

ELECTRONICS

FEBRUARY 2020

# sourcing

NORTH AMERICA

## BUYER DEMAND FOR PCBS CONTINUES APACE

*page 04*

WHY PURCHASERS ARE  
DEMANDING TRACEABILITY

*page 12*

OBSOLESCENCE: THE  
COUNTERFEITER'S BEST FRIEND

*page 18*

BLOCKCHAIN OR BUST

*page 22*

TABLE-TOP ENCLOSURES  
AVAILABLE IN A SMALLER SIZE

*page 34*

FEBRUARY 2020

## MEET THE HEROES OF OBSOLESCENCE MANAGEMENT

AN MMG PUBLISHING TITLE



Access to  
**9.2 Million+**  
Products Online

**DIGIKEY.COM**

# Breaking Down the Walls Between Procurement, Engineering, and Design



**Digi-Key Electronics offers a complete set of APIs to share information and automate the ordering process.**

#### Available APIs

- Ordering\*
- Order Support
- Quoting
- Product Information
  - Price and Availability
  - Part Search
  - Recommended Parts
  - Package Type by Quantity
  - Product Change Notifications
- Barcode

\*Subject to Digi-Key approval



**Download the eBook: [DIGIKEY.COM/API](https://www.digikey.com/api)**



## On the cover – February 2020

Meet the heroes of obsolescence management  
page 15

## Contents

# 04

### News

Supplies meet demand for efficient power



# 13

### IoT

Why wireless IoT will change your BoM



# 20

### Obsolescence

What's your game plan?



# 27

### EV Charging

Simplify your BoM with smart power solutions



# 37

### Buyers' Guide

All the facts and figures to help you buy



## Editor's Word



### Four-day purchasing week?

My father was a teacher in the '60s and '70s. I remember him telling me that government guidelines at the time were to educate children for a life of leisure to prepare for the day a robot took their job. These days people fear AI will make them redundant. Thus, I'm confused that while people are craving job security, governments and companies around the world are pushing the benefits of a four-day week.

I've done some research and I'm confused. There doesn't seem to be a global standard for a four-day week. Will it be voluntary or compulsory? Will employees be expected to work fewer but longer days? Will there be a hierarchy where some jobs are deemed suitable for a four-day week and others not, and if so who decides?

As a commercial fisherman my week was governed by the time of the tide, weather conditions and the skill of the skipper to put the boat above a shoal of fish. As a designer of robots my week was governed by the complexity of the next machine, installation deadline and the customer's willingness to shut an entire factory down so we could make a cut in their production line.

So, what's the likelihood that one day every purchasing professional will work a four-day week? I imagine many already do, so it must work. It's the number of variables that worry me. Is the company a start-up in a rush or a mature business cruising along? Are you weeks, days or hours from an important deadline? Do you purchase alone or are you part of an extensive team split across different time zones? It's complicated.

Anyway, enough of that. I'm finished with this leader and it's only Thursday.

*Jon Barrett*

## Contact



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

**ADVERTISING**  
Director of New Business: Charlotte Morgan  
charlotte.morgan@electronics-sourcing.com  
Area Sales Executive: Emma Poole  
emma.poole@electronics-sourcing.com  
North American New Business Manager: Glen Sundin  
glen.sundin@electronics-sourcing.com

**CIRCULATION**  
Circulation Manager: Vicky Leary  
vicky.leary@electronics-sourcing.com  
Circulation Account Manager: Liz Poole  
liz.poole@electronics-sourcing.com

**DESIGN**  
Graphic Designer: Josh Hilton  
josh.hilton@electronics-sourcing.com

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

Issue 89, Vol.11 No.02  
Published 12 times per year  
by MMG Publishing US Ltd

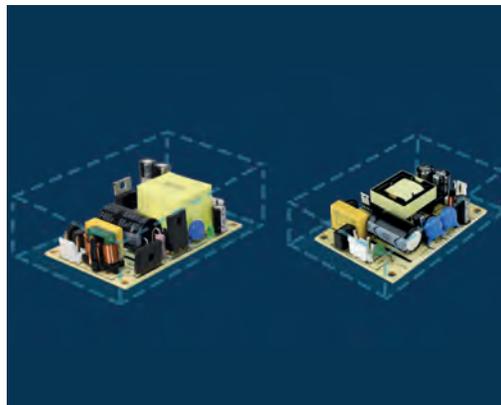
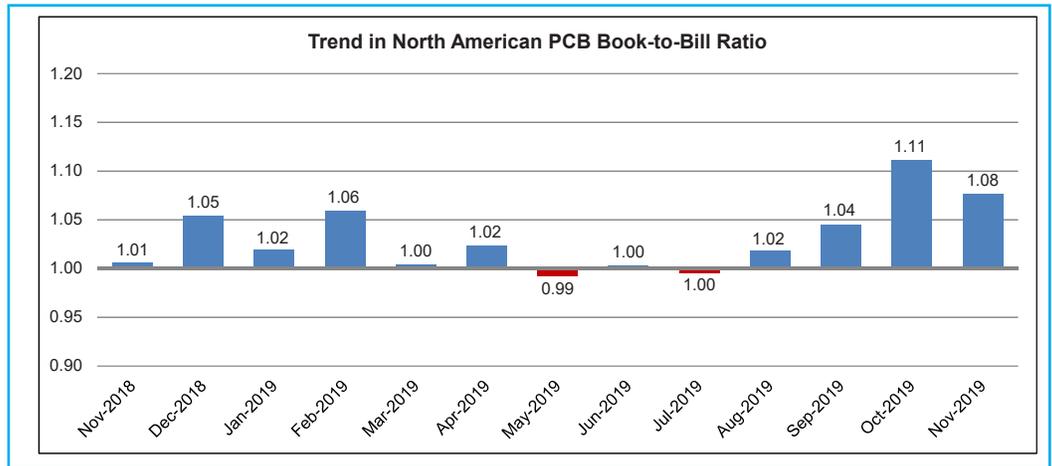
MMG PUBLISHING US Ltd  
Normandale Lake Center  
8400 Normandale Lake Boulevard  
Suite 920, Bloomington MN 55437  
Tel: 866.364.0951  
Fax: 952.378.2770  
@Electrosourcing

Printed in the United States  
© 2020 MMG Publishing US Ltd



ecia  
Connect. Insure. Optimize.

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 – shutterstock.com/alphaspirit



## Supplies meet demand for efficient power

CUI has added six low power, open frame AC/DC power supply series to its VOF product family. The VOF's efficient design, compact size and rock-solid reliability are said to make the supplies ideal for a range of consumer, industrial, ITE and smart home applications.

The new 15, 30, 40, 45, 60 and 65W additions to CUI's AC/DC power supply portfolio mean the full range now extends from three to 550W. Housed in compact, chassis mount packages measuring as small as 2.5 by 1.8 by 0.75in, the new models also feature industry standard footprints and no-load power consumption less than 500mW.

Along with UL/EN/IEC 62368-1 certification and CISPR32/EN 55032 Class B compliance, these open-frame modules feature universal input voltage ranges, 3kV AC isolation and up to 48V DC rated output voltages. The VOF-15C and VOF-30C series are additionally designed to meet UL/EN/IEC 60335 requirements.

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

## Buyer demand for PCBs continues apace

The November 2019 findings from the IPC's North American printed circuit board statistical program indicate buyer demand for US PCBs remains strong. Sales and orders in November continued to outpace last year.

Total North American PCB shipments in November 2019 were up 17.2 per cent compared to the same month last year. Year-to-date sales growth is 7.7 per cent ahead of the same period last year. Compared to the preceding month, November shipments increased 0.7 per cent.

IPC director of market research, Sharon Starr, commented: "Business is booming for the North American PCB industry as sales and orders outpace last year's performance by a substantial margin. A strong book-to-bill ratio following three months of positive ratios indicates the likelihood for continued sales growth through the first quarter of 2020."

[www.ipc.org](http://www.ipc.org)

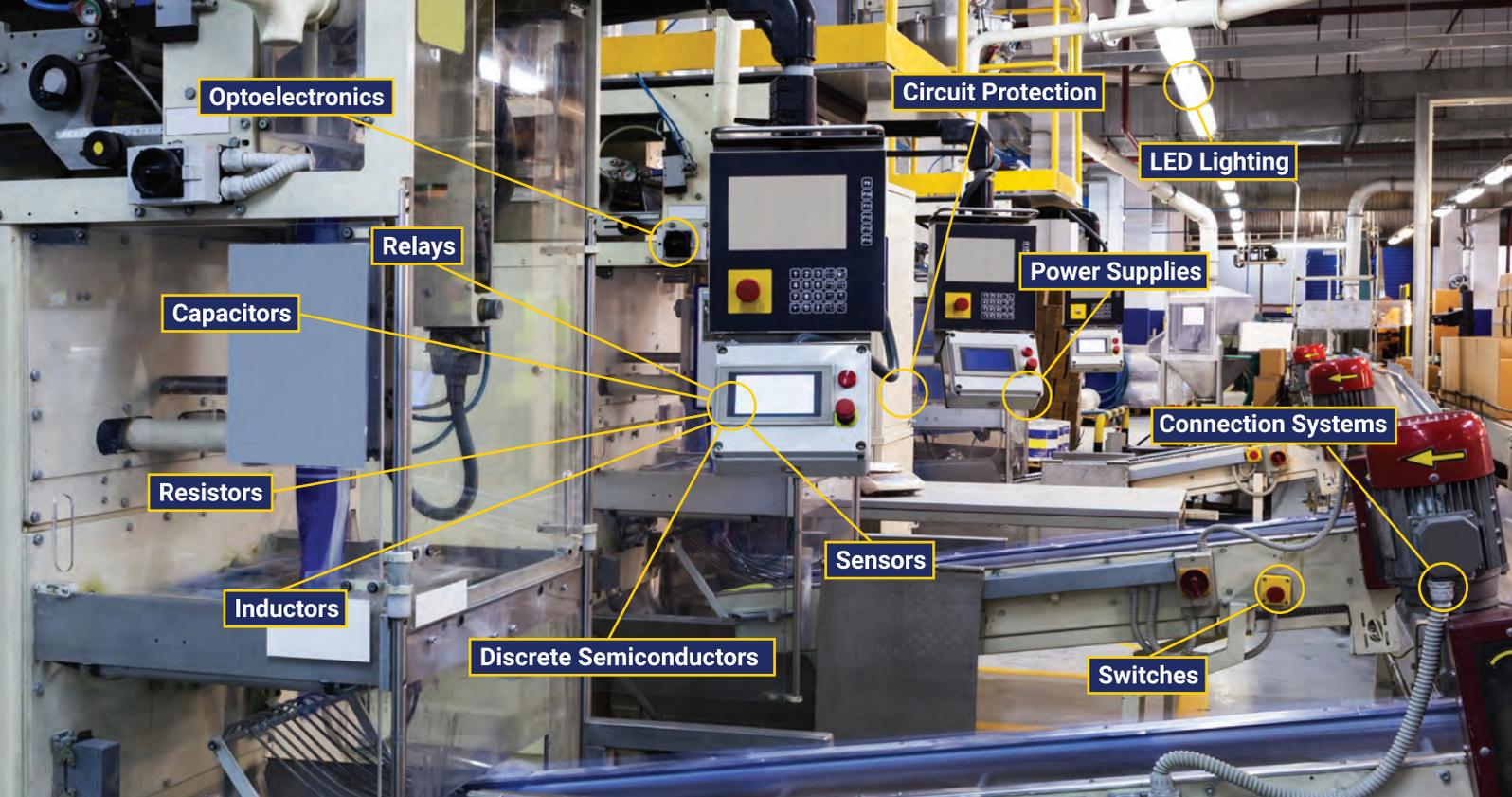
## Acquisition enhances passives choice

Gowanda Components Group has expanded its range of resistors, capacitors, coils and delay lines by acquiring RCD Components, a manufacturer of passive components for the commercial, military and aerospace industries.

Chief executive officer of GCG, Don McElheny, said: "The addition of RCD expands the breadth of our passive component offering and enhances our passive technology capabilities. As a result of our combined strengths we look forward to developing unique solutions to address board level design challenges."

Under the deal, RCD will maintain its operations in Manchester, New Hampshire, as well as its support facilities in the Caribbean and Asia. In addition to RCD's facilities, GCG has seven other manufacturing and design facilities located within the United States.

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



# The Number to Know for Industry 4.0 is 1.800.CALL.TTI

## America's Leading Inventory of Ready-to-Ship Electronic Components

TTI Industrial Specialists stock a broad and deep inventory of interconnect, passive and electromechanical components for factory floor applications. From harsh environment rated capacitors and resistors to lighting, sensors, and switches, to connectors, discretes, and wireless communications components for the Industrial Internet of Things, TTI has the components you need, on the shelf and ready to ship from our 800,000 square-foot distribution center in Fort Worth, Texas.

From our broad and deep inventory, to your production line, TTI Specialists have the components you need, when you need them at 1.800.CALL.TTI, visit us online at [ttiinc.com](http://ttiinc.com) or connect with us on social media @ttiinc



**ttiinc.com**  
**#ttiinc**  
**1.800.CALL.TTI**

A Berkshire Hathaway Company



## In Brief

### And the new president is...?

ECIA has announced that the search has begun for a new president and CEO, following the current incumbent, Bill Bradford's announcement that he plans to step down by the end of Q1 2020. Bradford has led the association since 2018 and will transition to an industry position later in the year. He leaves the body with a solid governing structure, a strong balance sheet and many exciting plans underway.

[www.ecianow.org](http://www.ecianow.org)

### Extended resistor choice

Exxelia has extended its portfolio of passive components and sensors by acquiring Micropen Technologies providing enhanced access to Micropen's Ohmcraft resistors. Serving customers in the medical, defense, space and industrial markets, Micropen utilizes a patented process to print materials such as conductive electrodes and precious metals onto planar or 3D substrates. This facilitates the Ohmcraft resistors as well as innovative medical sensors.

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

### Enhanced capacitors in stock

New Yorker Electronics is now distributing the enhanced Cornell Dubilier PC series of AC harmonic filter capacitors, which includes a new 85A RMS rating. Type PC capacitors are designed to meet the demands of filter applications rich in system total harmonic distortion. Series improvements include UL recognized construction and an internal pressure interrupter system designed to ensure fail-open performance under high current fault conditions.

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

### Integration offers new solutions

Renesas Electronics has announced that following the successful integration of Integrated Device Technology, IDT is operating under the name of Renesas Electronics America. Fueled by the IDT integration, Renesas is working to expand its analog lineup and to strengthen kit offerings that combine MCUs, SoCs and analog products. Close to 100 Winning Combination solutions featuring complementary products have already been developed. Former IDT products will be rebranded as Renesas from January onwards.

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



## Simplify IoT sourcing

Arrow Electronics has teamed with data solutions company, Microshare, to provide internet of things solutions at scale to its global enterprise customers. Together, the two companies will deliver IoT solutions to clients in facilities management, transportation, infrastructure, healthcare and other sectors.

President of Arrow's global services business, Kristin Russell, explained: "Microshare has the vision and capacity to scale IoT and manage the resulting torrents of data for global portfolios."

By combining Arrow's worldwide distribution and support with Microshare's preconfigured, solutions, the collaboration will deliver IoT solutions at scale with ease of deployment. Microshare's pre-configured kits include sensors, LoRaWAN network connectivity, dashboards, alerts, and simple step-by-step instructions that can be installed by non-technical personnel to start producing data on 'day one.'

The collaboration delivers complete services, from sourcing solution components, packaging and deploying to customers, providing installation and managing warranty, repair and returns.

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

## Partnership enhances UV sanitization offering



Laser Components USA has announced a new partnership with US manufacturer of UVB/C solid-state emitters, Bolb, providing purchasers with access to a new range of UV-LED sanitization technology. Bolb specializes in MOCVD reactors and epitaxy, device fabrication and advanced packaging, including single-chip and level two performance for universal disinfection.

Commenting on the agreement, Laser Components USA sales director for laser optics, diodes and modules, Huyen Vu, stated: "This



## An intelligent approach to AI

Mouser Electronics has launched a new eBook in collaboration with NXP Semiconductors examining artificial intelligence and identifying specific products for AI and machine learning. In *Imagine the Possibilities*, Mouser and NXP offer analysis of hot-button AI applications, including voice control, facial recognition, autonomous driving and object recognition.

Recent developments in AI and ML are leading to changes in technologies, products, and industries. As high-performance processing capabilities have moved from the cloud to the edge, lower bandwidth requirements have led to new solutions for industrial, automotive, and internet of things applications. This new eBook from Mouser and NXP clarifies the current state of AI and ML, in addition to highlighting future directions and solutions for the industry.

The book also features details on products such as NXP's S32V2 vision processor, Layerscape communications processors, and i.MX 8M application processors. It also provides tips on AI across a variety of industries, highlighting the steps and components required for successful solutions.

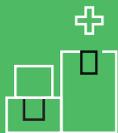
[www.mouser.com](http://www.mouser.com)

partnership enables us to deliver innovative solutions to our customer base, now and in the future. Bolb's UV LED product technology aligns with ours, creating continuity in our product applications."

Both companies offer products that support water treatment, healthcare delivery, agriculture and food security, and value-added white goods industries.

[www.laser-components.com](http://www.laser-components.com)

# Discover Over a Million Engineering Products from Suppliers You Know and Trust



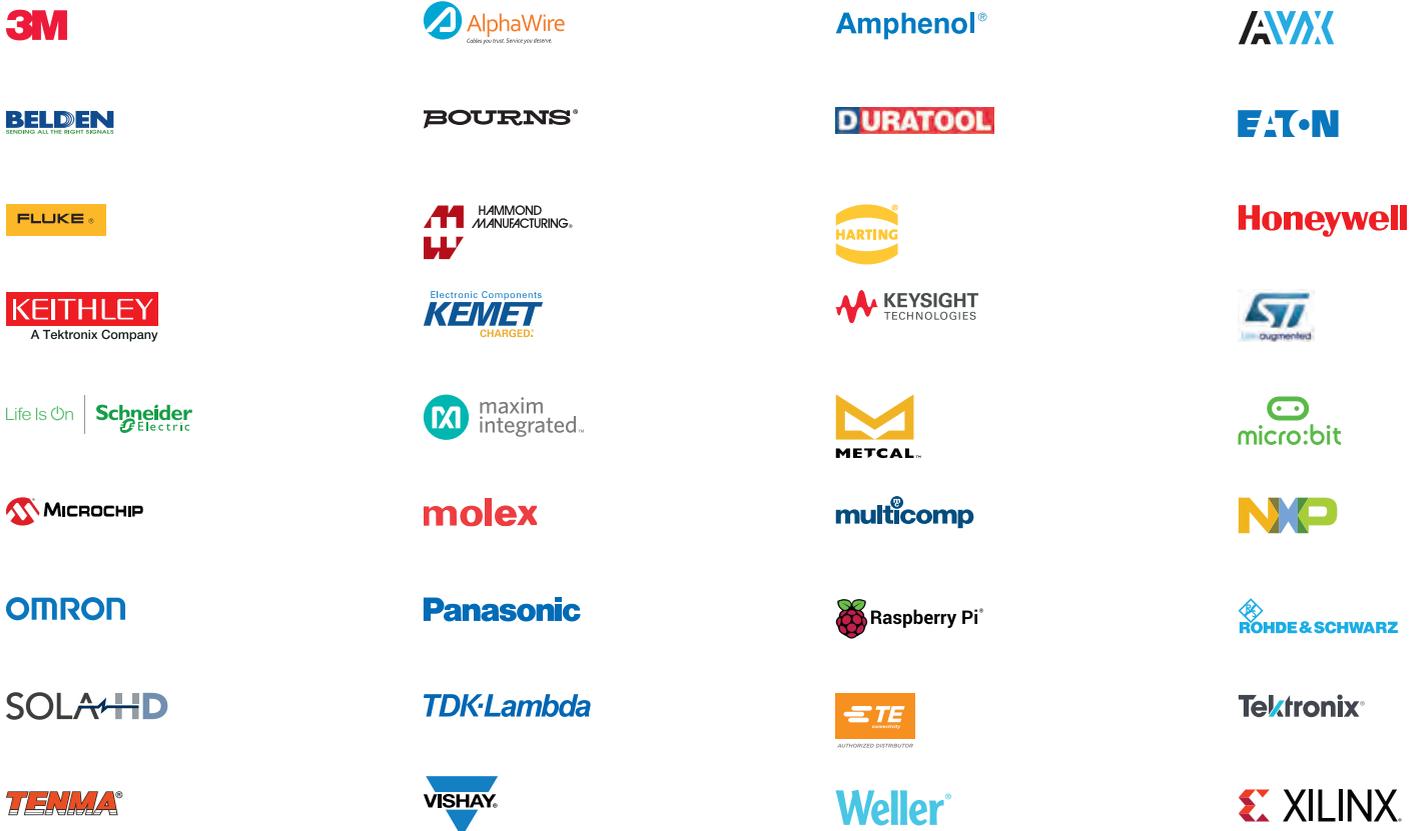
900+ new products  
each week



Custom services such as  
kitting, panel meters,  
enclosures, and many more!



Market-leading online  
community of over  
600,000 engineers



## Outsourced cable harness cuts lead times, not quality

Custom interconnect specialist, NAI, has been appointed to develop and manufacture complex cable harnesses for installation within explosion-proof enclosures in a large Chinese mining operation. The customer awarded the contract to NAI after producing the harnesses internally. By using NAI instead, they were able to reduce quality risks and manufacturing lead times as well as gaining access to NAI's global supply chain for advantages with various components.

In total, NAI assembles five different industrial-grade enclosures to house specific operational equipment: a main controller for a high voltage inverter, a DSP module, a power controller, the main controller for the inverter and a control unit for intrinsic mine safety. Various harnesses are installed within these enclosures, along with electronics and other components.

To meet the demands of this project, NAI products are rated GB3836.2-2010 for explosive atmospheric conditions, undergo high voltage testing at 330V for power cables and feature IP67 rated connectors for resistance to dust and water.

[www.nai-group.com](http://www.nai-group.com)



## Looking for secure IoT solutions?

Newark has announced same day dispatch of Renesas Electronics' RA family of 32-bit Arm Cortex-M based microcontroller units, said to provide security, a wide range of connectivity, low power consumption and scalability.

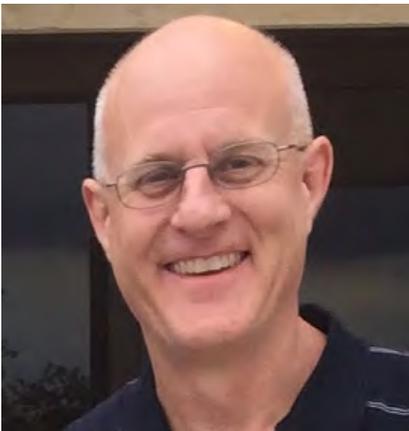
The RA MCUs will help customers deliver advanced solutions for a range of internet of things applications, including industrial automation, cloud computing, building automation, smart environment, energy and metering and home appliances.

All RA MCUs have been designed with a common DNA, making them feature-, software- and pin-compatible for easy scalability and code reuse from one device to another.

The MCUs also deliver key advantages such as embedded security, CoreMark performance, and ultra-low power operation. Arm PSA security certification provides customers with the confidence to quickly deploy secure IoT endpoint and edge devices and smart factory equipment for Industry 4.0.

Global head of semiconductors and SBC for Newark, Lee Turner, commented: "This is a significant new launch from Renesas, which provides customers with greater options in the development of their IoT hardware and software, without compromising on key features such as security."

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



## Power solutions center earns UL 508A certification

Sager Electronics has revealed that its Power Solutions center in Carrollton, TX, has now been certified as an UL 508A panel shop. This industrial control panel directive certifies that assembly meets the relevant standards of electrical inspection.

Director of manufacturing operations for Sager Electronics, Don Fincher, commented: "UL certification attests that Sager Electronics meets or exceeds the

stringent standards of electrical inspection in industrial control panels. Our customers rely on our Power Solutions center engineers and production team to design, test and assemble their custom engineered solutions. This certification further validates Sager Electronics as a leading choice for their value-add requirements. We are proud to be a UL 508A certified shop."

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



## Extended resistor values available

Stackpole has added a two milliohm resistance value to its popular CSS0603 series. The 0603 metal foil is rated at 0.33W and the 2mohm resistance value has a temperature coefficient of resistance of  $\pm 150$ ppm with tolerance capability as low as one per cent.

The CSS Series' metal alloy element is said to combine excellent environmental and electrical stability with robust high

temperature operation up to 225°C. This makes it a great choice for a range of precision power monitoring and control requirements, precision motor controls, instrumentation, and robotics.

Pricing varies with size and tolerance and ranges from \$0.10 to \$0.25 each in full reel quantities.

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

# Got Air?

Sager Electronics offers standard and custom air moving products to meet any thermal requirement.

From axial and centrifugal fans, blowers and impellers to a host of cooling solutions,

when you think thermal...  
**THINK SAGER**



**SAGER**  
POWER SYSTEMS  
A SPECIALIZED GROUP WITHIN SAGER ELECTRONICS

**AAVID**  
THERMAL DIVISION OF BOYD CORPORATION

**ebmpapst**

**Laird**

**NMB**

**SUNON**

**BERGQUIST**

**Henkel**

**Laird**  
THERMAL SYSTEMS

**SANYODENKI**

**wakefield-vette**

THINK THERMAL · [www.sager.com/thermal](http://www.sager.com/thermal) · 1.866.588.1750 · [thermal@sager.com](mailto:thermal@sager.com)



# Memory IC supply could tighten in the second half

*Prices for both DRAM and NAND flash memory should firm this year after declining sharply in 2019*



James Carbone

Semiconductor buyers can expect a buyer's market for memory ICs in the first half of 2020, but supply should tighten and prices increase in the second half as demand for DRAM and NAND flash rises.

While price increases will be modest, the market may lean towards being a seller's market in the second half and will be markedly different than the memory IC market 2019, according to industry analysts.

"Last year was a brutal year" for memory IC manufacturers, said Brian Matas, vice president of research for IC Insights. "The total memory market was down 33 per cent. DRAM declined 37 per cent, flash declined 27 per cent," he said. DRAM prices fell 44 per cent, while flash tags dropped 25 per cent compared to 2018.

The decline of the memory IC

market in 2019 actually began in 2018 after new capacity was added following two years of robust demand and rising sales. "In 2017 and 2018, DRAM manufacturers were making a killing and prices were rising," said Matas. "They started reinvesting their profits to add new manufacturing capacity and it came online and supply exceeded demand," he said.

## Demand cools

At the same time, memory IC demand cooled as fewer servers were ordered for data centers for cloud computing by companies such as Amazon, Facebook, Google, Microsoft. Such servers use a lot of memory and help to drive the overall memory IC market. With weakened demand, prices for both DRAM and NAND flash memory fell.

The good news for DRAM and flash memory manufacturers is

that data centers will invest in more servers and storage systems in 2020, which means demand for memory chips will increase. "We're expecting a return to growth in the second half of the year," said Matas. "We are seeing double-digit increases for both DRAM and flash."

He said DRAM revenue will increase 12 per cent to \$69.8 billion, while NAND flash sales rise 18 per cent to \$53.5 billion. "Both of these are pretty nice turnarounds," said Matas. However increased demand for memory IC probably won't occur until the second year. "It may be a little bit soft in the first half of the year or just perhaps tepid growth," said Matas.

Prices for DRAM will remain soft in the first half and for the total year, but rise in the second half, although for the total year, the average DRAM price will fall

about 8 per cent, according to IC Insights. However, flash memory prices should rise about 4 per cent in 2020.

## Low prices boost demand

Low prices in the first half of 2020 will boost demand for memory ICs. "We think these low prices are really going to spur unit demand for DRAM and NAND flash because of elasticity of demand," he said. He said prices are very low compared to last year and 2018 so memory is much more affordable. Systems manufacturers will likely decide "to pack their systems with a lot more memory," said Matas.

Servers and mass storage systems for data centers and cloud computing won't be the only drivers for memory ICs in 2020. Demand for memory should also increase for portable computers and next generation smart phones, according to

## By the Numbers



33%

The rate of decline of the worldwide memory integrated circuit market in 2019. Source: IC Insights



\$73 billion

The expected size of the worldwide DRAM market in 2020. Source: IHS Markit



\$110.3 billion

The forecasted size of the worldwide global memory IC market in 2020. Source: WSTS



\$57 billion

The total of NAND flash revenue in 2020. Source: IHS Markit



4.1%

The rate of growth of the memory market in 2020. Source: WSTS



\$188.1 billion

The forecasted size of the global memory IC market in 2024. Source: IC insights



Jeff Janukowicz, research vice president for IDC. More portable computers will be equipped with solid-state drives (SSD), which use NAND flash. We are expecting almost a 70 per cent SSD attach rate next year for portables," said Janukowicz. He said lower NAND prices will help drive use of SSD in portable computers.

He said the mobile phone market will also drive memory IC growth in 2020. "That's due to next generation mobile phones and the ramp up of 5G," he said.

Janukowicz noted that 5G is in its early phases of adoption but will grow in 2020 and for several years after. New 5G phones will use more memory than previous generations. Many older phones had been equipped with 8 or 16Gb of memory, but newer 5G phones will have 64Gb of memory or more.

Michael Yang, director of research for researcher IHS Markit, said 5G will deliver more bandwidth, enabling people "to do more with their cell phones." Fifth generation phone technology "will deliver a better gaming experience, a better virtual reality experience, enhance analytics and all of that is going to increase memory consumption," said Yang.

### More memory for cars

Another memory driver will be autonomous vehicles. "As cars become smarter, they need more sensors to collect more data and they need more processing power and more DRAM to help process that data and NAND flash for storage," said Yang. As a result, memory IC content in vehicles will increase significantly.

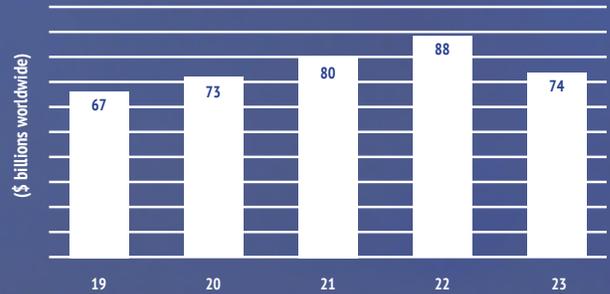
However, Yang points out while memory content in vehicles will rise, automobiles represent a relatively small market compared to computers and smart phones. About 1.8 billion smart phones will ship in a year and about a 250 million PCs are sold each year. Vehicle sales typically total about 100 million annually.

One of the other drivers for memory will be next generation game consoles," said Janukowicz. Both PlayStation and Xbox are scheduled to release next generations of their video game systems and the new consoles will shift away from hard drives to SSD which will "help boost demand for NAND flash," he said.

While memory IC demand will increase in 2020, the bad news for buyers is there will be cutbacks in capital expenditures for new capacity. "The challenges that the industry experienced in 2019 resulted in some lower

Worldwide sales revenue for DRAM will increase from \$67 billion in 2019-\$73 billion in 2020. Source: IHS Markit

## DRAM demand to rise in 2020



production plans for 2020 and reductions in capital spending," said Janukowicz. "That will bring the market a little bit more back into balance." As a result, prices should firm or even rise a bit.

"In fact, with NAND we are already beginning to see the market firm up. "We are expecting price increases" in the first quarter, he said.

In addition to overall memory IC cutbacks which will limit memory capacity growth, a fire and a power outage at two memory IC fabs could also end up crimping supply in the short term.

"There was a fire at a Kioxia (formerly Toshiba) plant and a power outage at a Samsung fab," said Janukowicz. Those events have created "some uncertainty in the NAND market."

### Production disrupted

Production of DRAM and NAND at Samsung's fab in Hwaseong, South Korea was stopped due to the outage, which was caused by an explosion at a local substation. While the outage only lasted about a minute, it was unclear how many wafers were in process at the time and how many of them were damaged.

Production was also disrupted by a fire at Kioxia fab in Japan and would likely lead to price

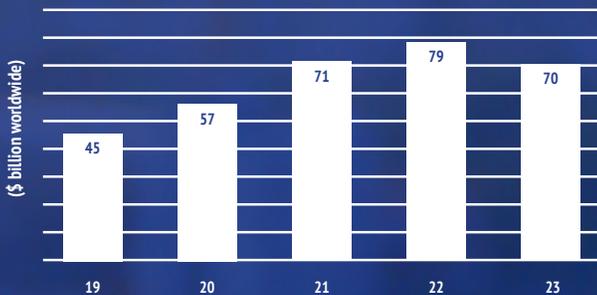
increases in the first quarter. The fab makes 64-layer and 96-layer, 3D NAND flash.

Because of the fire and outage and overall capex cutbacks, "we expect pricing to remain volatile through the first half of this year and some price increases to come along with that," said Janukowicz.

Some memory IC buyers may be heartened by the fact that two Chinese companies are expected to begin volume production of DRAM and NAND in 2020, which eventually could boost supply in the longer term. China's CMXT will produce some DRAM and YMTC will build NAND flash.

Both will start volume production in 2020 but probably won't be a factor in the memory market until 2021, according to Janukowicz. "It takes some time for their products to ramp. But China remains committed to being a memory provider and becoming a larger player," he said.

## NAND revenue to rise sharply in 2020



After declining 25 per cent in 2019, NAND flash memory rep will rise from \$45 billion last year to \$57 billion in 2020 because of increasing demand and higher prices. Source: IHS Markit

# Why purchasers are demanding traceability

*Vice president, operational excellence at Digi-Key Electronics, Teri Ivaniszyn, explains why provenance in the electronic components supply chain is vital for purchasers and distributors alike*

Today's culture demands greater transparency from brands than ever before. Whether it's food, beauty, automotive, or electronic components—customers want to know where their products are from and what they're made of. They also want to know more about the companies they support—their operating procedures, the way they treat their employees and their commitment to sustainability. At Digi-Key, we share this desire for transparency, and when it comes to our suppliers, we demand the same level of information that our customers do.

## What is traceability?

Information provided by manufacturers such as date codes, lot numbers, or serial numbers, enable anyone throughout the supply chain to trace components back to the original equipment manufacturer (OEM) should anything go wrong. Within the electronic components industry, traceability is quickly becoming a bigger focus than ever before.

Firstly, in an era where competition is stiff and gaining consumer confidence is vital, traceability is critical to protecting a brand's reputation. If a product is recalled or a malfunction occurs during testing, being able to trace the issue back to the manufacturer accurately and quickly can save customer trust and maintain a company's reputation.

In addition to bolstering a brand's reputation, sourcing

traceable products can also save companies a considerable amount of money. If any faults arise with a product, the OEM or subcontractor can get a recall notice out quickly—reducing legal costs and mitigating profit loss. Defects with genuine products can also be quarantined much easier than with counterfeit parts.

## Demonstrating authenticity

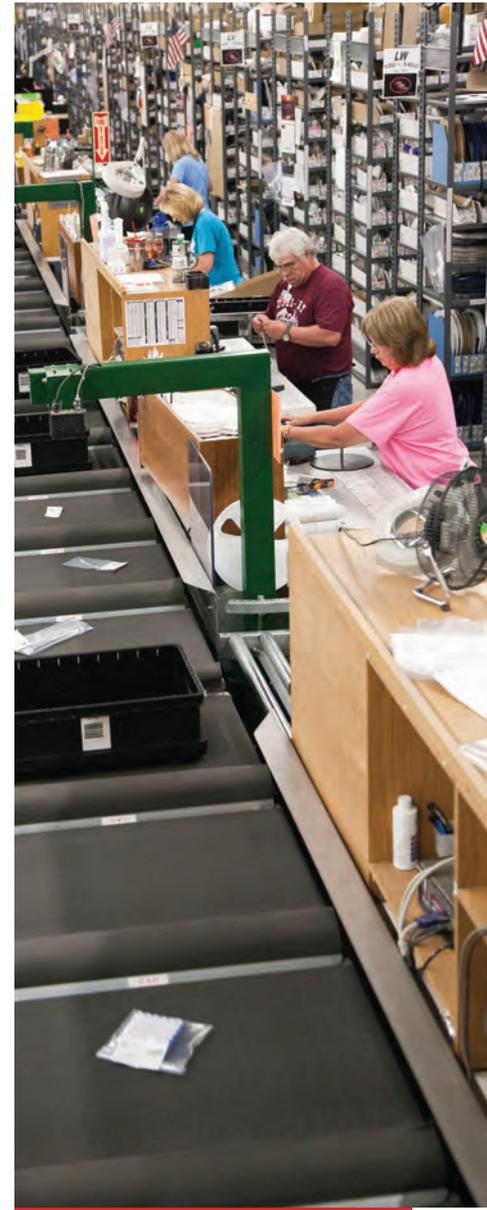
As the demand for traceability continues to grow, so does Digi-Key's commitment. We only buy direct from our 800-plus franchised manufacturers in order to ensure the component is new, authentic, and fully warrantable under the direct supplier. This also ensures that accurate, up-to-date technical information is readily available. For each of our more than 8.2 million components, Digi-Key holds documentation valid for 10 years that proves the traceability of the part and its authenticity.

In addition, Digi-Key has been certified to the Counterfeit Avoidance Accreditation Program. This proves our counterfeit controls have been verified by an external auditing company and ensures components are compliant to aerospace standard AS6496. Digi-Key also has controls for disposition, inventory control, receiving, and customer returns verification developed to adhere to the AS6496 counterfeit avoidance certification. In the event that suspect or confirmed counterfeit product is identified in the supply

chain, Digi-Key has processes in place to quarantine the product, and report the findings to the supplier, relevant customers and appropriate authorities. We also maintain the ISO 9001:2015, which certifies the purchasing, warehousing and distribution of electronic components to original equipment manufacturers and/or customer specifications. In other words, not only do we pursue transparency in our components, but also in our business practices and customer service.

Here at Digi-Key we're excited about the growing dialogue around traceability and the greater demand for authentic products. We look forward to continuing to equip purchasers across the globe with products that are 100 per cent traceable—from prototype to final product.

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

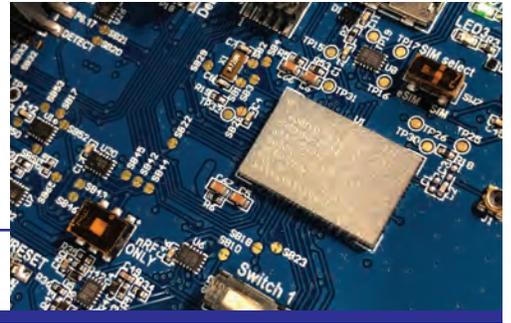


Inventory controls and returns verification processes adhere to the AS6496 counterfeit avoidance certification

# Why wireless IoT will change your BoM

*If you're purchasing for IoT applications, then cellular connectivity solutions are probably on your shopping list. Rutronik's product sales manager wireless, Sarah Brucker, explains everything you need to know about today's go-to technologies*

Today's wireless standards allow cloud access from remote places



The internet of things is becoming the new normal with a staggering 1.3 billion devices already connected to wide area networks at the end of 2018. From smart metering through to logistics and maintenance, IoT devices are taking centre stage in virtually every domain of our lives. At the heart of this transformation lies connectivity, which is facilitated by cellular technology.

The needs of a typical IoT device can, however, be very different to those of a mobile phone. To meet these needs, two simplified versions of Long-Term Evolution, one of the most popular standards for mobile wireless communications, have been developed: NB-IoT or Narrowband IoT, sometimes referred to as NB1, and LTE-M1, also known as M1.

Simpler and designed to transmit smaller data packets, these standards have the advantage of using less power and occupy a smaller frequency spectrum. Here are four things purchasers should know about these standards, which are currently opening up unprecedented opportunities for IoT devices.

## 1. They run on existing LTE networks

One of the biggest advantages of LTE-M and NB-IoT is that, as they are derived from LTE standards, they run on the existing LTE network infrastructure. This gives access to data transmission that is both robust and secure and, as the LTE network expands, allows mobile devices to roam globally in the same way a smartphone can. The infrastructure is provided by mobile network operators meaning that coverage in all regions is already excellent – and improving.

## 2. They allow cloud access from remote places

The IoT often requires small packets of data to be transmitted on an occasional basis. For example, it is not necessary for



NEW



## CORNER ENCLOSURES

SMART-CONTROL - Highly attractive angled enclosures designed for mounting to room corners and ceilings. Ideal for modern detection, control and IIoT equipment. 2 sizes in off-white UV-stable flame retardant plastic. Optional IP 55 sealing kit for dust/water protection. OKW ENCLOSURES INC  
800 965 9872 | [www.okwenclosures.com](http://www.okwenclosures.com)

Request a free sample today!

**OKW**

an ambient temperature sensor or a soil pH sensor to transmit frequently as the parameters being measured don't change that quickly. The challenge is that the sensing nodes are often placed in out-of-the-way places such as remote fields, inside building infrastructure such as air ducts, or within remotely-located cabinets. This is where NB1 and M1 come in.

The connectivity and range of sensing capabilities now allow engineers to imagine applications that would not have been possible before in areas including smart metering, infrastructure, agriculture, forestry, transport, logistics and maintenance. Utility companies can now receive metering information directly without the cost and inconvenience of meter readers while maintenance companies can monitor machines remotely and schedule predictive maintenance accordingly.

### 3. There is already a good choice of supporting technologies

Looking for technology to support NB1 and M1? Nordic Semiconductor has been involved in low-power wireless for some time. Its latest product, the nRF91 series, is a multi-mode system-in-package based on an ARM Cortex M33 microcontroller for NB-IoT and LTE-M. It searches for NB-IoT and/or LTE-M networks automatically and can switch easily between the two. ARM TrustZone and ARM CryptoCell provide security for storage while data transmission is encrypted and protected.

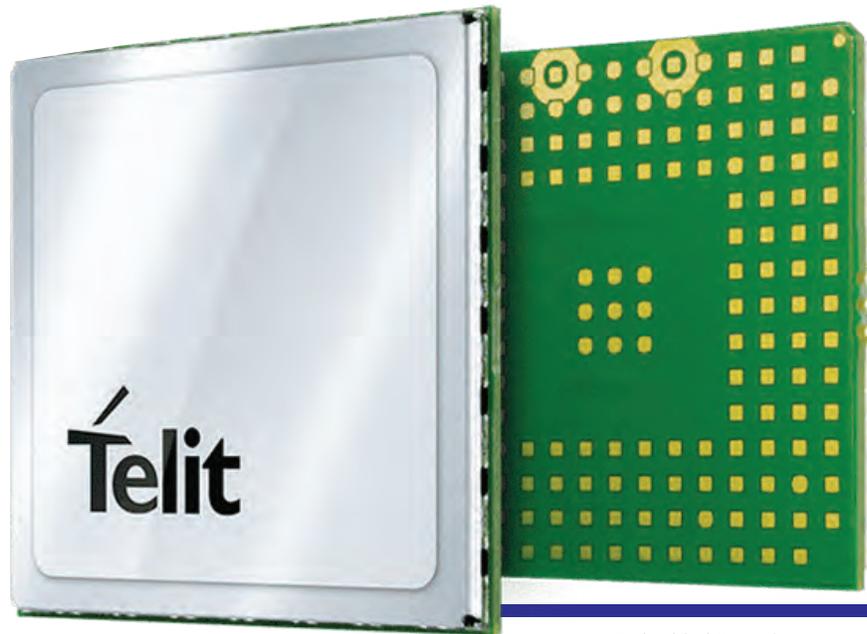
The SiP is available with assisted GPS and, even with this feature, is available in a tiny 10 by 16 by 1.2mm package. Its footprint is one-fifth of the volume of comparable NB-IoT and LTE-M modules coupled with

a GNSS module, which makes this product ideal for space-constrained IoT applications. The capable M33 processor allows data to be processed locally at the edge, keeping data traffic to a minimum and reducing energy consumption.

Nordic Semiconductor also provides the nRF91-SDK software development kit with a full suite of common stacks. To further simplify sourcing, the SiP is fully integrated with all necessary passive components included and allows for the connection of peripherals including LEDs, switches, relays and sensors.

### 4. SIM cards are no longer needed

Until recently, it was a requirement to have a physical SIM card and SIM card holder to send or receive cellular data. 'Embedded-SIM' solutions including the new integrated universal integrated circuit card not only save PCB space and remove the need for a SIM card holder, they also make it unnecessary to swap SIM cards when changing providers as they can be controlled and updated remotely.



Embedded-SIM solutions save PCB space and remove the need for a SIM card holder

One supplier of these iUICC embedded-SIM solutions is Telit. Its simWISE 2G wireless modules cover both LTE-M and NB-IoT, with one example being the ME910C1 combi-module, which covers both standards. Telit's simWISE modules are complemented by an IoT cloud platform that allows development of fully customisable cloud solutions.

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



**Until recently, it was a requirement to have a physical SIM card and SIM card holder to send or receive cellular data**

# Make confident buying decisions

*Mouser Electronics aims to take service excellence to the next level by providing purchasers with in-depth availability information—even flagging when components are unsuitable for new designs*

In the world of electronic components, where technical development is in a constant state of flux, it's reassuring to know that Mouser goes to great lengths to identify products that are 'not recommended for new designs'. Consequently, design engineers and buyers can be confident they're always working with the most advanced electronics available and can even subscribe to receive these product notifications online. This is just one of the ways Mouser, a new product introduction NPI distributor focused on the latest products from over 800 manufacturers, fosters speed to market for all of its customers.

Mouser Electronics' vice president of Americas sales and service, Coby Kleinjan, explained: "Having the newest, most advanced

technology to develop cost-efficient prototypes limits costly redesigns, manufacturing delays or even the termination of a project. It also leads to a design edge in delivering more product features and capabilities as well as longer lifecycles. That's why we work closely with all our manufacturer partners to provide the fastest and easiest access to the industry's newest components."

## Fresh ideas

Few things are more frustrating than a design delay because of obsolete products, so Mouser strives to deliver tomorrow's products today. Each transaction is about more than a sale; it's about building relationships, which is why Mouser aims to provide options to help buyers easily find what they want. This support assists purchasers to navigate the many new



Mouser can suggest component alternatives, along with the risk level for those potential replacements

# Coilcraft

We won't claim to be the #1 Magnetics Company.  
**Industry engineers did that for us!**

Coilcraft

Company M

Company B

## Here are some of their reasons:

- High-performance products manufactured 100% by Coilcraft
- Easy-to-use website with powerful online selection tools
- Responsive technical support and customer service
- Fast, free evaluation samples



Buy direct @ [coilcraft.com](http://coilcraft.com)



products available, with Mouser claiming to launch more new products than any other global distributor, with its website updated continually, every day.

To this end, customer service and technical support representatives are available weekdays from 7am to 8pm CST to assist with all types of requests, including price quotes, order placement and order status, real-time product availability, technical support and more.

Playing a central role is the company's website, [mouser.com](http://mouser.com), which features more than 800 manufacturers and access to more than four million orderable part numbers. For added service, buyers can also order and communicate with Mouser representatives via phone, email, fax and live chat.

### Informed decisions

For buyers who need to know real-time inventory, Mouser offers real-time product availability through its website and customer service representatives, providing the most accurate product information to make confident buying decisions. Mouser clearly identifies end-of-life, obsolete and not recommended for new design products to avoid the use of older components in new designs, providing a speed-to-market advantage for customers.

Identifying product lifecycle and NRND products are examples of Mouser's commitment to value-added services beyond simple component supply. The global distributor also gives suggestions for component alternatives, along with the risk level for those potential replacements. In addition, Mouser delivers easy and rapid access to essential



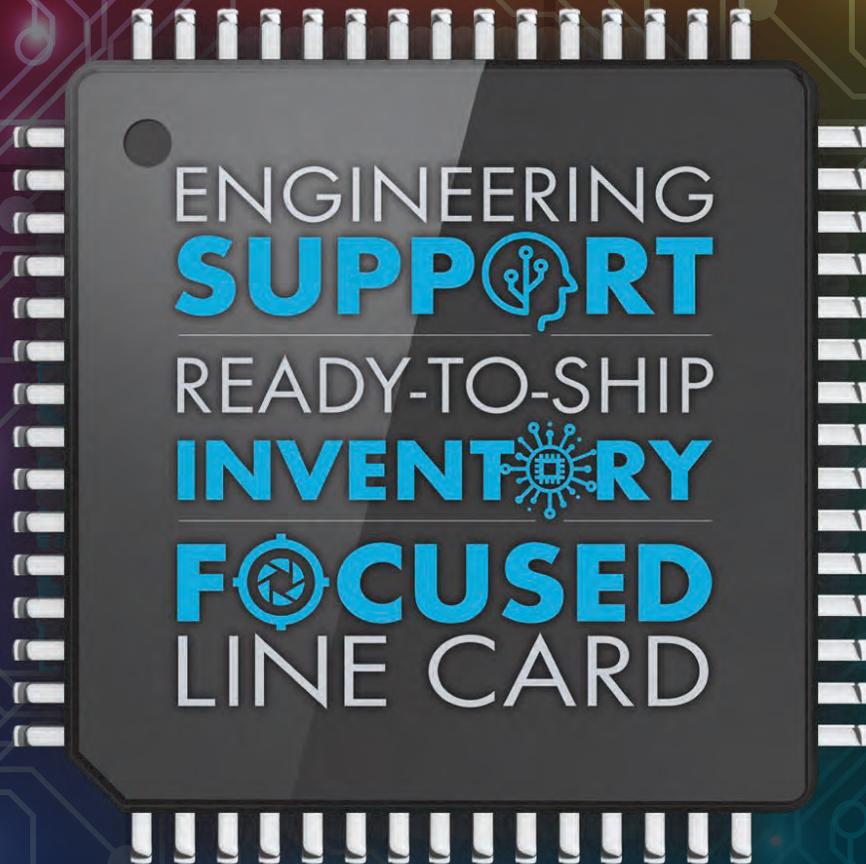
**Mouser Electronics'** vice president of Americas sales and service, **Coby Kleinjan**



**Mouser claims to launch more new products than any other global distributor, with its website updated continually, every day**

technical data and application resources—such as product datasheets, application design notes, white papers, videos, and other solution-based content—to give buyers and design engineers a technological edge.

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



## Our Components. Your Innovation.

For more than 20 years, Symmetry Electronics has been a driving force in helping engineers and industrial designers worldwide accomplish their goals. Through the highest quality engineering and sales support and a broad, ready-to-ship selection of parts, we consistently deliver the best in **wireless & video** semiconductor components and support.



A TTI Semiconductor Group Company

**Your Leading IoT Experts in Wireless & Video**

866.506.8829 (U.S. Only) | 310.536.6190 | [www.symmetryelectronics.com](http://www.symmetryelectronics.com)

# Obsolescence: the counterfeiter's best friend

*Wherever there are part shortages, long lead times or obsolescence, you can be sure there will be counterfeiters working to take advantage of the situation. Purchasers need to take a proactive approach to deny them this opportunity*

The military and aerospace industries have long understood the challenges of component obsolescence, where an end-of-life notice from a component manufacturer can have devastating effects on critical equipment. Commercial and industrial companies struggle with part shortages more than obsolescence, but the result is the same; counterfeiters will take advantage by introducing substandard parts into the market. That means this is truly an issue for all segments.

Obsolescence first became a major concern in the aerospace and military industries where older planes, ships, radar systems and satellites rely on often ancient electronic components to continue to operate. When shortages became inevitable, counterfeiters were able to fill the void with cheap knockoffs that were not up to spec with the original components. Counterfeit devices were not only unreliable, they were putting people's lives in danger.

### Adopt anti-counterfeit standards

Today, these risks still exist, which is why standards for the avoidance, detection, mitigation, and disposition of counterfeit parts, such as the SAE's AS5553, AS6081, and, more recently, AS6171 were introduced — to provide stringent testing requirements and industry best practices that help mitigate the risks and lessen the chances of a

counterfeit part finding its way further into the supply chain.

But while safety may be the primary concern regarding counterfeits, another is the overwhelming costs that introducing a substandard part can incur. Many companies have found out the hard way how expensive it can be to correct the issues created when due diligence isn't spent on part procurement.

These problems that the military and aerospace industries have faced for decades are now popping up in other industries such as automotive, where cars increasingly rely on electronics to operate and control safety features such as ABS, air bags and various sensors. As part lifecycles become shorter, electronic component obsolescence is sure to become a bigger issue as demand for older components increases to keep cars running. And you can be sure that the counterfeiters will be close at hand, ready to fill those electronic systems with substandard chips.

As new industries encounter the risks associated with counterfeit parts, they will need to incorporate similar mitigation strategies to minimize the costs and liability. When OCM parts with supply chain traceability simply aren't available, these companies will need to turn to alternative sources such as

aftermarket manufacturers or even complete redesign of assemblies, which can be a costly, time-consuming road to travel. An easier solution may be to align with trusted independent distribution sources who have the equipment and expertise necessary to determine the likelihood of a part's authenticity.

### Employ experienced test facilities

Now, more than ever, having a reputable testing facility at your disposal is a necessity, rather than a luxury. A knowledgeable independent distributor that tests product to the rigorous requirements of AS6081, for example, minimizes the risk of a counterfeit part being introduced into the supply chain.

To be clear, this is not a foolproof solution because counterfeiting is a complex subject, but the majority of substandard devices will not pass detailed inspections and tests performed by experienced personnel trained in counterfeit detection. Counterfeiters are prone to making mistakes, meanwhile those trained in counterfeit detection continue to improve detection methods.

The bottom line is that, if part obsolescence is becoming a concern for your industry, counterfeiters will be lining up to lend you a hand. Arming yourself with knowledge, common sense,

and a reliable supplier with proven expertise in counterfeit detection will go a long way towards saving your company the costs, manhours, and headaches associated with inadvertently purchasing and introducing a substandard device into your product.

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



**A certified testing facility that specializes in standards-based counterfeit detection is a counterfeiter's worst enemy**

## STEP 1

Search our inventory.



Visit [www.rocelec.com](http://www.rocelec.com)



## STEP 3

Build-to-order not an option?

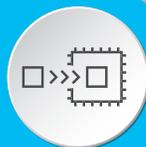


We may be able to re-create the device. Contact us!



## STEP 2

Not in inventory?



Explore our build-to-order options. Contact us!



# COMPONENT OBSOLESCENCE?

The Semiconductor Lifecycle Solution™ 100% Authorized by over 70 leading semiconductor manufacturers. Search the world's largest source of EOL and broadest range of active semiconductors at [www.rocelec.com](http://www.rocelec.com).



 **Rochester Electronics®**  
[www.rocelec.com](http://www.rocelec.com)



# DON'T RISK IT ALONE

CHOOSE YOUR SUPPLY CHAIN PARTNER WISELY



**⚠ WARNING ⚠**

**COUNTERFEIT AND  
SUBSTANDARD COMPONENTS  
BEYOND THIS POINT**

AS9100 Rev D AS6081 Compliant  
GIDEP ID\*EA erai ASA  
ANSI/ISO-920 20  
ITAR DFARS

Exclusively sponsored by



# Blockchain or bust



John Denslinger is a former executive VP Murata, president SyChip Wireless, and president/CEO ECIA, the industry's trade association. His career spans 40 years in electronics

John Denslinger explores the electronics distribution use case to identify tangible, measurable benefits of implementing blockchain for buyers and supplier alike

Blockchain • By John Denslinger

**W**ant to see someone's eyelids elevate, just mention the word blockchain. Want to stump them further? Ask what they know about blockchains. Want to impart pain? Ask if they're involved in mapping or implementing a blockchain multi-party solution. The point to be made here is blockchains are as much a mystery for most as it is a strategic priority for some.

In a 2019 global survey Deloitte found 'Leaders wary of tech-based solutions have come to see the larger, transformational importance of the technology'. Yet that same survey mentions only 23 per cent have actually started some level of blockchain deployment down from the 34 per cent reported doing so in 2018. The top five barriers mentioned: problems adapting or replacing existing legacy systems; regulatory issues; potential security threats; lack of in-house capabilities; and lastly, uncertain ROI. With all that said, perhaps the most startling stat was 43 per cent still see blockchains as over-hyped up from 39 per cent in 2018. Deloitte concludes blockchain decisions are evolving in both pragmatism and maturation. As more use cases are confirmed, adoption is bound to gain traction.

So, let's examine a buyer/supplier relationship typical of our industry. Is there a justifiable use case worth committing time, resources and investment in a blockchain solution? Is it really possible to achieve a buyer /supplier relationship that: further reduces cost; shortens cycle time of essential processes; mitigates multi-lateral risk; creates unparalleled trust; and is completely secure?

Blockchain information is readily available from a number of sources. ECIA recently hosted a webcast by Christophe Begue, director solution strategy & business development, discussing IBM's blockchain and how

it might relate to our industry. His Trust Your Supplier (TYS) blockchain solution essentially connects qualification, validation, on-boarding and life cycle management. Within that blockchain loop is the buyer and supplier as expected, but also included are: industry standards bodies; key government agencies; environmental compliance verifications; financial/credit/insurance/indemnity validations; embargo/watch-list screenings; 3rd party authentications; and auditors. The chain is scalable to fit small to large concerns. Sounds promising, but is there a tangible, measurable benefit?

Yes, it would appear so. Buyers gain: real-time access to supplier data at a fraction of former costs; speedy and consistent on-boarding new suppliers at substantially reduced cost; risk minimization; uniform compliance assurance; and permanent and easily accessible records of all events by all parties in the blockchain.

Suppliers gain as well: elimination of repetitive and redundant qualifications; cycle time optimization on-boarding as a new supplier; faster time to first order; reduced administration costs managing approvals, certifications, compliance and other life cycle expectations.

Obviously, there are a number of blockchain platforms to choose from. IBM is only one solution. Some are public, some private, others consortium based, and finally there is even a hybrid version. Regardless of your choice, plan for a lengthy period of intensive discovery, status quo challenges, and potential system upheavals. You will ultimately find digital networks create enormous efficiency when classic barriers are removed. Our industry definitely has a use case. The contribution of blockchains is just beginning.

The World's Largest Selection of Electronic Components  
Available for Immediate Shipment® [DIGIKEY.COM](http://DIGIKEY.COM)



# eBOM.com

## DISCOVER

## SOURCE

## COMPARE

## BUY

Unique virtual  
trade show

Latest electronic  
components

Choose from over  
17 categories

Search part  
number – real  
time stock and  
price check



For Advertising Enquiries Contact [ebomsales@ebom.com](mailto:ebomsales@ebom.com)

# Open minded buyers stand to benefit

*With electronics technologies evolving all the time, isn't it time to rethink outdated purchasing procedures, asks Retronix*

For a market dominated by technological advancements, the electronics sector is also an industry with some outdated ideas. There is a seam of 'but that's how we have always done it' running through a lot of companies that doesn't allow them to take advantage of new services and options that their more open-minded competitors have.

Retronix has seen this firsthand and it is understandable to a degree. The 'if it's not broken why fix it' and 'too much of a risk' attitude does have a place, but not if it is at the expense of progress, cost savings and delivery dates. Most companies will have some procedures that were written, for example, 10 years ago that they have not reviewed since then. And for an industry that is always

advancing, that seems rather counterproductive.

## Review outdated procedures

Decisions are made on past errors and procedures written to ensure that these errors never happen again, which is correct. However, as technology progresses and new ideas emerge, those procedures need to be reviewed. Everyone in a company will know a handful of things that are just never considered as an option due to history and possibly a previous costly mistake.

For many companies, one of these 'written in stone' ideas is: 'thou shalt not reclaim components from PCBs.'

Often, this is based on a past mistake or just a general idea that this is too risky a process. But in the current climate of

allocation, long lead times and obsolescence, can you really afford to be sitting on a bone pile of PCBs populated with the same components that the purchasing department are pulling their hair out trying to source? That is not productive for anyone.

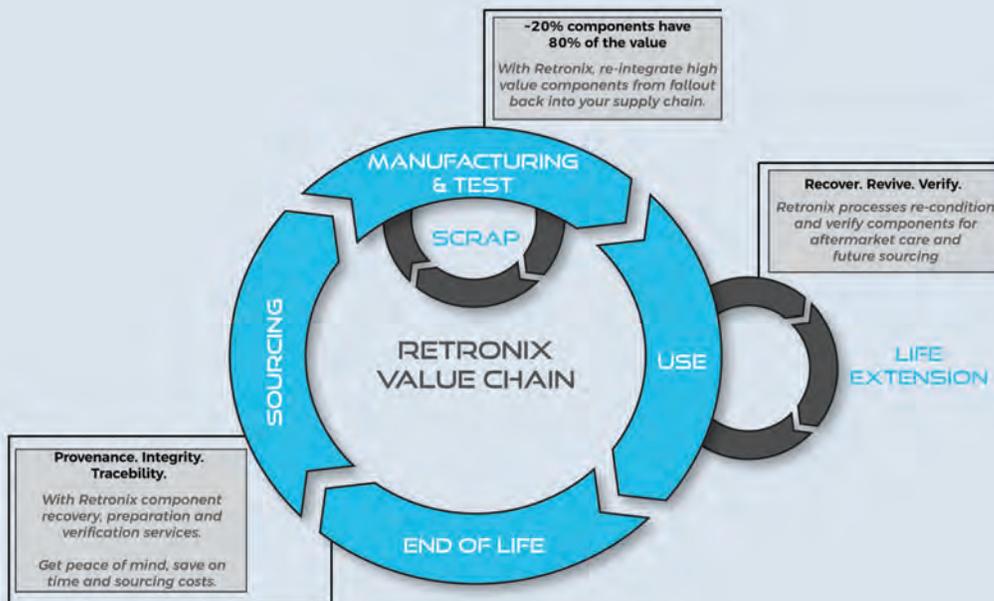
## Profit from scrap

Millions of dollars of components are scrapped within manufacturing and repair/rework processes. If these components could be safely removed, and the BGAs reballed, companies could save huge amounts of money in recovered and revived high value silicon. This can provide much needed allocated components and reduce the amount sent to landfill. An added bonus is that it would also seriously damage the counterfeit industry, whose raw material supply would be reduced.

Retronix's range of services to the electronics industry offer a complete service for reclaim and re-use of components. With the safest removal procedures in the industry, terminal re-life options, testing, x-ray and re-reeling, Retronix offers a robust service and this has seen a mindset change in many customers who have seen the benefits of these services. Their procedures no longer say no reclaim and re-use but rather list Retronix as the only approved supplier of this service. And their purchasing departments are very grateful for that!

To be part of the new mindset shift, talk to Retronix about how to help your purchasing team retain their hair during this challenging time for electronics sourcing.

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



# Winning the relay race

ESNA asked president of Relay Specialties, Barry Sauer, what considerations purchasers face when sourcing relay products and how to select the 'best buy' option

**Q** Relays come in a variety of form factors, styles and technologies. Can you explain their strengths and weaknesses for different applications?

The selection of any relay is determined by the application in which it is intended to be used. There are no strengths or weaknesses for a given application. Strengths or weaknesses are created or caused by the engineer, hobbyist, or whomever is doing the selecting.

**Q** What are the differences between reed relays, electromechanical relays, and solid state relays?

There are many differences and you could write a whole article dedicated just to this subject but the main considerations are application dependent. Factors to consider include: the load that is being switched, speed, size, mounting, serviceability and longevity. Once these questions are answered, then, and only then, should the 'type' of relay be determined.

The main characteristics to consider for a reed relay are: their suitability for low level switching generally under two amps; limited contact configuration; and limited voltages; their very fast speed and small size; with sealed contacts protecting them from corrosion.

When assessing electromechanical relays, bear in mind that they are available

in various sizes, with varied input voltages and various mountings. A wide variety of loads and voltages can be switched and parts can be supplied with various contact configurations.

Finally, the main characteristic of a solid state relay is that it can switch 'off' AC loads at the point of zero load current. SSR devices come in limited contact configurations, with limited packaging and mounting options, but they provide excellent isolation when switching high current. They also boast very fast, long life expectancy, with no mechanical noise, low power consumption, high durability, and are vibration resistant, but sadly, all of these features can come at a very high cost.

**Q** Are FET switches an alternative to relays and if so, are there any limitations?

A field-effect transistor is not a relay and is not intended for switching loads, which is the primary function of a relay. A transistor is a semiconductor device, much smaller in size than a relay. It is used in place of relays in fast switching devices and is non mechanical in nature.

**Q** What options do electronics purchasing professionals have when relays are discontinued or declared EOL?

This is an age-old question. Too often the marketplace is not aware when manufacturers discontinue

products. The obsolescence of any item can be caused by many factors. Knowing the cause generally simplifies the process of identifying whether there is an alternate, substitute, form-fit and function equal available, or not. In many instances there are substitutes or alternatives. Sadly, in many instances there are no options other than to redesign. Speak to a professional for assistance.

**Q** How are lead times performing in the US for relays?

Manufacturers have changed their business model over the years. This has led to many reducing factory inventory levels and shifting stocking responsibility to distribution. More importantly, the majority of US manufacturers have moved to offshore production, which has led to longer lead times. The very few US based manufacturers, or those where production is within NAFTA, can have lead times four to six weeks shorter than those based in the Far East.

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



President, Relay Specialties, Barry Sauer



**The main characteristic of a solid state relay is that it can switch 'off' AC loads at the point of zero load current**

# Accelerate your EV projects

Featuring new components and technologies for electric vehicles and charging infrastructure Mouser's latest eBook, produced in collaboration with Bourns, is a go-to guide for purchasers

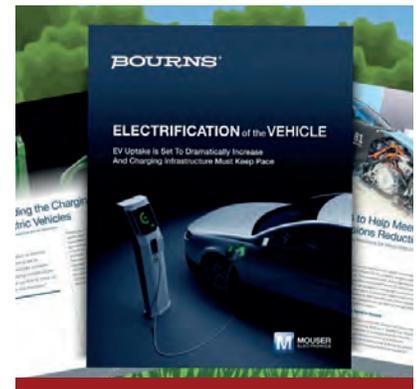
Mouser Electronics, has launched a new eBook in collaboration with Bourns, exploring new components, technologies, and strategies for the design and development of electric vehicles. In *Electrification of the Vehicle*, experts from both Mouser and Bourns provide detailed explanations of concepts and products including shunt resistors, inductor designs for on-board chargers, and the use of inductors and current sense resistors to reduce automotive emissions.

Citing sector surveys and industry projections, *Electrification of the Vehicle* predicts growing adoption of electric vehicles throughout the United States. To keep pace with increasing numbers of electric vehicles, significant strides must be made in the development of charging infrastructure. The eBook highlights some of the most pressing challenges relating to electric vehicles and charging stations, providing in-depth guides to potential technical solutions and useful products.

The eBook also incorporates

detailed information on products such as the Bourns Model CSM2F series of shunt resistors. Available in three footprint sizes, the CSM2F series is designed to deliver accurate current sense measurements in high-energy storage applications. Bourns' useful guide highlights the key elements of each transistor in the series.

In total, the eBook includes key features and ordering information for more than a dozen products from Bourns, including BMS signal transformers and SRN



Mouser's EV eBook will help purchasers address the expected uptake in demand for EV charging

automotive semi-shielded power inductors. Purchasers may also be interested in information on Bourns' complete range of products for electric vehicles, available from Mouser, which includes encoders, magnetics, position sensors, and other automotive solutions.

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

The Premier Global Event in Power Electronics™

# APEC®

## 2020

### New Orleans

MARCH 15-19, 2020

# Simplify your BoM with smart power solutions

*Clever converters help purchasers address growing demand for dual voltage power in automotive systems, without ramping up the component count, explains Digi-Key Electronics' Rich Miron*

The LV148 automotive standard combines the existing automotive 12V system with a secondary 48V bus. The 12V bus will typically continue to provide power to systems such as lighting, infotainment, audio, and ignition while the 48V bus will supply systems like the adjustable suspensions, electric turbos/superchargers, air conditioning compressors, and active chassis along with regenerative braking support.

Implementing this additional 48V supply network will present various challenges. To help alleviate these issues, Linear Technology offers several DC/DC converters that handle bi-directional energy transfer very efficiently. With these converters, either battery could be charged and current could be supplied to the same load when needed.

Unlike many early 12V/48V dual battery DC/DC converter designs that utilize separate power components to step-up and step-down the voltage, Linear Technology's LTC3871 bi-directional DC/DC controller uses the same external power components for stepping down the voltage as it does for stepping it up.

## An integrated solution

The LTC3871 is a bi-directional 100V/30V two phase synchronous boost or buck controller. It can provide bi-directional DC/DC control and battery charging between the 12V and 48V system networks. It operates in boost mode from the 12V bus to the 48V bus and in buck mode

from the 48V bus to the 12V bus.

This device allows both batteries to simultaneously supply energy when additional power is required. The maximum current delivered to the load is regulated by the on-chip current programming loop. There are four control loops that enable the control of voltage and current on either of the 12V or 48V busses.

## Maximize efficiency

To provide more output current without increasing input or output voltage ripple, users can daisy chain multiple LTC3871s and run them out-of-phase. A maximum of twelve phases can be daisy chained to run simultaneously out-of-phase with respect to each other.

The demonstration board for the LTC3871 can be configured in either two or four phases with one or two LTC3871s.

Efficiency curves for the devices are encouraging. Looking at a four-phase demonstration board utilizing two LTC3871 devices, the buck mode curve shows the efficiency as the board steps a 48V input down to 12V at up to 60A, while the boost mode curve shows the efficiency as the board steps a 12V input up to 48V and up to 10A. On both curves, peak efficiencies are around 97 per cent.

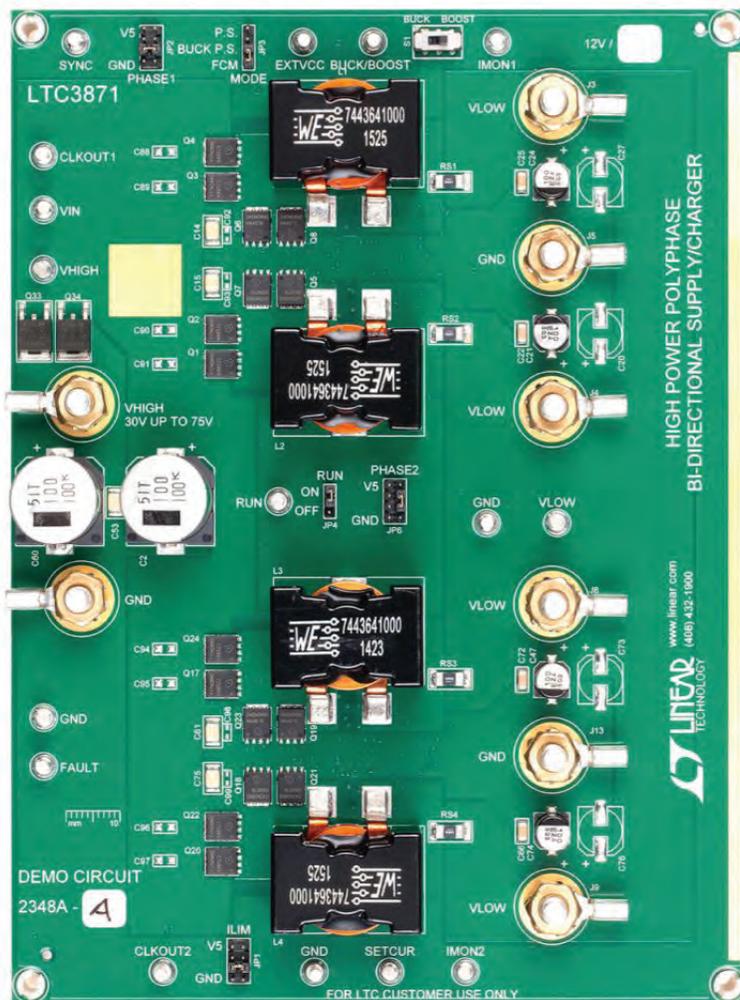
## Simpler sourcing

Not only will the LTC3871 bring a new level of

performance and enhanced control, it also has the power to simplify dual battery 48V/12V DC/DC automotive systems. By allowing the same external power components to be used for both step-up and step-down purposes, this clever converter could well cut your component count.

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

Specify either a two or four phase demo board for the LTC3871



# Buyers can expect tighter supply, higher prices for MLCCs in the second half of 2020

*The good news is that supply conditions will not worsen to 2018 levels when many multilayer ceramic capacitors went on allocation*

Purchasers can expect supply of multilayer ceramic capacitors (MLCCs) to be ample in the first half of the year, but supply will likely tighten and lead times could stretch in the third and fourth quarters as demand builds through the year, according to component manufacturers and distributors.

Some industry analysts say supply could even tighten before the second half because higher-than-usual inventory levels are being worked off and demand from key market segments such as smart phones and automotive is expected to rise. Some distributors say there is a possibility of allocations for some parts later in the year, but the MLCC supply scenario won't devolve into 2018 levels when lead times time stretched to 30+ weeks and parts were on allocation.

Capacitor manufacturers have been adding capacity since 2017 and, while lead times for many parts could stretch, allocations for most parts, are not likely. However, it is unclear what the MLCC scenario will be and if buying conditions will turn from being a buyer's market to a seller's market. One thing is for sure. The MLCC market will be different in 2020 than it was in 2019.

Last year was 'a correction' year for MLCCs, said Roberto Salazar, business manager for capacitor manufacturer AVX when there were fewer orders placed with MLCC manufacturers. "It's hard to say how much underlying demand grew last year because of high inventory levels that we had to deal with as a result of the shortage of 2018," said Salazar.

When the shortage hit, manufacturers increased prices after years of falling to flat tags. Capacitor manufacturers took some of their new-found profits and invested in new capacity to boost supply. For instance, AVX bought new equipment for its capacitor factories and built a new facility for MLCCs, said Salazar.

However, as capacity began to come online, many companies had built up inventories and fewer orders were placed for MLCCs in 2019 with component manufacturers and distributors.

**MLCC usage increased**  
Salazar said AVX shipped fewer MLCCs in 2019 than 2018, "but we feel the actual usage of MLCCs actually grew." The parts that were used were from inventories at OEMs, EMS providers and distributors.

He said that in 2018, because of tight supply and allocations, buyers at many companies ordered large number of parts that they did not need. Rather than return the components, they held onto them and slowly worked through inventory in 2019.

Usually, OEMs and EMS providers "keep lean inventories," said Salazar. However, because there was an unprecedented shortage of MLCCs, companies built up their inventory so they had the parts on hands rather than risk a line shut down over a part that costs less than a penny.

A lot of the inventory in the supply chain has been worked off, but some buyers say inventory levels are still higher than normal for some components including MLCCs. Capacitor makers and distributors say inventory levels should be mostly depleted by the end of the first half and demand should pick up through the year. Some distributors say they are already seeing increased orders.

"Going into 2020, the global MLCC market business is starting to heat up and we're seeing examples of how the 2020 market will become more robust due to increased global demand, particularly



**Jeff Ray**, vice president of product and supplier marketing for TTI



**Going into 2020, the global MLCC market business is starting to heat up and we're seeing examples of how the 2020 market will become more robust due to increased global demand, particularly in smaller case size MLCCs used in communications applications**

in smaller case size MLCCs used in communications applications,” said Jeff Ray, vice president of product and supplier marketing for TTI. While MLCC demand is increasing, pricing has remained flat, according to Ray. “Manufacturers have been slow to react to price corrections during the 2019 lull period, likely due to foreseeable near-term upticks in the overall market,” he said.

While lead times for most MLCCs have been reduced “across the board,” some have started to inch upward because of increased demand in the Asian communications sector, according to Ray.

He said many MLCC manufacturers added capacity in 2018 and 2019, but some reduced their workforces due to lower market demand and lead times for some MLCCs in 0201 and 0402 cases sizes have seen increased lead times. While larger case size MLCC lead times are still extended, they have been stable over several quarters, according to Ray.

#### Lead times will stretch

He added that MLCC demand will increase in the second half and lead times for MLCCs could stretch.

Some capacitor manufacturers and distributors think strong demand for MLCCs could kick in later in the second half and continue through 2021 because OEMs and EMS providers cut back on purchases last year because of high inventories. In addition, MLCC demand is likely to increase from key large volume customer segments including smart phones and automotive systems.

The return of robust demand for MLCCs could mean allocations in late 2020 once inventories are worked through and companies need

to buy more parts including MLCCs in the second half.

“MLCCs will be a problem as we go through the year,” said Mark Burr-Lonnon, senior vice president, Europe, Middle East, Asia and global service at Mouser Electronics. “It’s going to be a messy year” for MLCCs, he said. Business will be relatively flat in the first half but I think in the third and fourth quarters allocations will hit. “Most people are thinking there will be some type of allocation of MLCCs at some point in 2020,” said Burr-Lonnon.

He said many MLCC manufacturers added capacity in 2018 and 2019, but some reduced their workforces due to lower market demand and lead times for some MLCCs in 0201 and 0402 cases sizes increased. Mobile phone service providers are building out 5G networks and consumer demand for new 5G handsets will likely increase towards the end of the year. Industry analysts say many consumers have been holding off upgrading their phones until 5G networks are widely available. Once 5G handset demand builds, there will be a surge in demand for MLCCs. Each handset has hundreds of MLCCs. In fact, the iPhone X has 1,000 MLCCs.

The automotive industry is also a huge user of MLCCs. As more and more car models are equipped with more sophisticated electronic systems such as advanced driver assistance systems, demand for MLCCs from automakers will rise. The traditional gasoline powered car has about 2,000 MLCCs, while high-end electric vehicle may use 10,000 MLCCs.

Automotive accounts for 25 to 30 per cent of MLCC business for some capacitor manufacturers. Demand for MLCCs will also grow from aerospace and defense,

electronics, industrial IoT, consumer electronics, smart homes and buildings, and smart manufacturing facilities, according to researcher Frost & Sullivan. In fact, Frost Sullivan says the number of MLCCs is increasing significantly in every electronics application segment.

#### Will capacity be added?

While demand for MLCCs will rise, it does not necessarily mean that component manufacturers will be aggressive about adding new capacity to meet rising demand. Capacitor manufacturers are careful about boosting capacity because of the capital cost, the researcher said.

When capacitor manufacturers do decide to increase production capacity, most will invest in manufacturing facilities that make capacitors in small case sizes rather than larger sizes. Larger case sizes are often used in equipment that has very long lifecycles such as industrial equipment. Demand is much stronger for smaller case size MLCCs used in smart phones and consumer electronics equipment.

In the first half of 2020, it is not likely that new capacity will be needed for large case size capacitors. Dave Valletta, executive vice president of worldwide sales for Vishay Intertechnology, said demand for MLCCs in larger case sizes has held up “fairly well, but as the new year began there was still inventory in the supply chain that built up in 2019. Vishay only makes MLCCs in larger case sizes including as 0603, 0805, 1206, 1812, 1825, 2225 and 3640.

MLCC case sizes can range from 008004 to 6560. Typically, small case sizes are 0402 and smaller, while larger sizes will be 0603 and greater. A case size of 0402 measures ▶



**Roberto Salazar**, business manager for capacitor manufacturer **AVX**



**Demand for MLCCs in larger case sizes has held up fairly well, but as the new year began there was still inventory in the supply chain that built up in 2019**

.04 inches by .02 inches.

Valletta says many capacitor manufacturers have stopped making larger case sizes because “when you’re a major commodity producer it just doesn’t make sense to invest in smaller product lines.” He added that large case size MLCCs are a “healthy niche” business for Vishay.

Valletta said that while many capacitor manufacturers have exited the large case size MLCC business, there will always be demand for them. Large case size MLCCs are used in equipment that has long lifecycles such as medical, telecommunications, and industrial equipment.

“When you need a more stable dielectric and higher voltage rating with a decent capacitance, a larger size ceramic will always be needed,” he said.

#### No serious issues

Valletta said he did not expect any serious supply issues with MLCCs in larger case sizes in 2020. “We will see continued inventory depletion in the first quarter and the market will pick up a little bit,” he said.

AVX is another capacitor manufacturer that builds MLCCs in larger case sizes, although it also makes small case size capacitors as well. “We offer the entire range of capacitors,” said Salazar. “We recognize that there are a lot of requirements out there for smaller case sizes and smaller voltages and we make them as well,” he said.

However, the “sweet spot” for AVX’s business is with three markets: automotive, industrial and networking infrastructure equipment although it also services defense, aerospace, medical OEMs.

Networking infrastructure and industrial equipment needs MLCCs in larger case sizes. “They have certain voltage requirements that need to be met and higher voltage than consumer voltages,” said Salazar.

Salazar said automotive is the fastest-growing market for MLCCs as the number of MLCCs in vehicles continues to rise exponentially because more vehicles are equipped with sophisticated infotainment and safety systems. Autonomous cars and electric vehicles will also contribute to MLCC demand. Electric cars in the future will have thousands of MLCCs so even if vehicle sales stay flat, demand for MLCCs by automakers will continue to rise.

In the long term, the biggest driver for MLCC growth will be 5G technology, said Salazar. MLCCs are used in 5G infrastructure and handsets, but the technology will result in new products being designed and built that will take advantage of 5G’s bandwidth and speed. Salazar said AVX’s supplies MLCCs for 5G networks, but “we have only scratched the surface with 5G.”

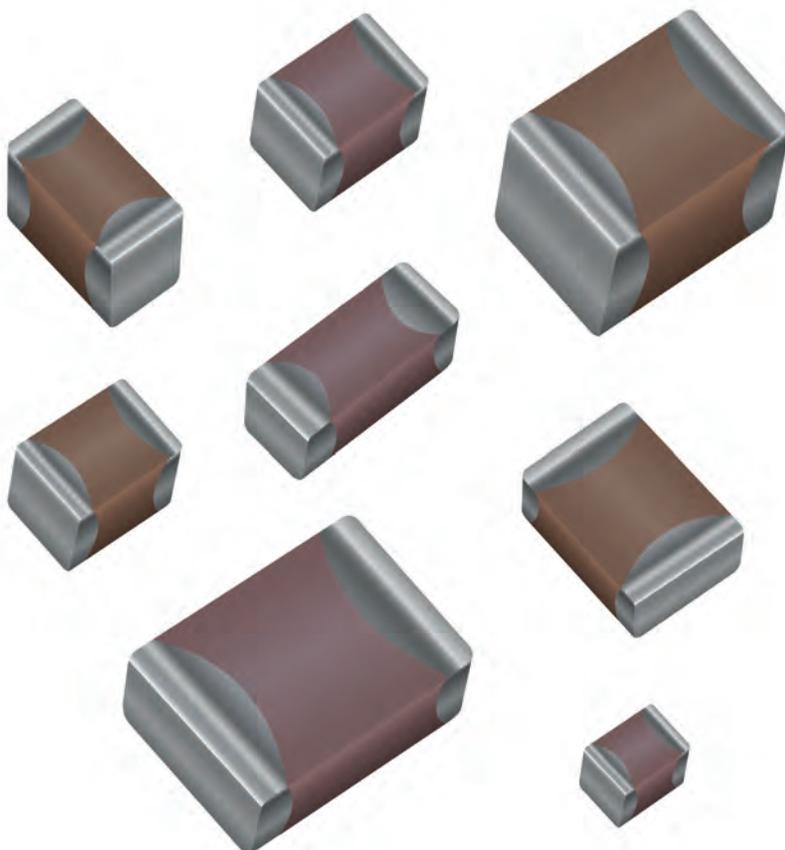
Salazar said besides 5G, buyers should keep apprised of the miniaturization trend with MLCCs. While miniaturization is not new in the electronics industry, the size of MLCCs continues to shrink as capacitor manufacturers find ways to deliver more functionality in a smaller package.

“From a manufacturing standpoint if you downsize it is more efficient because you make more parts with the same resources. There are marketable incentives to downsize,” said Salazar.

But there are challenges for customers with miniaturization. OEMs and EMS providers often “don’t have the ability to place such small parts on boards because the parts can’t be seen naked eye” he said.



**It’s hard to say how much underlying demand grew last year because of high inventory levels that we had to deal with as a result of the shortage of 2018**



# Smart thinking

To start the year, eBOM.com's marketing manager Amy Leary invokes some future gazing, looking at jobs, smart electronics, robotics and gender

## How is the electronics engineering job market evolving?

Electronic engineering has been a widely recognised field since the 1950s. With the roots of electronic engineering evolving in 1835 when the first relay was invented by Joseph Henry, it has developed into a high demand industry market. In this article I walk readers through the movement of the engineering workforce and explore how it has evolved.

But who are electronic engineers? Electronic engineers design, develop, test and supervise the manufacture of electronic equipment ranging from motors and power generation products, to mobile phones, robotics and computers. Engineering is a crucial part of electronics where the product comes together to operate efficiently. All the electronic products you see today would have been designed by an electronics engineer, regardless of whether it was physically constructed by robots or humans.

## Demand for smart electronics is increasing

The more electronic products that are designed, the more that can be manufactured and sold, the more profit to be made. Countries producing the highest quantity of electronics have the greatest demand for engineers and designers. According to Investopedia, China, Hong Kong and the US lead the global field in producing electronic products.

Maintaining its reputation for producing inexpensive consumer goods in large quantities, China contributes

heavily to the electronics sector, as this is the country's most prominent export category. Smart electronics such as mobiles, smartwatches and tablets have been in high demand in recent years. The ever-changing trend of smart devices means that electronic engineers will need to be adaptable to keep up with the latest technologies. China is soon to overtake the United States as the largest economy, widely contributed to by talented electronics engineers.

## Rise of the robots

When I think of what the future holds, I imagine robots serving us at restaurants, driverless cars, and robots making our clothes etc. However, this may just be the reality. According to Academy ArchiStar, several studies have suggested that artificial intelligence may cause job losses. One recent example comes from » the University of Oxford. The study found that over 700 types of jobs are at risk of technological disruption. All told, this means that about 47 per cent of jobs are at risk because of artificial intelligence. Up to 20 million manufacturing jobs around the world could be replaced by robots by 2030, according to analysis firm Oxford Economics. However, electronics engineers may be in luck. Being an engineer takes a great deal of creativity which can unlikely be replaced by robotics.

## Demand increasing for green engineering

Climate change has been a passionate topic for many people over recent years. According to Global Climate Change, the planet's average surface temperature has risen about 0.9 degrees Celsius

since the late 19th century, a change driven largely by increased carbon dioxide and other human-made emissions into the atmosphere. Because of this, there has been huge pressure on engineers to produce sustainable products which have a positive impact for the climate. As well as this, not only is the pressure for electronics engineers to produce products that are made in an environmentally friendly way, but products that are environmentally friendly throughout their lifespan. According to Survey Monkey, 35 per cent of people are willing to spend more money on products that are better for the environment. Engineers strive to create products which are in high demand and make people feel good about buying. Therefore, it's important that they incorporate this new environmentally friendly trend when designing products. The trend is producing products which preserve natural resources, are cost-efficient and support human and natural environments.

## Gender imbalance in the work force

In this field of employment there is a significant gender disparity, with far fewer women than men working in the area. The gender imbalance in engineering has been going on for centuries. Recent statistics show that only 16 per cent of engineering and technology undergraduates in the UK are women. Also, according to Wikipedia, the salary of female engineers is 10 per cent less than male engineers. Today, it is more widely accepted to have females in the male dominated engineering work force.



Amy Leary, marketing manager at eBOM.com

However, very few females pursue a career in this field.

## What can I do to keep up with the ever-changing market?

I would advise electronics engineers to constantly research the latest smart devices and trends. This would be beneficial for engineers as their products would be in higher demand. Also, customers are more likely to buy products which are positive towards the environment so I would advise taking that into consideration.

## Summary

In my opinion, I think the engineering market is adapting to be more sustainable and environmentally friendly. Electronics engineers see the world in a more fragile way and therefore strive to engineer products in a way which doesn't contribute to climate change. The engineering job market is evolving to be more technical and smarter device dominated to keep up with the latest products. In my opinion, the engineering market in the future will be more robotics dominated due to the latest technology. This would be a more efficient way to produce products due to not having to pay wages etc.

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



# Distributors are optimistic about future growth in North American

*Many electronics distributors expect to post single-digit sales growth over the next five years as more electronics are used in more systems and products*



James Carbone

It's no secret that over the past 15 years, many North American electronics distributors have gone global expanding operations to Europe and Asia to service customers that have migrated manufacturing outside of North America.

Distributors have also expanded global operations to service European and Asian-based OEMs and electronics manufacturing services providers that they had not done business with before. As a result of global expansion, the percentage of total sales of North American distributors customers in the U.S., Mexico and Canada has declined.

North America used to be responsible for the vast majority of sales of large U.S.-based distributors, but now account for about a third of annual revenue, while Europe and Asia account for two thirds of sales. However, that does not mean North American sales are declining, or that distributors are not bullish about their prospects in North America.

Distributors are optimistic about the future of distribution in North America over the next five years and are confident that sales in North America will continue to grow, sometimes in the mid-single-digit or double-digit range although the growth rate may be lower than in Asia. They say demand will be strong in North America because of the growing use of electronics in a host of

equipment ranging from wearable electronics and portable medical equipment to factory automation equipment and self-driving cars.

In 2019, some distributors in fact had more sales growth in North America that they did elsewhere. "Last year was not a great year for the overall market, but we still had 5 per cent growth in North America," said Mark Burr-Lonnon, senior vice president, Europe, Middle East, Asia and global service at Mouser Electronics. Mouser's business in Europe was flat, while its sales in Asia declined about 8 per cent.

Over the next five years, Mouser expects its sales to continue to grow in North America because there's so much design activity in the U.S., Mexico and Canada and most of Mouser's business is with the design engineers working on new products.

## Customer base grows

In addition, Mouser has a huge customer base totaling about 400,000 in the Americas and the number grows each year. "A lot of them are small, but they're good margin customers and they keep coming back," he said. By comparison, Mouser has about 120,000 customers in Asia and 220,000 in Europe.

Mouser's business in North America is growing with startups and with established OEMs. Mouser is also growing the number of customers it has



**"A lot of our customers are small, but they're good margin customers and they keep coming back"**

**Mark Burr-Lonnon**, senior vice president, EMEA, Asia and global service at **Mouser Electronics**

within companies. Often it has multiple buyers at multiple sites of a large company. "So, if we had 10 people buying from us before at a company, maybe now we have 20 people," said Burr-Lonnon.

While most of Mouser's customers are small, it has some big OEM customers that purchase \$10-\$30 million of parts per year from multiple company sites. "Each site may place hundreds of orders per day, or thousands of orders per month. It's not the production business. It's engineering or shortage business," said Burr-Lonnon.

He notes that during times of shortages, if a large OEM

cannot buy parts directly from a component manufacturer, the company's buyers will reach out to distributors for shortage parts. They often turn to Mouser because the distributor has a wide breadth of inventory. "For us it's all about inventory. Whether it's TI, TE or Molex or ADI. We want to make sure we have the most number of parts available," he said.

Having a wide range of parts is important because most OEMs' forecasting is not as accurate as it should be. "That means distributors with inventory will always have orders. If a production line goes down tomorrow and you have the products, you're likely to get the



**MOUSER  
ELECTRONICS**

The Newest Products  
for Your Newest Designs.

**Same-day Shipping**



business," said Burr-Lonnon.

**A "buoyant" marketplace**

Another distributor that is optimistic about the future of North American distribution is WPG Americas, based in San Jose, Calif. "We are predicting double-digit growth for 2020 in North America. Part of that was because 2019 was a bit of a rough year" and business should bounce back in 2020, said Ian Basey, vice president supplier marketing & asset, for WPG Americas. Long term, he expects high single-digit to low-double digit growth over the next five years. "We think the Americas distribution marketplace is a buoyant one," said Bassey.

One reason for growth is startups. "I think there is a lot of startup business occurring in the Americas. It's the culture of the business in the Americas to try something new, to try new business," he said.

He said WPG Americas is doing business with a lot of solid-state lighting startups. The distributor has a solid-state business unit to service startups and other companies that are designing solid-state lighting systems for commercial buildings.

"There are a lot of new commercial buildings going up

and lighting is a big part of the cost of an overall building," he said. Solid-state lighting reduces energy costs and by using different lighting colors "make the workplace environment more enjoyable for workers and therefore more productive. That's a big focus for startups," he said.

There are also startups that focus on horticulture. Solid-state lighting systems are being designed for vertical farming where vegetables are grown inside and in stacked layers. Lighting systems for horticultural applications use less power and enhance plant growth compared to other lighting technologies.

Besides solid-state lighting, medical, and autonomous driving will also drive North American distribution sales over the next five years.

"There have been so many improvements in medical devices, mostly electronic improvements and that will be a big growth driver for the Americas marketplace," said Basey. A lot of those devices tend to be high-cost, low-volume, and they tend to be the type of products, distributors can get a foothold in," said Basey.

He added that autonomous vehicles will be a "driving force"

**Cameron Ward, senior vice president at RS Components**



for electronics distributions in the near future. "It's not just cars. There are other areas," such as farming, which will use autonomous driving technology. There will be more driverless tractors, combines and other agricultural vehicles, he said.

Basey added that 5G will also help drive North America distribution sales over next five years, but it probably won't begin in 2020. He said 5G will be used in IoT, "but that's a longer-term play."

**Confidence level grows**

One distributor that is cautiously optimistic about North American business is RS Components. Cameron Ward, senior vice president of marketing for RS, said there should be mid-single-digit growth in North America over the next several years.

"There's a much higher level of confidence going into this year," he said. "Last year was difficult for everyone across the board. I don't think there's a single distributor out there that would claim that it was a great year," said Ward.

However, RS is conservative with its outlook because "there's a lot of things happening in the marketplace that we have no control over," said Ward. "You

take a look at the trade war that's going on. That's affecting business. And there is Brexit. "There's also a little bit of a wait and-see approach about what technologies are going to take off," he said.

The Internet of things, the growing use of electronics in vehicles, and 5G technology will help drive growth, said Ward.

"The industrial space represents a good opportunity for us," he said. The fact that is we already have very large customer industrial customer base that consumes some type of electronics. Industrial IoT is an opportunity," said Ward.



## Table-top enclosures now available in a smaller size

OKW's Evotec table-top enclosures are now available in a smaller size, increasing the range to five plan sizes. At 3.149 by 1.968in, the new Evotec 80 is the smallest in the range.

These soft-contoured, ergonomic enclosures are tough enough for challenging working environments including applications such as measurement and control, IT, IoT/IloT, gateways, medical, laboratory and environmental technology. A large non-recessed top accommodates switches, push buttons and touch displays.

All Evotec enclosures feature screw pillars both in the top and base for installing PCBs. Self-adhesive rubber feet ensure stability on flat surfaces. Enclosures are assembled using Torx assembly screws to prevent tampering, which is ideal for medical electronics.

Molded from UV-stable ASA+PC-FR in off-white, Evotec can also be adapted with custom colors, RFI/EMI shielding, CNC machining, lacquering, screen/tampo/digital printing or laser marking.

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



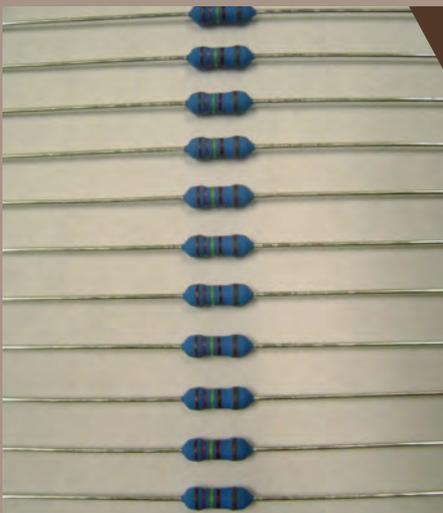
## Long-life supplies cut long-term costs

Sager Electronics is now stocking TDK-Lambda's DRB series 48V 480W DIN rail power supply designed to offer optimum efficiency and long field life.

Occupying a narrow 84mm width, the DRB480-48-1 AC/DC supply boasts an efficiency of up to 93 per cent. Waste heat has been reduced, allowing the use of a compact enclosure size featuring a power density of 6W per cubic inch. The DRB480-48-1 has an operating input range of 90 to 264V AC and can deliver 48V at 10A.

The convection cooled unit can operate in ambient temperatures of -20 to 70°C, with linear derating above 50°C to 62.5 per cent load at 70°C. According to Sager, its design ensures that electrolytic capacitor temperature rises are minimized, providing a seven-year life when operating 24-hours a day in a 40°C ambient at 230V AC input, 75 per cent load.

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



## Miniature resistors deliver maximum performance

Stackpole's RNS series miniature through hole metal film resistors boast a high power to size ratio, ideal for designs that require downsizing or new designs that require the smallest form factor possible for a given power rating.

Specifically, the RNS 1/2W has a 1/8W body size, the 1W has a 1/4W body size, and the RNS 2W has a 1/2W body size. This high power handling performance is achieved through rigorous process control of a power film alloy. The standard flameproof silicone coating enhances its usefulness at high power levels.

Thanks to these performance

specifications, the RNS series will be useful in a variety of applications and end products. Among them are home appliances, solid state power supplies, instrumentation, safety equipment, welding systems, robotics, and industrial power and control applications where an axial leaded resistor with robust performance under harsh environmental conditions is desired.

Pricing will vary depending on size, tolerance, and temperature coefficient of resistance.

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



## Stay cool with efficient heat transfer

TE Connectivity has introduced a new thermal bridge technology, said to deliver up to two times better thermal resistance compared to traditional technologies such as gap or thermal pads.

Ideal for systems like servers, switches and routers that deliver higher speeds and have higher power requirements, TE's new solution helps systems handle more heat. TE's thermal bridge boasts superior thermal resistance, better reliability and durability, and allows for easier system serviceability than comparable products.

Optimized for input/output applications using cold plates with liquid cooling or heat pipes, ganged heatsinks or direct chassis conduction applications with little to no airflow, TE's thermal bridge solutions feature a near-zero plate gap for improved thermal transfer and minimal levels of compression. In addition, the new solution delivers long-lasting and consistent thermal performance with an elastic compression design that is resistant to set or relaxation over time. This feature also helps to reduce component replacement during system servicing. The thermal bridge comes pre-assembled on the I/O cage and features an interleaved series of plates that allows heat to pass from the I/O module to the cooling area, while providing the necessary normal force, which is built into the thermal bridge.

Product manager at TE Connectivity's data and devices business unit, Zach Galbraith, said: "In next-generation computing and networking systems, TE's thermal bridge allows for simplified architectures and reduced component counts by eliminating the need for additional compression mechanisms, which traditional solutions require."

TE's thermal bridge solutions are currently available for sample in SFP+, QSFP28 and QSFP-DD form factors.

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

## Meet demand for smartphone camera quality

AMS has launched a new spectral ambient light sensor for high-end mobile phone cameras. The new AS7350 sensor enables high quality images even in situations with extreme color contrast, or under mixed light conditions, by enabling light source identification via spectral reconstruction. It can identify any type of light source, including daylight, incandescent, fluorescent, and all LED types.

By accurately identifying ambient light conditions, the AS7350 enables unparalleled image quality even in high color contrast scenes. This provides vendors with a competitive edge by supporting professional-grade camera

quality in mobile devices.

Vice president and general manager of the color and spectral sensors business line at AMS, Reiner Jumpertz, said: "For many consumers, camera performance is the decisive factor in choosing a premium mobile phone. Now smartphone vendors can use the AS7350 spectral ALS to detect and identify ambient light sources to obtain extremely accurate white balance information - above and beyond normal RGB sensors - thereby delivering world-class picture quality to their customers."

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

**Dove**  
Electronic Components, Inc.  
The Crystal & Oscillator Specialist


**NO Distributor  
Can Match  
Our Offering Of  
Authorized  
Frequency  
Control  
Suppliers.  
And we now offer  
EVEN MORE!**

**1-800-232-9825 • [sales@doveonline.com](mailto:sales@doveonline.com) • [www.doveonline.com](http://www.doveonline.com)**



### Push all the right buttons with square bezel design

E-Switch has extended its popular PV series of anti-vandal switches with the new PVS7 pushbutton offering a 25mm square bezel, plus the option to order pre-wired, ready for installation.

The 25mm square bezel requires a 22mm panel cutout, carries an IP65 rating for dust and moisture protection and is available in single-throw or double-throw circuits. Purchasers can choose a non-illuminated or ring style lens with multiple LED color options including RGB. There are also several illumination voltage choices and the option for a laser etched power symbol on the face of the actuator. Besides the standard solder termination, E-Switch is offering 300mm long wire lead termination as an option.

With a 50,000-cycle electrical life and a rating of 2A at 24V DC, common applications for the PVS7 switch include audio/visual equipment, security devices, electrical housewares, public ticket dispensers and vending kiosks.

[www.e-switch.com](http://www.e-switch.com)



### Sensor delivers flagship smartphone functionality

OmniVision Technologies offers the OV48C, a 48 megapixel image sensor with a 1.2 micron pixel size designed to facilitate high resolution and excellent low light performance for smartphone cameras.

Claimed to be the first image sensor for high resolution mobile cameras with on-chip dual conversion gain high dynamic range, the OV48C eliminates motion artifacts and boasts an excellent signal-to-noise ratio. The sensor also offers a staggered HDR option with on-chip combination, providing smartphone manufacturers with the flexibility to select the best HDR method for a given scene.

Staff marketing manager at OmniVision, Arun Jayaseelan, explained: "The combination of high resolution, large pixel size and high dynamic range is essential to providing the image quality required by flagship mobile phones for features such as night mode. The OV48C provides superior signal to noise ratio, unparalleled low light performance and high quality 4K video."

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



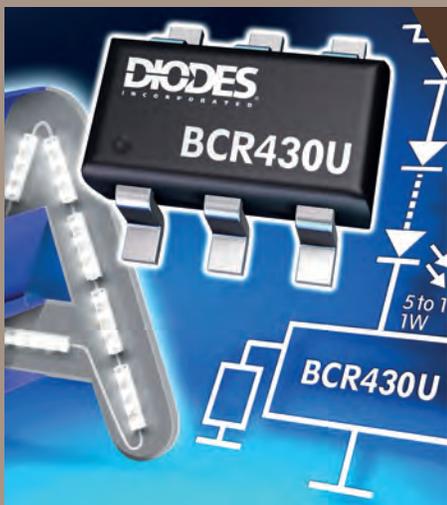
### Slow blow fuses now available in 2410 size

Bel Fuse Circuit Protection has announced a new series of ceramic surface mount fuses with in-rush current withstand capability in a 2410 SMD package. The 0680L slow blow fuses are designed for automotive and other applications that require high DC voltage ratings and high DC interrupting ratings.

Fuses in the range feature a current rating from 375mA to 12A and an operating temperature range of -55 to 125°C. They are also AEC-Q200 compliant, RoHS compliant, halogen- and lead-free.

Typical applications range from notebooks, office equipment and white goods to industrial and medical equipment, storage systems and wireless base stations, or battery charging circuit protection applications that require slow blow or time delay fuses to power the 2410 chip.

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



### One driver extends lighting possibilities

Diodes' new BCR430UW6 linear LED driver allows more LEDs to be driven from a low supply voltage with ultra-low dropout voltage and constant current regulation between 5mA and 100mA. This makes the BCR430UW6 suitable for applications that require multiple LEDs to operate together, such as signage illumination and architectural lighting for commercial and retail installations.

According to Diodes, the ultra-low dropout voltage of 115mV and low operating current of 285µA provide a greater level of system efficiency and scope to drive more LEDs per string reliably.

Furthermore, the device requires no external power transistors or capacitors, reducing the overall BoM cost and increasing system stability. Long-term reliability is also improved through the robust design, which is tolerant to overvoltage levels resulting from faults in the LEDs or supply transients.

With an adjustable output current level between 5mA and 100mA, the BCR430UW6 allows a single design to be used to drive various LED configurations, delivering a uniform output lighting level under all operating conditions.

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

Franchised Distributor (Y/N/M)  
 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  
 Pack and Hold

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	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	Pack and Hold
<b>ACOUSTIC COMPONENTS</b>											
BeStar Electronics Ind. Co. Ltd.	BeStar Technologies Inc.	520-439-9204	www.bestartech.com	Y	N/A	\$250,000	N/A	100.00%	50	900	Y
<b>CABLE &amp; WIRING</b>											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23235	N/A	\$0	0.46	50	1,000+	Y
Alpha Wire	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,106	N/A	\$0	93.00%	50	1,000+	Y
Belden Wire & Cable	Mouser Electronics	800-346-6874	www.mouser.com	Y	5,863	N/A	\$0	97%	50	1,000+	Y
Molex	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>CIRCUIT PROTECTION</b>											
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	\$0	68.00%	50	1,000+	Y
Eaton	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,487	N/A	\$0	100%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	28,790	N/A	\$0	67%	50	1,000+	Y
Schurter	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	31,445	N/A	\$0	68%	50	1,000+	Y
<b>DISPLAYS &amp; LEDs</b>											
BIVAR	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,390	N/A	\$0	99.00%	50	1,000+	Y
Dialight	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,179	N/A	\$0	84.00%	50	1,000+	Y
Displaytech	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Electronic Assembly	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kingbright Company, LLC	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	\$0	100.00%	50	1,000+	Y
Lumileds	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Newhaven Display	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,690	N/A	\$0	100.00%	50	1,000+	Y
VCC	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>ELECTROMECHANICAL</b>											
ALPS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Apem, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,326	N/A	\$0	83.00%	50	1,000+	Y
C&K Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	27,230	N/A	\$0	90.00%	50	1,000+	Y
E-Switch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Grayhill	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Keystone Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NKK Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	13,976	N/A	\$0	86.00%	50	1,000+	Y

Continue on page 38

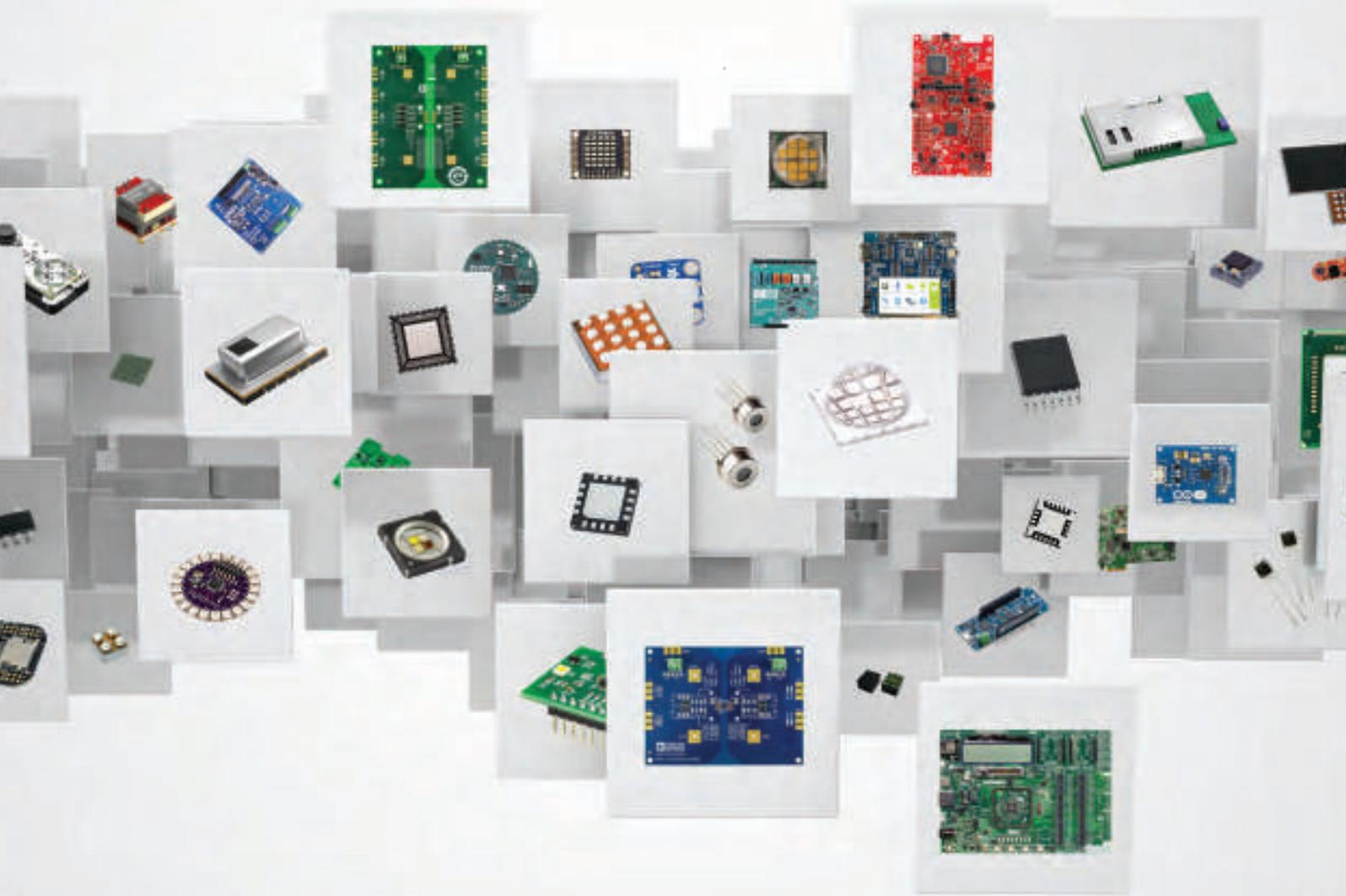
## Advert Index

Advert	Page	Advert	Page
4 Star Electronics	21	Newark	7
APEC	26	OKW Enclosures Inc	13
Coilcraft	15	Rochester	19
Digi-Key	FC, IFC & 22	Rutronik	BC
Dove	35	Sager	9
eBOM.com	23 & 41	Symmetry Electronics	17
Mouser	10, 11, 32, 33, 39 & IBC	TTI	5

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	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	Pack and Hold
<b>ELECTROMECHANICAL (Continued)</b>											
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Panasonic	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
PUI Audio	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schneider Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Sensata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne Relays	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>ENCLOSURES</b>											
Bud	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bud Industries	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	80.00%	50	1,000+	Y
Hammond Manufacturing	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,839	N/A	\$0	82%	50	1,000+	Y
New Age Enclosures	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>FREQUENCY MANAGEMENT</b>											
Abrakon Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,780	N/A	\$0	100%	50	1,000+	Y
CTS Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,889	N/A	\$0	100%	50	1,000+	Y
ECS Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,070	N/A	\$0	100%	50	1,000+	Y
Epson Toyocom	Mouser Electronics	800-346-6873	www.mouser.com	Y	178	N/A	\$0	100%	50	1,000+	Y
IQD Frequency Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Kyocera	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Labs	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>ICs &amp; SEMICONDUCTORS</b>											
Analog Devices, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,749	N/A	\$0	95%	50	1,000+	Y
Broadcom Limited	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Central Semiconductor Corp.	Future Electronics	(800) 675-1619	www.futureelectronics.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
Cree, Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cypress Semiconductor Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	\$0	81.00%	50	1,000+	Y
Digi International	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Diodes Incorporated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
FTDI	Mouser Electronics	800-346-6873	www.mouser.com	Y	94	N/A	\$0	100%	50	1,000+	Y
IDT (Integrated Device Technology)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Infineon	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,580	N/A	\$0	63%	50	1,000+	Y
Intel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ISSI	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
IXYS	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lattice	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MACOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	\$0	100%	50	1,000+	Y
Microsemi	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Nexperia	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	\$0	100%	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	\$0	96%	50	1,000+	Y
Power Integrations	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Qorvo	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Renesas Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
SanDisk	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	\$0	100.00%	50	1,000+	Y
Skyworks	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	\$0	96.00%	50	1,000+	Y
Swissbit	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	\$0	94%	50	1,000+	Y
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	\$0	77%	50	1,000+	Y

Continue on page 40

# More new products in stock



**MOUSER**  
ELECTRONICS

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

**ORDER WITH CONFIDENCE**

Authorized distributor of semiconductors and electronic components

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	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	Pack and Hold	
<b>INTERCONNECTION</b>												
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23,235	N/A	\$0	46.00%	50	1,000+	Y	
Aero Conesys	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Amphenol	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Amphenol	Mouser Electronics	800-346-6873	www.mouser.com	Y	165,853	N/A	\$0	31%	50	1,000+	Y	
Anderson Power Products	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Aptive (Delphi)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Cinch	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Cinch Connectivity/Bel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
ERNI Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
FCI	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,394	N/A	\$0	73.00%	50	1,000+	Y	
Glenair	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Harting	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,160	N/A	\$0	51.00%	50	1,000+	Y	
Harwin	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Hirose Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
ITT Cannon	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
ITT Cannon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
JAE Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,02	N/A	\$0	100%	N/A	N/A	Y	
JST	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
LEMO	LEMO	800-444-5366	www.lemo.com	M	N/A	N/A	N/A	N/A	N/A	1,500	N/A	
LEMO	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Mill-Max	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	\$0	89%	50	1,000+	Y	
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	\$0	100%	50	1,000+	Y	
NorComp	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	\$0	77.00%	50	1,000+	Y	
Radiall	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	\$0	27%	50	1,000+	Y	
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	\$0	55%	50	1,000+	Y	
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	\$0	69%	50	1,000+	Y	
<b>OBSOLESCENCE / HARD TO FIND</b>												
	America II Electronics	800-767-2637	www.americaii.com	M	1,900	\$1B	\$0	75.00%	59	550+	Y	
	Lantek Corp.	973-579-8100	www.lantekcorp.com	M	186,000	\$22M	\$0	75.00%	5	62	Y	
	Chip 1 Exchange USA, Inc.	949-589-5400	www.chip1.com	Y	850,000	N/A	\$0	85%	20	150	Y	
	Rochester Electronics	978-462-9332	www.rocelec.com	Y		N/A	\$250		10	400+	Y	
<b>OPTO ELECTRONICS</b>												
Broadcom	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	582	N/A	\$0	99.00%	50	1,000+	Y	
Finisar	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,927	N/A	\$0	99%	50	1,000+	Y	
ROHM Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
<b>PASSIVES</b>												
ABRACON	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
AVX	Mouser Electronics	800-346-6873	www.mouser.com	Y	42,454	N/A	\$0	72%	50	1,000+	Y	
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	38	N/A	\$0	78%	50	1,000+	Y	
Cornell Dubilier	Mouser Electronics	800-346-6873	www.mouser.com	Y	24,145	N/A	\$0	71%	50	1,000+	Y	
Coilcraft	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	26,533	N/A	\$0	98.00%	50	1,000+	Y	
Fair-Rite	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
Kemet	Mouser Electronics	800-346-6873	www.mouser.com	Y	77,568	N/A	\$0	66%	50	1,000+	Y	
KOA Speer	Mouser Electronics	800-346-6873	www.mouser.com	Y	34,078	N/A	\$0	58%	50	1,000+	Y	
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	33,780	N/A	\$0	99%	50	1,000+	Y	
Nichicon	Mouser Electronics	800-346-6873	www.mouser.com	Y	20,389	N/A	\$0	84.00%	50	1,000+	Y	
Ohmite	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,293	N/A	\$0	55.00%	50	1,000+	Y	
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,948	N/A	\$0	100.00%	50	1,000+	Y	
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	\$0	98.00%	50	1,000+	Y	
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	\$0	100.00%	50	1,000+	Y	
TT Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	
United Chemi-Con (UCC)	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y	

Continue on page 42

ASSEMBLY | TEST

NEW PRO

DEFENCE



30metre  
range

E-MECH

**eBOM**.COM

**DISCOVER ALL THE  
LATEST ON ELECTRONICS  
FROM OUR WIDE RANGE  
OF CATEGORIES!**

SEMICONDUCTOR

# Buyers' Guide

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	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	Pack and Hold
<b>PASSIVES (Continued)</b>											
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	\$0	64.00%	50	1,000+	Y
Würth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	\$0	99.00%	50	1,000+	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	\$0	100.00%	50	1,000+	Y
<b>POWER &amp; BATTERIES</b>											
Artesyn Embedded Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cincon	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Cosel	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
CUI Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Delta Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
MEAN WELL	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Mornsun	+1-978-567-9610/+1-978-293-3923	www.mornsunamerica.com				N/A	\$0	100%	N/A	2000+	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phihong	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
RECOM	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Schaffner	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK Lambda	Mouser Electronics	800-346-6873	www.mouser.com	Y	405	N/A	\$0	80.00%	N/A	N/A	Y
TRACO Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Vicor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
<b>REED SWITCHES</b>											
HSI Sensing	HSI Sensing	405-224-4046	www.hsising.com	M	75	N/A	\$200	100.00%	15	275	N
<b>SENSORS</b>											
ams	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Analog Devices Inc.	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Bosch	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,059	N/A	\$0	64.00%	50	1,000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,379	N/A	\$0	45.00%	50	1,000+	Y
Melexis	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,915	N/A	\$0	59.00%	50	1,000+	Y
Sensirion	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
STMicroelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	914	N/A	\$0	65.00%	50	1,000+	Y
<b>SWITCHES &amp; KEYBOARDS</b>											
OTTO	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<b>TEST &amp; MEASUREMENT</b>											
B&K Precision	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Fluke	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,008	N/A	\$0	94.00%	50	1,000+	Y
Keysight	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Lasarc Electronics		814-835-0621	www.lasarcelectronics.com	Y	130	\$602,000	\$0	100%	10	175	Y
Tektronix	Mouser Electronics	800-346-6873	www.mouser.com	Y	N/A	N/A	\$0	N/A	50	1,000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	\$0	96.00%	50	1,000+	Y

## Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Employees	Number of Surface Mount Lines	Approvals	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
Pektron	1-248-677-4838	www.pektron.com	\$66m	Michigan & UK	350	8	ISO9001, ISO14001, TS16949, BEAB, VCA, TUV, UL	Y	Y	Y	Y	Y	Y

# We're single-minded

JOIN OUR GROWING LIST OF CUSTOMERS

## about your satisfaction

환상적인 고객  
서비스. 정말  
감사합니다!

感谢Mouser一直  
以来专业热心的  
服务与支持!

Excellent  
service client  
à chaque  
fois.  
Merci  
beaucoup

Jedes Mal ein  
hervorragender  
Kundenservice.  
Vielen Dank!

毎回素晴らしい  
カスタマーサービス。  
どうもありがとう。

Fantastic customer service  
every time. Many thanks!



**MOUSER**  
ELECTRONICS

Optimizing your purchasing experience across the globe.  
Visit [mouser.com/customer-resource-center](https://www.mouser.com/customer-resource-center)



RUTRONIK.

**Trusted by over 30,000  
customers worldwide.**



## Your Benefits

- Broadline Distributor
- 40+ years of global experience
- Tailored supply chain solutions
- Reliable, on-time delivery from Austin, TX
- Local technical support
- 60+ local franchised suppliers

Contact us: +1 469-782-0917 or  
sales-na@rutronik.com

