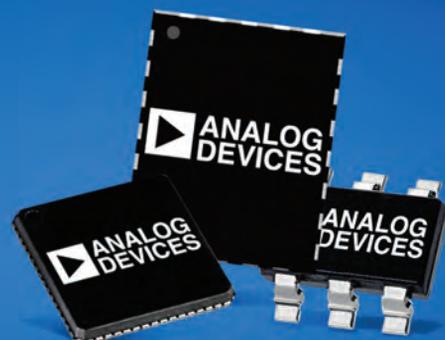
Worldwide leading authorised distributor of semiconductors and electronic components

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
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											
ABRACON LLC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	41,991	N/A	£0	100.00%	150	3500+	Y
AVX	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	70,700	N/A	£0	58.00%	50	1,500+	Y
AVX CORPORATION	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	70,131	N/A	£0	89.28%	150	3500+	Y
Bourns	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	49,500	N/A	£0	98%	50	1,500+	Y
BOURNS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,314	N/A	£0	82.47%	150	3500+	Y
CINCH CONNECTIVITY/Bel	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	31,120	N/A	£0	78.21%	150	3500+	Y
Coilcraft	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	10,400	N/A	£0	98%	50	1,500+	Y
Cornell Dubilier	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	33,000	N/A	£0	65.00%	50	1,500+	Y
EPCOS / TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	31,000	N/A	£0	74.00%	50	1,500+	Y
Fair-Rite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	94.00%	50	1,500+	Y
HONEYWELL MICROELECTRONICS & PRECISION SENSORS	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	28,560	N/A	£0	89.87%	150	3500+	Y
Kemet	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	135,800	N/A	£0	93%	50	1,500+	Y
KEMET	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	101,257	N/A	£0	91.57%	150	3500+	Y
KOA Speer	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	107,900	N/A	£0	82%	50	1,500+	Y
Laird	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	15,187	N/A	£0	97.20%	150	3500+	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 INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	59,517	N/A	£0	91.54%	150	3500+	Y
Murata	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	66,179	N/A	£0	99.79%	150	3500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,300	N/A	£0	99%	50	1,500+	Y
Nichicon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	21,600	N/A	£0	47.00%	50	1,500+	Y
NICHICON	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	39,747	N/A	£0	96.70%	150	3500+	Y
Ohmite	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	17,300	N/A	£0	99.00%	50	1,500+	Y
Panasonic	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	154,777	N/A	£0	94.42%	150	3500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	67,900	N/A	£0	69.00%	50	1,500+	Y
Rohm	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	55,139	N/A	£0	99.85%	150	3500+	Y
Samsung	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	37,336	N/A	£0	100.00%	150	3500+	Y
Taiyo Yuden	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	6,400	N/A	£0	82%	50	1,500+	Y
TAIYO YUDEN	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	21,540	N/A	£0	99.97%	150	3500+	Y
TDK	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	60,769	N/A	£0	99.20%	150	3500+	Y
TDK	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	25,300	N/A	£0	85.00%	50	1,500+	Y
TE	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	338,106	N/A	£0	79.40%	150	3500+	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	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	581,798	N/A	£0	87.71%	150	3500+	Y
Vishay	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	119,800	N/A	£0	76%	50	1,500+	Y
Wurth Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	63%	50	1,500+	Y
WURTH ELECTRONICS INC	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	23,733	N/A	£0	100.00%	150	3500+	Y

MORE.

ANALOG DEVICES
AHEAD OF WHAT'S POSSIBLE™



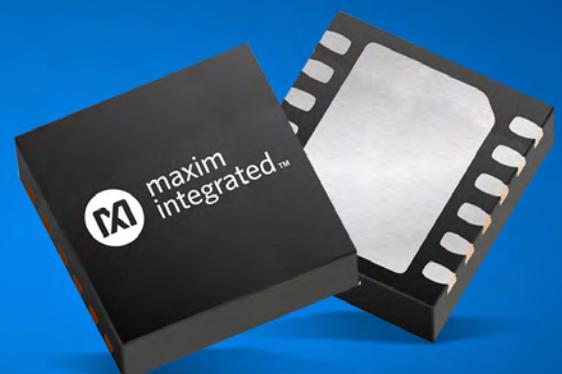
Over 12,000 Analog Devices Products and 2,000 Dev Tools in Stock.

Worldwide leading authorised distributor of semiconductors and electronic components

mouser.co.uk

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
PASSIVES (continued)											
Yageo	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	45,300	N/A	£0	99%	50	1,500+	Y
YAGEO	Digi-Key Electronics	0800 587 0991	www.digikey.co.uk	Y	147,833	N/A	£0	84.31%	150	3500+	Y
POWER & BATTERIES											
Bel Power Solutions	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,400	N/A	£0	94.00%	50	1,500+	Y
Cincon	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,500	N/A	£0	60%	50	1,500+	Y
Cosel	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	11,800	N/A	£0	99%	50	1,500+	Y
CUI Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,900	N/A	£0	100%	50	1,500+	Y
FRiWO Gerätebau GmbH	Haredata Electronics	01423 796240	www.haredata.co.uk	Y	250 - 500	€1M	£250	100%	7	14	Y
Jauch Quartz		01276 605900	www.jauch.com			£500,000	0	95	15	130	Y
Mean Well	Ecopac (UK) Power Ltd	01844 204420	www.ecopacpower.co.uk	Y	6,000	£2M	£0	100%	8	30	Y
Mean Well	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,500	N/A	£0	75%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,200	N/A	£0	93%	50	1,500+	Y
RECOM	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	23,300	N/A	£0	92%	50	1,500+	Y
Schaffner	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	98%	50	1,500+	Y
SL Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,100	N/A	£0	87%	50	1,500+	Y
TDK-Lambda	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	4,600	N/A	£0	99%	50	1,500+	Y
TRACO Power	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	3,400	N/A	£0	95%	50	1,500+	Y
SENSORS											
All Sensors	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	2,300	N/A	£0	70.00%	50	1,500+	Y
ams	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	77%	50	1,500+	Y
Analog Devices Inc.	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	500	N/A	£0	78%	50	1,500+	Y
Bosch	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94.00%	50	1,500+	Y
Freescale Semiconductor	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,000	N/A	£0	66%	50	1,500+	Y
Honeywell	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	15,500	N/A	£0	80%	50	1,500+	Y
Maxim Integrated	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	900	N/A	£0	N/A	50	1,500+	Y
Melexis	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	N/A	50	1,500+	Y
Omron	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	5,700	N/A	£0	N/A	50	1,500+	Y
Sensirion	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	N/A	50	1,500+	Y
TE Connectivity	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,100	N/A	£0	N/A	50	1,500+	Y
SWITCHES & KEYBOARDS											
ALPS	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	400	N/A	£0	70.00%	50	1,500+	Y
Apem	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	700	N/A	£0	96%	50	1,500+	Y
C&K Components	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	1,500	N/A	£0	84%	50	1,500+	Y
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



Over 12,000 unique
Maxim products in Stock

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
TERMINAL BLOCKS											
Marathon Special Products	Global Supply Services	01904 436 488	www.global-supply-services.com	Y	8,000	£800,000	£100	100%	3	11	Y
THERMAL MANAGEMENT											
3m / Laird / Henkel / Brightview / Luminit / Universal Science	Materials direct 247	01908 222211	www.materialsdirect247.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
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	G.English Electronics Ltd	0208 855 0991	www.gelec.co.uk	Y	3,500	£1,000,000+	£0	100%	10	28	Y
Sunon	Thermaco Ltd	01684 566163	www.thermaco.co.uk	Y	3,500	£230,000	£100	100%	6	12	Y
TRANSFORMERS & INDUCTORS											
Best Windings	Best Windings	0044 (0)1394 448424	www.bestwindings.co.uk	N	300	N/A	£100	N/A	2	14	Y
WIRELESS SOLUTIONS											
Anaren	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	86.00%	50	1,500+	Y
B&B Electronics	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	87%	50	1,500+	Y
Bluegiga Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	93.00%	50	1,500+	Y
Digi International	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	200	N/A	£0	92%	50	1,500+	Y
Laird Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	76%	50	1,500+	Y
Linx Technologies	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	99%	50	1,500+	Y
Microchip	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	85%	50	1,500+	Y
Murata	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Panasonic	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	91%	50	1,500+	Y
Redpine Signals	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	94%	50	1,500+	Y
RF Digital	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	100%	50	1,500+	Y
Texas Instruments	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	75%	50	1,500+	Y
Wi2Wi	Mouser Electronics	0044 (0)1494-467490	www.mouser.co.uk	Y	100	N/A	£0	36%	50	1,500+	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BCA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
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
CML Innovative Technologies (uk) Ltd	01284 714700	WWW.CML-IT.com	£12M	UK/EU/China	65		ISO9001 TS16949 UL	N	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
CSI EMS Ltd	01376 500050	www.csiems.co.uk	£5m	Essex	50	3	ISO 9001, UL, IPC610	Y	Y	Y	Y	Y	Y
CT Production Ltd	01202 687633	www.ctproduction.co.uk	£4.5m	Poole, Dorset	55	3	ISO9001:2015, AS9100, SC21 Bronze Award	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, ISO 13485, IUL	Y	Y	Y	Y	Y	Y

Continues on next page

Best
Windings Ltd

For the Best in Windings

ISO 9001 Design, Manufacture and Supply



- Transformers, inductors, coils, modules
- Custom and standard
- Through hole, surface mount, low profile, encapsulated
- Signal, power, high voltage, safety critical
- Low, medium and high volume
- UK and offshore manufacture
- Security, military, avionics, medical, industrial, telecoms, datacoms, consumer, audio, video . . .



Why settle for less? Talk to Best Windings

Tel: +44 (0)1394 448424 sales@bestwindings.co.uk www.bestwindings.co.uk
Best Windings Ltd, Viking Works, Bucklesham Road, Ipswich, IP10 0NX, UK

Contract Manufacturers Buyers' Guide (continued)

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BCA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Electrica Limited	0161 343 7575	www.electricalimited.com	£1.75m	Cheshire	26	3	BSI ISO 9001:2015, IPC-A-610 to Class 3, IPC-J-STD-001, Cert IPC Trainer, UL	Y	Y	Y	Y	Y	Y
Electronic Technicians 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	£20m	UK	200	5	ISO9001, ISO13485, UL, IPC610/620 Class 3	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
Fabrinet UK	01249 814081	www.fabrinetuk.co.uk	£21m	UK/Thailand/US	210	5/31/2	AS9100/NADCAP/EN13485/OHSAS18001/14001/9001/TS16949/FDA/ATEX	Y	Y	Y	Y	Y	Y
FermionX Ltd	+44(0)1903 524600	www.fermionx.com	£5m	Worthing, W. Sussex	40	4	ISO9001, ISO14001, IPC-A-610	Y	Y	Y	Y	Y	Y
G&B Electronic Designs Ltd	01420 474188	www.gandbelectronics.co.uk	£4.2m	Hampshire	60	2	ISO9001, ISO13485, IPC-A-610, IPC-J-STD-001, IPC-7711/7721, BS EN 61340-5-1/2 (ESD)	Y	Y	Y	Y	Y	Y
Hallmark Electronics Ltd	01782 562255	www.hallmarkelectronics.com	£2m	M	26	2	ISO9000/UL, IPC610/D	Y	Y	Y	Y	Y	Y
Icon Electronics Limited	01423 798294	www.iconelectronics.co.uk	£6.5m	Hampshire & Yorkshire	70	6	AS9100, ISO9001, BS EN ISO/IEC 80079-34:2011 ATEX, IPC-A-610 Class3	Y	Y	Y	Y	Y	Y
Industrial Electronic Wiring Ltd.	+44(0)1793 694033	www.view.co.uk	£4.5 m	Swindon, UK	60	N/A	ISO9001:2008, IPC610, IPC620	N	Y	Y	N	Y	Y
Jaltek	01582578170	jaltek.com	£8m	UK	80	3	AS9100, ISO9001, ISO13485, IPC-A-610 Class 3, Certified IPC Trainer (IPC-A-610, J-STD-001 & J-STD-001 Space Addendum)	Y	Y	Y	Y	Y	Y
JIS Manufacturing Ltd	01455 555500	www.jismanufacturing.com	£35m	Bedford, Luttworth, (CZ)	420	3	ISO9001:2015, ISO14001:2015, IPC 610 A class 2&3	Y	Y	Y	Y	Y	Y
Lacon Electronic	+44 (0) 7836 338122	www.lacon.de/en	50m	Germany/Romania	500	13	ISO9001, ISO14001, ISO13485, TS16949, OHSAS18001, VG96927, UL	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
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	01332 832424	www.pektron.com	£50m	E-Midlands	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y
Protronix EMS	01582 418490	www.protronix.co.uk	£2.5m	Luton	10	2	ISO9001:2015, 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
Sedgewall	01582 475555	sedgewall.com	£1.2m	Bedfordshire	25	2		Y	Y	Y	Y	Y	Y
Simtek EMS Ltd	01843 233120	www.simtekems.co.uk	£6m	SE	60	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	£12.5m	Windsor, SE	99	4	IPC610 to Class 3, ISO9001:2015	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	£14.5m	SE	126	7	ISO9001, ISO14001, IPC610 Class 3	Y	Y	Y	Y	Y	Y
Tioga Limited	01332 360884	www.tioga.co.uk	£15m	Derby	110	6	ISO 9001:2015, ISO 13485:2016, IPC 610, IPC 7711/7721	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

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (ie Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Flexi / Flex-Rigid	Obsolete 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	ISO9001:2015, UL	SML	Y	4-16	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
GSPK Circuits Ltd	+44(0)1423 321100	www.gspkcircuits.ltd.uk	M/R	UK, Europe, Asia	BSEN, ISO9001:2008, TS16949:2009, UL, CECC release, Queens Award	SML	Y	4-16	Y	Y	Y	Y	Y
LEF Circuits	0116 2891122	www.lefcircuits.co.uk	M/R	M	ISO 9001:2008, UL	SML	Y	4-30	Y	F/R	Y	Y	Y
Photronix Group	01903 231901	www.photronix.co.uk	B	SE	ISO9001:2015, 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 I/II, UL	SML	Y	4-48	Y	Y	Y	Y	Y
Stevenage Circuits Ltd	01438 761811	www.stevenagecircuits.co.uk	M/B	UK/China	ISO 9001:2008, ISO 14001, EN9100:2009, UL, JOSCAR	SML	Y	4-44+	Y	F, F/R	Y	Y	Y
Tate Circuit Industries Ltd	01889 583627	www.tatecircuits.com	B	UK/China	ISO 9001:2015, UL	SML	Y	4-20	Y	Y	Y	Y	Y
Techridge Circuits	0207 993 6503	www.techridgecircuits.co.uk	M Rep.	UK Europe	UL, TS16949(2009), ISO14001(2004), ISO9001(2008)	SML	Y	4-16	Y	N	Y	Y	Y

EURO QUARTZ

The Engineers Design Resource

Frequency Control

UK PRODUCTION - AS9100 Certified

- Crystals
- Oscillators
- Filters

- RF and MICROWAVE FILTERS
- Crystal
- SAW
- LC Filter
- Cavity
- Stripline
- Co-axial
- Ceramic
- Helical

t: 44(0)1460 230000 w: www.euroquartz.co.uk



Farnell

element14



Your DEVELOPMENT DISTRIBUTOR

Supporting your journey at every stage

Offering products and solutions to create a better future

EDUCATION & MAKERS

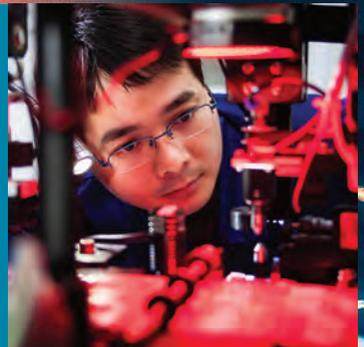
Your Development Distributor



Helping engineers bring their ideas to life

RESEARCH & DESIGN

Your Development Distributor



Enabling our customers to develop and build their prototypes faster

PROTOTYPE & TEST

Your Development Distributor



Supporting business and maintenance needs

PRODUCTION & MAINTENANCE

Your Development Distributor



uk.farnell.com/your-development-distributor

EXPAND YOUR HORIZONS

To take your design capabilities virtually anywhere.



- Extensive UK inventory on **Advanced Digital, MCU & MPU, Analog & Mixed Signal, Memory and Power** products.
- Design support and **FREE** development tools available.
- **FREE UK Delivery**

Explore our extensive Renesas Portfolio on

angliaLive

www.anglia-live.com