ELECTRONICS SOULT C IN MIG PUBLISHING TITLE

SHIELD CUSTOMERS FROM GLOBAL SUPPLY ISSUES PAGE 20

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On the cover - July/August 2023

Shield customers from global supply issues Page 22

Editor's Word



Automation, where next?

If there is one area of engineering where I have spent most of my time, both professionally and as a maker, it is automation. Interestingly, if the definition of automation is 'reduce human intervention in processes' my work with both physical machines and software applications must count towards my automation experience.

Everywhere I look I see opportunities to automate. However, for the electronics industry to implement an effective long-term supply chain strategy for automation technology it needs to know where future growth will originate. Here are some guesses.

Firstly, as populations age and birth rates fall, logically, the number of older, isolated individuals will increase. Social robots could ride to the rescue. Regardless of their form—human, animal or machine—they could act as a companion, helper, nurse, shopper and more. In fact, at a recent university open day I witnessed just such a project.

Secondly, I can visualise a future where domestic micro manufacturing allows households to become productive assets for the benefit of families and the state. This will be based around additive manufacturing and cobots.

Thirdly, as more businesses confront their Scope 1 and 2 emissions targets, they will need to improve their productivity while simultaneously reducing their energy consumption. This will require the wholesale replacement of old, dumb, energy hungry automation with new generations of smart, efficient systems.

I could go on. These three examples are the tip of a coming automation iceberg, pushed along by diverse individual, local, national and global goals. My guess is that any distributor with a finger in the automation pie is looking at a rosy future.

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NEWS



AEROSPACE AND DEFENCE



Fixing a break in the defence supply chain



SEMICONDUCTORS



Efficiency in electric vehicle charger design



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ANTI-COUNTERFEITING:





Long-term SiC supply partnership

Vitesco Technologies has secured strategically important capacities in energy-efficient silicon carbide power semiconductors through a long-term supply partnership with Rohm–worth over one billion US dollars until 2030. Vitesco's inverters with integrated Rohm SiC chips will be applied inside electric vehicle powertrains.

vitesco

vitesco

Vitesco Technologies' CEO, Andreas Wolf, said: "The supply partnership agreement with Rohm is an important building block for securing Vitesco Technologies' SiC capacities in the years ahead. We have had very good experience in our development cooperation so far and are now looking forward not only to continuing it, but also to intensifying it further."

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Rohm member of the board, managing executive officer and CFO, Dr Kazuhide Ino, added: "In the high-growth automotive market, SiC is a pathfinder for higher efficiency. With an expected higher market share of more than 30 per cent, we are strongly positioned here and have gained a strategic partner in Vitesco Technologies for further market penetration."

www.vitesco-technologies.com



Investing in smart building technology

NeoCortec, a manufacturer of ultra-low-power bi-directional wireless mesh network modules, has moved into new headquarters just outside Copenhagen, Denmark, effectively doubling the office and laboratory space available.

NeoCortec's CEO, Thomas Steen Halkier, said: "We took advantage of a nearby facility which has just become available in order to give us space to grow and develop our capabilities. Our focus is on enabling smart buildings by providing a sensor networking platform technology that delivers the information that owners and users of public and commercial spaces need to make informed choices and implement energy-saving, secure premises management systems."

The company's tiny modules have an average power consumption as low as 20 microamps, meaning modules can run for years on two AA batteries. Modules are simply positioned as required around a building or set of buildings. All nodes in a NeoMesh wireless network are equal–each can generate and transmit data.

www.neocortec.com

CO₂ sensor boxed and ready

Mouser Electronics is now stocking Amphenol's Telaire T6793 CO₂ high accuracy NDIR carbon dioxide sensors. They provide a flexible platform designed to interact with other microprocessor devices to measure and control CO₂ levels for HVAC air quality, environmental and energy-saving applications.

The sensor is a miniature, non-dispersive, single-channel OEM module said to offer the accuracy and reliability of many larger sensors. It meets the accuracy standards of CA Title 24 and has an accuracy rating of \pm 45 parts-per-million (ppm) +3% of reading in the measured range of 440 to 2000ppm. The sensor has a 4.4 to 5.5V supply voltage, a 200mA peak current with a 25mA average current that calibrates with most applications. The patented Telaire ABC Logic software features a lifetime calibration in most applications.

The ultra-small form factor of 29.97 by 15.60 by 8.61mm and fast warm-up time provide an affordable gas sensing solution for OEMs with applications requiring an operating temperature range of -10 to 60°C and relative humidity of zero to 95 per cent (non-condensing).

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In Brief

Robotics expects all-time high

The German robotics and automation sector expects a record year, forecasting a 13 per cent increase in sales to 16.2 billion euros in 2023. Chairman of VDMA Robotics + Automation, Frank Konrad, said: "The market situation is characterized by full order books. During the pandemic, suppliers built up large order backlogs, which are being gradually worked off." www.vdma.org/ robotics-automation

Analogue and power

portfolio grows EBV Elektronik has signed a franchise agreement with Nisshinbo Micro Devices, a supplier of analogue, power and microwave components. EBV Elektronik's president, Thomas Staudinger, said: "We believe this well-known brand in Japan, delivering some of the highest quality silicon available in the market, will be of great interest to many of our customers." www.ebv.com

Gigafactory launch

Varta is investing in renewable energies, with its new factory for energy storage systems going into operation this summer. The 5,000m² Neunheim site in Ellwangen, Baden-Württemberg plans to produce up to 100,000 energy storage systems per year. With an average capacity of 10kWh per system, the output will equate to over 1GWh per year. varta-aq.com

JOSCAR for supply

chain security Hyperstone has been awarded JOSCAR certification and is now recognized as a fully compliant supplier for several security companies and major organizations. The Joint Supply Chain Accreditation Register (JOSCAR) is a collaborative accreditation and compliance system used by the aerospace, defense and security industries to ensure suppliers meet high standards www.hyperstone.com



okings -

ook-to-Bill-Ratio

10/21 20/21 30/21 40/21 10/22 20/22 30/22

Billings

Strong sales, lower orders

German components distribution made a huge push in the first guarter of 2023, with sales by distributors reporting to the FBDi reaching an impressive €1.51 billion in the January to March period, up 23.2 per cent on the same quarter last year. As expected, new orders declined significantly to €1.1 billion, corresponding to a book-to-bill ratio of 0.73.

The differences between the product areas were significant. While semiconductors recorded the lion's share of the growth (32.4 per cent to 1.03 billion euros), passive components increased by 'only' 7.5 per cent to 200 million euros and electromechanics by 'only' 4.3 per cent to 182 million euros. With growth of almost 20 per cent to around 53 million euros, power supplies

also showed a very positive trend. There was little change in the overall product split except for semiconductors, which accounted for almost 68 per cent of total sales (passives 13 per cent, electromechanics 12 per cent, power supplies 3.5 per cent and others 3.5 per cent).

10/23

Source: F8Di e.V., May 2023

FBDi's chairman of the board, Georg Steinberger, said: "The increase in sales was quite surprising, but not the normalization in bookings, which we have been seeing for several quarters and which should also have an impact on sales in the coming guarters. The overheating of the last two years has thus largely dissipated, although not all availability problems have been solved."

www.fbdi.de



Boosting capacitor options

Rutronik has expanded its portfolio with Vishay Intertechnology's latest X1, X2 and Y2 film capacitors. They are ideal for suppressing electromagnetic interference for standard cross-line and line-bypass applications.

The company states the F340 series was designed to meet the highest requirements for robustness against humidity. As a result, 1,000 hours of operation are easily possible in temperature-humidity bias tests at 85°C and 85 per cent relative humidity. Other stated benefits include high stability in terms of capacitance, dissipation factor, and insulation resistance.

That combination of features enables longer life under harsh application conditions in industrial and automotive power electronics like battery chargers, renewable energy inverters, motor drives and UPS.

With the F340 products, Vishay offers a complete range of X1, X2, and Y2 safety capacitors with IEC60384-14/AMD1 2016 Grade IIIB, available in two versions with rated voltages of 305VAC or 480VAC.

www.rutronik24.com



Investing in customer test

Nicomatic has opened a testing laboratory offering test and qualification services to customers with demanding applications. Nicomatic test engineers work with customer design and development teams, applying their expertise to materials test and qualification of customer projects.

The company's test lab is quality management system certified to ISO9001 and AS9100, with decades of experience in meeting industry standards and specifications across defence, aeronautics and space applications, including MIL-DTL-55302, MIL-DTL-83513 and ESCC3401.

Almost a dozen test instruments and machines perform more than 30 tests to ensure customer products, devices and systems are comprehensively performance tested, including: signal integrity, environmental, mechanical, electrical and chemical.

Nicomatic test engineer, Jorris Martel, said: "This new test laboratory fulfils several important roles. Arguably our most critical assignment is to assist customers during their implementation of Nicomatic products in their application. We are not a simple test laboratory: our real value is to provide specialist interconnect advice and expertise where others cannot."

www.nicomatic.com

Advertorial

Mitigating the risk of counterfeit components entering the supply chain

The Value of Using an Authorised Distributor

In the current market, design engineers frustrated by interruptions to their supply chain may resort to sourcing components from unfamiliar distribution sources. However, this decision is fraught with risk because some unauthorised distributors choose to source their components from the "grey market." The provenance of such parts is often unknown, meaning their authenticity cannot be determined. It can be difficult to distinguish a counterfeit component from the genuine part because they are deliberately packaged to appear identical — featuring the same manufacturer branding and part number. Determining if a part is fake or genuine can only be done by carefully examining the internals of the package, a task that requires the use of an X-ray machine and specific testing skills.

A major concern associated with counterfeit components is that there is a high probability that they have not undergone the same rigorous levels of testing and quality control procedures that genuine parts have been subjected to. This means that they are more likely to exhibit inferior levels of performance, or even fail, in the field. Engineers who use counterfeit components could be exposed to legal actions relating to product

faults. With chip shortages still occurring with some products, individuals and OEMs are advised to only source components from authorised distributors with systems in place that allow them to trace their components back to the point of manufacture. This is especially important for components intended for use in medical or aerospace applications, which must have relevant documents and certification.

Mouser Electronics was the industry's first authorised distributor to be accredited with AS6496, the aerospace industry's high standard for anti-counterfeit measures in authorised electronic component distribution.

The AS6496 aerospace standard sets requirements mitigation, and disposition of counterfeit products in the authorised distribution supply chain. This international standard requires authorised distributors to have a counterfeit mitigation policy and a counterfeit electronics parts control plan. AS6496 is geared for all industries and individuals looking to reduce the risk of counterfeit electronic parts entering the supply chain.

Mouser is also registered to AS9100D, ISO 9001:2015, and ANSI/ESD S20.20-

2014, the industry's gold standards for quality, control, and electrostatic discharge (ESD). Registration to these standards lets customers know that Mouser is an authorised distributor of the highest quality components by providing traceability, risk management, process control, customer support, product availability and document control.

Mouser has rigorous processes in place to prevent counterfeit products entering its supply chain, so customers can be confident that the components they purchase are genuine.

In addition to product integrity, Mouser also assists its customers through realtime stock updates and obsolescence management and offers a variety of technical tools and resources to assist the design engineer.

Today, Mouser has 27 support locations worldwide, offering localised service for more than 650,000 customers in their local language, currency and time zone. Inside Mouser's vast Global Distribution Centre, you will find the industry's widest selection of products from over 1,200 manufacturer brands, with new products being added on a daily basis — all authorised, of course.

www.mouser.com/quality





Mark Patrick Technical Marketing Manager <u>EMEA M</u>arketing

As Mouser Electronics' Technical Marketing Manager for EMEA, Mark Patrick is responsible for the creation and circulation of technical content within the region – content that is key to Mouser's strategy to support, inform and inspire its engineering audience.

Prior to leading the Technical Marketing team, Patrick was part of the EMEA Supplier Marketing team and played a vital role in establishing and developing relationships with key manufacturing partners.

In addition to a variety of technical and marketing positions, Patrick's previous roles include eight years at Texas Instruments in Applications Support and Technical Sales.

A "hands-on" engineer at heart, with a passion for vintage synthesizers and motorcycles, he thinks nothing of carrying out repairs on either. Patrick holds a first class Honours Degree in Electronics Engineering from Coventry University.

Optimizing wiring harnesses

In this article, TTI's supplier marketing manager, John Sandy, walks readers through the support services distributors can offer during the design and manufacture of wiring harnesses

When building wiring harnesses, how helpful would it be if a capable distributor could streamline and simplify the process. With the recent supply chain issues, an authorized distributor should also have the parts to hand.

Connector selection is something most engineers are familiar with, needing little help. After that, they source samples and test them for fit and function. If additional help is needed, look to an authorized distributor with a broad and deep selection of styles and capabilities in inventory.

Quality distributors stock connectors from manufacturers that even provide pre-crimped housing and contacts as a single part number, helping ensure the connector fits and functions as imagined.

Select distributors can provide online customization tools to specify orientation, cable lengths and anything else needed to retrieve a drawing and quote. From there, the distributor will obtain all part numbers and inventory in stock and ensure requirements are met and products are delivered exactly as needed.

Once the product is received, prototype testing can begin. This may need production quality off-theshelf (OTS) cable assemblies in lengths that are close to that required in the final design. The distributor can provide them, including over-molding and discrete wire? Whatever engineers need, the distributor should have an option.

In addition to offering a wide range of components and seasoned expertise through each design step, an accomplished distributor should offer two things invaluable in today's fastmoving, ever-changing electronics world—available parts and an available partner—ensuring supply chain hang-ups don't slow down processes and customers have an invested source they can depend on.



TTI's supplier marketing manager, John Sandy

For decades, TTI has worked hard to be the electronics component resource of choice that engineers rely on to provide the widest and deepest variety of quality parts exactly when customers need them along with experienced specialists to help them with all their needs.

tti.com





The Critical Link in Your Supply Chain

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Fixing a break in the defence supply chain

According to Charcroft's product specialist Chris Leek, restoring the continuity of supply after a break in the defence supply chain needs specialist distribution skills

The recent withdrawal of a manufacturer from supplying circuit breakers for defence applications has highlighted the specialised distribution skills needed to maintain supply continuity. In fact, this manufacturer will not even supply commercial circuit breakers for use in defence applications.

The easiest option is for the distributor to find a

drop-in replacement or close alternative with the same physical size, voltage and current rating. Unfortunately, some breakers no longer available for defence applications have no direct alternatives.

For breakers rated up to 500A, the most costeffective solution may be for the distributor to offer an alternative from a different manufacturer by adapting an existing breaker to carry 500A.

In addition, a high-vibration version of the standard 2TC circuit breaker has been engineered by circuit breaker manufacturer, Sensata, by changing the standard 7/16in neck thread to an M12. Another solution was provided by adapting the breaker fixing. The replacement had the same size and current rating as the original but a slight change to the front panel was needed for fixing.

The need to find replacements for highreliability components goes further than circuit breakers and extends to capacitors and resistors.

As defence applications often have lifetimes measured in decades rather than years, the ability to identify and



Charcroft's product specialist Chris Leek

deliver a replacement for an obsolete passive can be vital. This can mean the difference between having defence equipment operational or sitting in a workshop waiting for a costly redesign.

Charcroft uses in-house manufacturing to customise *Continues on page 12 >*

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The need to find replacements for high-reliability components goes further than circuit breakers and extends to capacitors and resistors SPONSORED BY /\VNET

Rise of wide bandgap semiconductors in power electronics



While silicon has long dominated the power transistor market, WBG alternatives are gaining interest, especially for applications requiring maximum power efficiency like electric vehicles and renewable energy generation. However, the higher cost of WBG power semiconductors makes them unsuitable for low-cost consumer power supplies. WBG devices' enhanced efficiency leads to lower heat dissipation, improving mechanical and thermal design and enabling smaller product sizes. SiC's ability to operate at higher temperatures is beneficial for automotive and industrial applications.

Industrial power supplies and motor inverters: Si insulated-gate bipolar transistors (IGBTs) are suitable for high-power, lower switching frequency applications powered by a three-phase supply. WBG devices offer efficiency benefits, making them valuable in continuous operation industrial applications and lowerpower applications requiring compact machines like advanced factory robots.

PV inverters/solar:

Efficiency is crucial at every stage of solar power generation. SiC-based boost and inverter power integrated modules (PIMs) improve critical stages, including single-phase and three-phase inverters. GaN devices find application in smaller solar inverters.

Heat pumps: For relatively low-power heat pumps, the efficiency gains offered by fast and accurate switching make GaN transistors a relatively good choice. The precise control provided by GaN technology enables heat pumps to operate at optimal levels, resulting in improved energy efficiency and cost savings for homeowners. Additionally, GaN transistors offer compact size and lightweight characteristics, making them ideal for space-constrained heat pump installations.

Energy/home storage systems: Efficiency in power switching is vital for energy storage systems. The high cost of these systems justifies the extra cost of WBG devices. Silicon carbide devices, including hybrids, are meeting these requirements.

Electric vehicle charging:

To meet the growing demand for EV charging, SiC devices provide high power, efficiency and reliability. Vehicle-to-grid (V2G) technology, allowing EVs to return power to the grid, requires a reliable and efficient solution.

Selecting power semiconductors involves trade-offs. The availability of WBG devices expands options for designers. Evaluating the benefits and drawbacks of SiC, GaN and Si devices is crucial. By understanding their characteristics and suitability for specific applications, designers can make informed decisions aligned with industry trends. Optimising designs for efficiency, reliability and costeffectiveness requires careful evaluation of trade-offs in the power electronics field.

www.avnet-silica.com



HARVEY WILSON, SYSTEMS ENGINEER, SMART INDUSTRY EMEA, AVNET SILICA

Aerospace and defence

a solution for an individual customer and deliver a replacement passive with the same form, fit and function. UK manufactured specials include custom passive assemblies to meet tough electrical, mechanical and environmental specifications for challenging or retrofit designs.

In-house processes can help overcome a range of supply-chain challenges, including screening a batch of passives which are rated for five per cent tolerance to select out individual components with two per cent tolerance.

The defence supply chain must meet the immediate need to supply the correct component and deliver long-term support throughout the extended lifetime of the defence equipment. By developing a customised computer system, plus quality-led sales processes, Charcroft has been designed to support the special needs of defence and other tough applications.

Immediate needs are supported by ensuring that the appropriate grade of component is quoted and supplied for each application and that a certificate of conformity (CofC) is included with every shipment. A copy of every CoC is archived, so the customer can request a copy to address a question which may arise longer term.

An archive of internal customer part numbers is also maintained. These are sometimes used by defence customers in place of the component manufacturer's original part number. The archive can identify the original part number and help identify a replacement if the component becomes unavailable or obsolete. An archive of decades-old legacy datasheets adds to resources available to identify a replacement for a legacy passive.

Having supported the defence customer from the point of supply and through the component and equipment's lifetime, the distributor must also look to the future. This means sharing knowledge of emerging components entering the defence market.

One of the latest components is a potential game-changer. This new ultra-high energy, surfacemount film capacitor is 90 per cent lighter than the MLCC capacitor it can replace. A new highfrequency clock oscillator adds ultra-low sensitivity to acceleration, plus low phase noise, and is designed for high shock or vibration applications.

A flexible approach can be extended to longterm and stabilised price agreements. An agreement can be reached with a customer to provide a stabilised price and hold inventory for a component for the length of the pricing agreement.

While mainstream distribution will supply components to the defence market, it takes a special set of distribution skills and processes to deliver the knowledge and resources to fix a break in the supply chain.

www.charcroft.com

Standard circuit breakers can be customised as replacements



Design Flexibility and Innovation

by Tim Carroll, vice president, marketing and eCommerce at DigiKey

Often in our monthly columns for Electronics Sourcing, we share ideas and information about the digital tools and resources DigiKey offers procurement professionals, engineers and designers to make their jobs more efficient and flexible. DigiKey is continually innovating so we can accelerate progress for every engineer, designer and builder. Recently, we've also been working on design flexibility and innovation within our own brand and thinking about the way we're seen around the world.

The Updated "DigiKey"

To this end, DigiKey recently unveiled an update to its brand system including a refreshed logo, updated color palette and typeface, tagline, simplified name and updated brand voice.

The updated logo and brand system is an evolution of the company's historic look that

allows for design flexibility across digital platforms while reinforcing an engineered feel in a more modern, timeless way. It was designed to emphasize progress and connection with suppliers and customers while reflecting DigiKey's digital-first, forward-looking perspective. The refreshed brand identity also features a simplified company name to better reflect its deep technical product and digital solutions portfolio.

For 50 years, our focus has centered on accelerating progress for engineers, designers, makers and procurement professionals. DigiKey's updated look and feel reflects that inspirational progress, our leadership position in the industry and our commitment to digital experiences and solutions that move goods and ideas forward.

We Get Technical DigiKey's brand refresh combines its legacy of success with the vision for future opportunities and growth to support the core business and creates paths for bolder moves within an innovative industry. At DigiKey, we get technical because the technical aren't just who we serve, it's who we are.

DigiKey's commerce and logistics lead the industry by continually raising the bar on our operations, and the solutions we provide our clients. We build and apply a deep understanding of the market that translates into meaningful service for all. DigiKey delivers frictionless interactions to move people forward towards nextgeneration solutions, business growth and operational efficiency. Our new brand system reflects these deliverables that have always been at the core of who we are. The timing for our design refresh also seems serendipitous. We've recently seen a rejuvenation from companies stressing the focus on new designs. The amount of engineering activity is extremely strong – companies now have the engineering resources at their disposal to focus on the products and designs of tomorrow and we're proud to help them accelerate that progress.

We're still the same DigiKey, we'll just start to look different. You'll see the refreshed DigiKey look on our website, on our boxes and shipping tape, at tradeshows and in magazines like Electronics Sourcing as we roll out our updated branding over the next year. We're excited to share our design innovations with you.

www.digikey.com

Global economy continues to cool

In this article, the IPC's chief economist, Shawn DuBravac, presents readers with a plethora of market information including company and consumer sentiment

Per IPC's May 2023 Economic Outlook report, the global economy continues to cool, but not quite as severely as expected at the start of the year. Stronger-thanexpected growth in 2023 will come at the cost of weaker growth in 2024.

The IPC's chief economist, Shawn DuBravac, said: "Consumer confidence fell sharply in the last month, erasing half of the gains since the all-time low levels of June 2022. Business confidence has also been weak. Manufacturers report a subdued outlook in both the US and Europe. Leading economic indicators continue to suggest a high risk of recession this year, even if the timing continues to push later into the year."

Labor markets remain extremely strong, despite the widely held view that recession is imminent. Both the US and Europe are enjoying record low levels of unemployment. Employment remains strong even in markets where growth has turned negative. Germany for example just expected a second quarter of negative GDP growth in Q1. The country is likely in recession. But Germany also has one of the lowest unemployment rates in Europe at just 2.8 per cent. Job openings remain strong as well. Job openings in the US rose 358,000 in April to 10.1 million while layoffs eased during the month.

Strong labor markets and solid wage growth are likely to keep inflationary pressures stubbornly high. In the US, the personal consumption expenditures price (PCE) index, the Fed's preferred gauge of price increases, remains high. PCE excluding food and energy costs, rose 0.4 per cent in April. Prices are up 4.7 per cent over the last year, where they have hovered since December 2022. The euro area annual inflation rate was seven per cent in April, up from 6.9

per cent in the prior month. This is down from 7.4 per cent the previous year but still well above the ECB's target of two per cent.

Last month DuBravac wrote: "Right now, the futures market suggests little chance of a rate increase at any of the five remaining meetings in 2023. In fact, the financial markets suggest a 99 per cent chance of a rate cut by the end of the year, with the highest probability being a cumulative 75 basis point cut, starting in the third quarter and the end of the year. I am less sanguine than others. I believe there should be some expectation of at least one additional rate hike in 2023 and a lower probability of rate cuts later in the year."

In the last month the markets have caught up with my perspective. Today the futures markets are suggesting better than 50 per cent probability of a rate hike in the June meeting. Higher rates will undoubtedly slow the economy further and likely push against further employment gains. Recent work by former Fed chair Ben Bernanke and former IMF chief economist Olivier Blanchard suggests unemployment might need to rise to 4.3 per cent in order to cool inflation.

Confidence weakened over the last month. Consumer confidence fell sharply in the last month, erasing half of the gains since the all-time low levels of June 2022. Some of the weakness was likely the result of the uncertainty surrounding debt ceiling discussions. Business confidence has also been weak. Manufacturers report a subdued outlook in both the US and Europe.

Behind the headline numbers, data provides a more subtle picture of confidence. For example, the share of consumers planning to buy vehicles over the next six months



AUTOMOTIVE PRODUCTS

Auto production jumped a strong 9.3% during April. Nonauto manufacturing rose 0.3%. Auto production is up 8.5% in the past year.



TRANSIT EQUIPMENT Transit equipment

production rose 3.6% during the month. The sector is up 6.4% over the last year.



INFORMATION PROCESSING & RELATED EQUIPMENT

Production in the information processing and related equipment sector rose 2.2% during the month. The sector is down 1.2% over the last year.



INDUSTRIAL & OTHER EQUIPMENT

The industrial sector was flat last month. The sector is down 1.2% over the last year.



DEFENSE & SPACE EQUIPMENT

The defense and space equipment segment rose 1.1%. The sector is up 0.2% over the last year.

Feature



rose compared to last month. The share planning to buy major appliances including refrigerators, washing machines and televisions rose to a seven-month high in the last month. Household finances remain intact and declining price pressure is likely making a better time to make major purchases when compared with last year. Consumer spending rose in April after a few flat months. Business investment in the US was solid in the last quarter and orders for durable goods rose sharply in April.

The monthly IPC sentiment reports point to a slowing environment, but still a growing environment. The number of firms reporting that orders are expanding is declining, but the majority of firms continue to report that orders are rising and they expect that to continue in the months ahead. At the same time, cost pressures continue to decline which is helping companies to satisfy those orders.

www.ipc.org

Stronger-thanexpected growth in 2023 will come at the cost of weaker growth in 2024



Efficiency in electric vehicle charger design

EBV Elektronik's director segment city and infrastructure, Andreji Orel, explores the trends, options and trade-offs in semiconductors for EV charger design

Electric vehicle (EV) DC chargers rely on semiconductor power switches for efficiency, low cost and small size. DC EV chargers serve as AC-DC power supplies with unique characteristics. AC charging incurs losses in the vehicle's onboard charger (OBC), designed by car manufacturers to protect the battery and impose charging limitations. In contrast, DC charging bypasses the OBC, enabling alternative charging protection mechanisms and faster charging. Energy efficiency is crucial for optimal performance, necessitating high efficiency in DC EV chargers. Affordable, reliable and efficient equipment usage is imperative to minimise operational expenses throughout the charger's lifetime.

Designing DC EV chargers presents challenges. Chargers require high, variable voltage outputs to accommodate different batteries and must follow timed, sequential, constant current and constant voltage charging regimes. Power levels can be extremely high, with ultra-fast chargers rated in fractions of a megawatt. Bi-directional energy flow is also becoming an important consideration.

Silicon MOSFETs, an older technology, offer high switching frequency and can function as switches or synchronous rectifiers for bi-directional energy flow. However, at higher power levels, MOSFETs have resistive properties leading to increased dissipation. Parallel operation can mitigate this but adds complexity and cost.

Wide band-gap devices (WBG) like silicon carbide (SiC) and gallium nitride (GaN) are considered the future of power switches. They exhibit lower dynamic and static losses compared to silicon and can operate at higher temperatures. However, SiC and GaN devices have specific gate drive requirements and limitations. For instance, SiC MOSFETs have a high forward drop in their body diode, while GaN HEMT cells show a high reverse voltage drop during dead time. GaN parts are also rated at relatively low voltages due to the absence of a protective avalanche effect.

Optimal designs of DC EV chargers often incorporate a combination of Si-MOSFETs, SiC-MOSFETs and SiC diodes. The specific power rating of the charger stage determines the choice of components and configuration.

For charger powertrains rated less than 50kW, a Vienna rectifier stage is commonly used. This stage serves for mains rectification and power factor correction. It benefits from lower-voltage Si-MOSFETs due to their costeffectiveness and advantages in terms of on-resistance. The switches in the Vienna rectifier experience half-voltage stress. Chargers exceeding 50kW employ an active front end, while higher power levels (eg 100kW) may use a diode rectifier configuration.



arrangement used at less than 50kW



EBV Elektronik's, director segment city & infrastructure, Andrej Orel

AC-DC conversion in ACDC stages varies: lower power levels use unidirectional power factor correction (PFC), and higher power levels use bidirectional active rectifier configuration. An isolated multiphase transformer rectifier setup may be necessary for specific charger requirements.

DC-DC conversion considers isolation, energy flow and can be either isolated or non-isolated based on requirements. It can also be unidirectional or bi-directional to accommodate different charging and energy flow scenarios, ensuring efficient and safe charger operation.

Modularity is a normal approach due to maintenance and scalability in high-power DC EV charger design. Chargers use modular subunits rated 25 to 50kW, that can be stacked or paralleled for higher power. This approach reduces semiconductor stresses and can minimise electromagnetic interference. Modularity also provides flexibility, ensuring optimal overall efficiency, as subunits can be switched in as needed. Additionally, a single sub-unit failure only reduces maximum power output without disabling the entire charger.

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Combating counterfeit semiconductors

Rochester Electronics EMEA's technical sales manager, Ken Greenwood, discusses how companies can fight counterfeiting and ensure an authorised supply

In times of supply shortage, or where there is need for a discontinued component, the risk of encountering counterfeits increases dramatically. Counterfeit semiconductors come in many disguises, including the following.

Firstly, non-functional or scrap product, re-marked as good and resold. Next are second-hand original components, re-marked, repacked and claimed as new. Thirdly, functional, yet substandard, product purchased by the counterfeiter, re-marked and resold as a higher spec, higher price product. Then come unauthorised functional copies. Finally, genuine original components with forged traceability/ authenticity documentation.

We have moved beyond fraudulent copies of logos and empty packages that can be caught by AS6081 visual testing. Counterfeiters now utilize impeccable component finishes and seemingly perfect paperwork trails, as potential gains are enormous.

Risks to purchasers are many and the misconception that 'testing' can provide a 100 per cent guarantee is too common. The question is which tests? Many anticounterfeiting measures only cover levels of visual, re-marking and x-ray testing. This will catch many counterfeits but more sophisticated examples may not be identified.

In re-marking cases, etching back the original external markings with aggressive chemicals or mechanical grinders can damage internal bonds or substrates. Cleaning residues slowly enter and contaminate the device, damaging bondpads or bond-wires.

Non-authorised handling and storage can lead to moisture ingress and ESD damage. This risk applies to product purchased through non-authorised routes regardless of date-code.

Recovering previously used semiconductors from old PCBs can result in catastrophic heat and mechanical damage. Recovering ICs from PCBs is normally the last step of a scrap trail, which includes the products' prior use and a return-for-recovery route through an uncontrolled storage environment. Exposure to excessive humidity, water and salt is common. This produces an authentic used product with questionable reliability.

Third-party testing can never guarantee to identify every counterfeit and cannot offer a guarantee of product reliability.

What does 100 per cent authorised and tested really mean? All product provided by an authorised source has been 100 per cent fault-coverage tested and is guaranteed to meet the original component manufacturer's datasheet and reliability standards. Products have been fully tested by the OCM or, for ongoing production of discontinued product, by an authorised obsolescence partner. Partners are authorised to use the original test programmes to offer a full guarantee.

Authorised after-market suppliers and manufacturers, as identified by the US Department of Defence DFARS (such as Rochester Electronics), provide a 100 per cent guaranteed and counterfeit-free source for active-shortage and obsolete semiconductors.

Finished devices stored and supplied by authorised sources are guaranteed to come from the OCM and to have been stored in-line with the OCM's specifications. These products are 100 per cent conformance guaranteed.

As a licensed manufacturer, Rochester Electronics can offer ongoing production of obsolete devices. Built from known-good die, these products are tested using the OCM's test procedures and, in many cases, the original test equipment. Each component is 100 per cent compliant to the original specifications.

Rochester Electronics is authorised by OCMs to mark products with the original part numbers and the current date-codes. Many devices are still in production 20-years after the original discontinuations.

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Rochester Electronics' technical sales manager, Ken Greenwood

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As a licensed manufacturer, Rochester Electronics can offer ongoing production of obsolete devices

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Manufacturers making sourcing easier

In this article, Samtec explains how access to manufacturer stock means the supply chain can become an integral element in the design process

In the world of electronic components, the roles played by manufacturer and distributor are shifting because the modern design process is changing. As more product selection is conducted online with less personal contact, it is vital manufacturers engage directly with customers using digital resources. These tools, from traditional 2D product drawings to online simulation software, provide customers with direct access to manufacturers' expertise.

Connector manufacturers like Samtec have embraced this by developing online tools that let engineers research, select and build with the latest products. Central to this approach is the role the manufacturer is playing in the supply chain.

Traditional manufacturing has struggled to deliver components quickly, which is why distribution channels are so important. However, there are limitations to the stock distributors can reasonably hold. Obtaining small quantities of specialist components is key to prototyping and early production. If customers are limited by the stock available through distribution, they may fail to embrace the most effective solutions.

Rapid delivery of small component volumes is not limited to prototyping. The flexibility offered by modern smart factories means customers need to respond quickly to changing demand. Holding stock in anticipation of new demand is impractical and expensive. The ability to respond quickly to customer requirements is part of Samtec's Sudden Service concept. The modular nature of many of its products lets Samtec assemble products quickly from a broad inventory of subcomponents, resulting in a short lead time.

Samtec has taken the Sudden Service model further, introducing the Samtec Reserve program, in which over 200,000 products are held in stock in completed form, ready for one-day shipping. These products are clearly identified on the Samtec. com website, letting engineers select readily available products and making procurement easier.

The Sudden Service model and Samtec Reserve program are designed to work in conjunction with the existing distribution network, which is still hugely important in providing flexible and competitive sources of components. However, direct access to manufacturer stocks, and the latest online resources, means that the supply chain can finally become an integral element in the design process, not an inconvenient afterthought.

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Obsolete / End-of-Life Sourcing

Shield customers from global supply issues

PEI-Genesis' senior VP and MD Europe, Jonathan Parry, advises on how to provide stability for customers during uncertain times

Shipping costs between China and the UK increased by over 350 per cent between 2020 and 2021, according to China-Britain Business Council. Issues including the pandemic, war in Ukraine and Brexit have created component shortages and forced many manufacturers to raise prices. The following article presents three steps businesses can take to give customers stability in uncertain times.

The war in Ukraine has caused fuel prices to surge, forcing up freight costs for all modes of transportation. It has also disrupted the rail transport route connecting China and Europe, which had already become competitive due to rising consumer demand during the pandemic.

Although global shipping prices started stabilising

in 2022, data provided by Freightos indicates that transpacific and transatlantic rates are still 180 and 240 per cent higher, respectively, than early December 2019.

In the US, labour disputes, rail backlogs and rising diesel prices are all causing supply chain problems.

These are all issues businesses have no control over. However, there are steps and strategies that can help to mitigate these and build a secure operational platform to provide stability for customers.

Localisation: Over the past two years, mismatching lockdowns worldwide have caused many containers to become stranded at ports. Similarly, competition to fill the gap caused by issues in the China–Europe route has forced ships to be diverted to parts of Africa or South Asia.

This dependence on a global supply chain has increased the time it takes for many companies to service their customers, forcing them to localise. By bringing their manufacturing process closer to consumers, businesses can ensure a continuity of service and speedy supply, regardless of future global challenges.

The just-in-case strategy: Before the pandemic, many businesses relied on the just-in-time strategy. This inventory management strategy lets manufacturers align materials orders from suppliers with their production schedules, increasing efficiency and minimizing inventory costs

This strategy works well when supply chains are reliable. However, the pandemic forced manufacturing to shut down and, when the markets reopened, there was a jump in demand. This, coupled with the other issues mentioned previously, means JIT no longer works for many companies.

To help ensure continuity of service, manufacturers can invest in holding more stock, also known as the just-in-case (JIC) strategy. JIC aims to minimise the likelihood that a product will sell out, serving as a cushion in the event of supply disruptions.

By ensuring availability of products, businesses can avoid permanently losing customers and suppliers. They can also prevent a supply chain collapse.

Reconnect with customers: Pandemic lockdowns prevented

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Connectors

businesses from meeting with their clients and building relationships. With most restrictions now lifted, it is a great opportunity for companies to reconnect with their customers by investing in their field sales coverage.

This is especially important for companies who operate in regions that contain different languages and cultures, as localised sales teams can provide a tailored service based on customers' needs in these regions.

PEI-Genesis is taking these steps to invest in providing stability for its customers globally. These investments are centred around its three pillars: speed, inventory and being a trusted advisor.

To provide speed and keep its 48-hour promise to its customers, it has opened an additional manufacturing facility in Philadelphia, USA, alleviating the pressure on its existing South Bend facility. It has also opened a facility in Zhuhai, China, because customs clearance meant it took over ten days to ship products from its other sites in the Asia-Pacific region.

PEI-Genesis has also invested in its inventory. It has ten million dollars more component stock than this time last year. This offers unrivalled availability for customers as it can offer the widest range of part numbers and selections. Finally, the company is investing in being a trusted advisor. This means having experts in each market to drive customer relations. For example, in APAC, the company has expanded its sales force to cover ten out

of fourteen APAC markets, opening its most recent sales office in Singapore. This enables it to bring solutions with new and existing products, while allowing it to give a more bespoke service to customers of different languages and cultures.

www.peigenesis.com

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To help ensure continuity of service, manufacturers can invest in holding more stock, also known as the just-incase (JIC) strategy

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Buyers' Guide	Distributor	Telephone	Website	Location	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
			PASSIVE	S								
AVX	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	17850	N/A	0€	N/A	50	2,500+	Y
Bourns	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	15,100	N/A	0€	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,750	N/A	0€	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,450	N/A	0€	N/A	50	2,500+	Y
KEMET	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	23,650	N/A	0€	N/A	50	2,500+	Y
Kemet	RS Components	08457 201201	www.rs-components.com	EU	Y	N/A	£161m	0€	N/A	50+	2,500	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	18700	N/A	0€	N/A	50	2,500+	Y
Ohmite	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	6,550	N/A	0€	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	25,450	N/A	0€	N/A	50	2,500+	Y
Taiyo Yuden	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,100	N/A	0€	N/A	50	2,500+	Y
TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	13,050	N/A	0€	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	11,500	N/A	0€	N/A	50	2,500+	Y
TT Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,050	N/A	0€	N/A	50	2,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	43850	N/A	0€	N/A	50	2,500+	Y
Würth Elektronik	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	6.750	N/A	0€	N/A	50	2.500+	Y
Würth Elektronik	Würth Elektronik	+49 (0) 7942 945 0	www.we-online.com	FU	Ŷ	N/A	N/A	0€	100%	250	4 000	Y
Yanen	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	FII	Y	21 450	N/A	0€	N/A	50	2 500+	Y
						21,150				50	2,500	
				тгош	-c							
			POWER & BAI	TERI	->							
RECOM Power GmbH	Various Distributor	+43 /612 88 325 /00	www.recom-power.com					0€	100%		560	
Sanyo Electronic Industries Co., Ltd.	Sanyo Electronic Industries Co., Ltd.	+81 36699 8080	www.eta.co.jp	JP	N	1,000	€3000k	20€	90%	10	100	
Bel Power Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		600	N/A	0€	N/A	50	2,500+	
CUI Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		2,200	N/A	0€	N/A	50	2,500+	
MEAN WELL	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com			4,400		0€			2,500+	
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		1500	N/A	0€	N/A	50	2,500+	
RECOM	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com			3,150	N/A	0€			2,500+	
TDK-Lambda	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		1,900	N/A	0€	N/A	50	2,500+	
TRACO Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com			4,000		0€			2,500+	
Vicor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		2,300	N/A	0€	N/A		2,500+	
XP Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com			2,200		0€			2,500+	
			SENSOR	S								
ams	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	150	N/A	0€	N/A	50	2,500+	Y
Analog Devices Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	300	N/A	0€	N/A	50	2,500+	Y
Bosch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	25	N/A	0€	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,200	N/A	0€	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	350	N/A	0€	N/A	50	2.500+	Y
NXP	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	300	N/A	0€	N/A	50	2.500+	Y
Sensition	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	FU	Ŷ	80	N/A	0€	N/A	50	2 500+	Y
STMicroelectronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	FU	Ŷ	75	N/A	0€	N/A	50	2 500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	FII	Y	650	N/A	0 €	N/A	50	2,500+	Y
Tevas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	FII	v	850	N/A	0€	N/A	50	2,500+	V
	Houser Liectionics	0047 (0)87 520 402 110	www.mousei.com	LU		0.00	INA	00	IN/A	50	2,500.	_
				VDOA	- JUD							
			SWITCHES & KE	TBUA	KD2							
Apem	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		2,850	N/A	0€	N/A	50	2,500+	
C&K Switches	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU		5,550	N/A	0€	N/A	50	2,500+	
CHERRY	RS Components	08457 201201	www.rs-components.com	ΕÚ		600	N/A	0€	N/A	50+	3,500+	
E-Switch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EÚ		2,350	N/A	0€	N/A	50	2,500+	
EAO	Mouser Electronics	0049 (0)89 520 462 110				1,800		0€			2,500+	

Buyers' Guid	Distributor	Telephone	Website	Location	Franchised Distributor	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Buffer Stock Facility
Honeywell	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	י EU	Y	4,700	N/A	0€	N/A	50	2,500+	Y
NKK Switches	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com			4,000		0€			2,500+	
Omron	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	י EU		4,700	N/A	0€	N/A		2,500+	
Panasonic	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com			550		0€			2,500+	
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	ı EU	Y	1,350	N/A	0€	N/A	50	2,500+	Y
	_	_	TERMIN	AL BLOCKS		-	-	-	-	-	-	
Molex	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	n FII	Y	1 850	N/A	0€	N/A	50	2 500+	Y
Phoenix Contact	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	1 FU	Y	13 550	N/A	0€	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.com	n EU	Y	1,750	N/A	0€	N/A	50	2,500+	Y
									_	_		
			THERMAL M	1ANAGEMI	ENT							
Bergquist Company	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		250	N/A	0€	N/A	50	2,500+	
Delta Electronics	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	/00	N/A	0€	N/A	50	2,500+	Ŷ
ebm-papst	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	1,450	N/A	0€	N/A	50	2,500+	
Materials Direct	Materials Direct	+44 (0)1908 222 211	www.materials-direc	t.com EU	N/A	N/A	£1,000,000	0.6	N/A		2500	Y
Universal Science	Universal Science	+44 (0)1908 222 211	www.universal-science	e.com EU	r N/A	1,450 N/A	£1,000,000	0€ 0€	N/A N/A		55	
			TRANSFORMER	rs & Indu	CTORS							
Bourns	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	4,900	N/A	0€	N/A	50	2,500+	Υ
Coilcraft	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	5,500	N/A	0€	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	1,300	N/A	0€	N/A	50	2,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	6,900	N/A	0€	N/A	50	2,500+	Y
TDK	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	4,050	N/A	0€	N/A	50	2,500+	Y
Visnay Wurth Elektropik	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y V	1,200	N/A	0€ 0€	N/A	50	2,500+	Y V
WULLI ELEKLIOIIIK	Mouser Electronics	0049 (0)69 520 402 11	0 www.mousei.co		1	5,400	IN/A	UE	N/A	50	2,500+	T
			WIRELESS	SOLUTIO	NS							
DIGI	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU			N/A	0€			2,500+	
Espressif	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		30	N/A	0€	N/A	50	2,500+	
Laird Connectivity	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU			N/A	0€	N/A	50	2,500+	
Lantronix	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		25	N/A	0€	N/A	50	2,500+	
Microchip	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		150		0€	N/A		2,500+	
Murata	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		30	N/A	0€	N/A	50	2,500+	
Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		150		0€			2,500+	
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU		20	N/A	0€	N/A	50	2,500+	
u-blox	Mouser Electronics	0049 (0)89 520 462 11	0 www.mouser.co	m EU	Y	10	N/A	0€	N/A	50	2,500+	Y
PCB Buyers'	Guide	vice Provided Boke, Manufacture or Repair)						ume - all, Medium, Large	Jble-sided tti-layer 0/10-20-30	tal PCBs xi / Flexi-Rigid	solescence Solutions	difications totyping
Manufacturer	Telephone	Website ୬.ଞ୍ <i>ବ</i>	Location		Appro	ovals		S del	Po Mu 4-1	He Me	ą	₽ &
Elvia PCB Group	+33 233 763 200 w	ww.gepcb.com M/B	France, Tunisia, China AS	9100, PRI-NADCAF	,ISO-TS1694	9, ESA, UL, ISC	9001, ISO14001	S/M/L	Y 1-30	Y F,F/	R Y	Y Y
Graphic Plc	00441363 774874 ww	w.graphic.plc.uk M	UK/China ASS	100, NADCAP, ISO 9001,/	ISO14001,OHSAS	5 18001, Mil 31032	2,Mil 55110,Mil 50884	S/M/L	N 4-10	Y Y	N	Y Y
Contract Mar	nufacturers Buy	ers' Guide						ployees	imber of Surface Junt Lines A Capacity	ad Free anufacturer	sign Capability	ll Turnkey bles and messing
Manufacturer	Telephone W	ebsite Turnover	Location		Appr	ovals		Ē	BG, Mc		ĔĔ	포한 도
Alan Anderson Manufacturing Ltd	d +44 (0) 333 322 7222 www.aa	-manufacturing.co.uk £21m	Hertfordshire UK	I	509001:201	5, IPC-A-610		40	2 Y	Y	Y Y	Y Y

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