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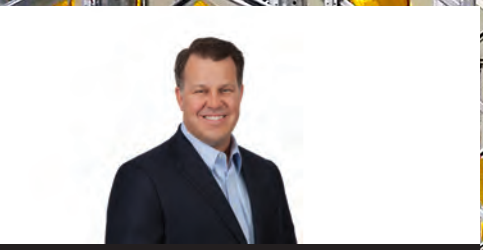

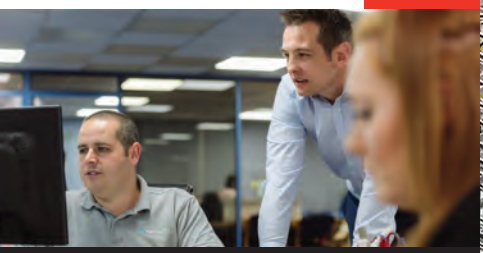

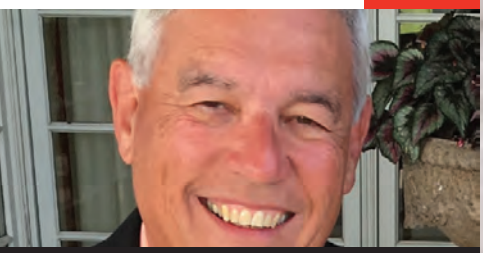

IT'S NOT JUST SEMICONDUCTORS THAT ARE IN SHORT SUPPLY

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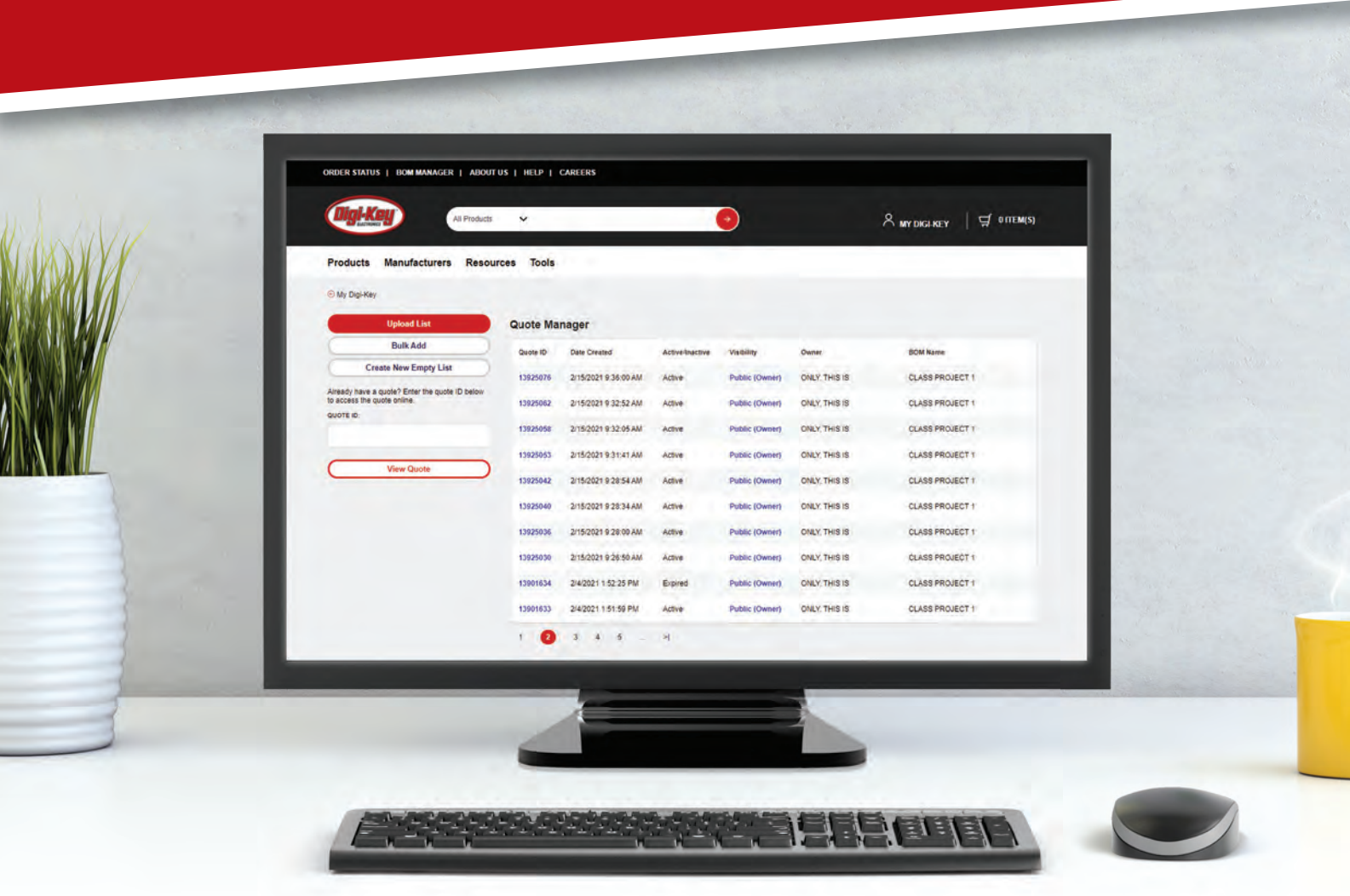

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Editor's Word

What next JIT

I'm no JIT expert but I appreciate that reducing work-in-progress is a sensible goal. However, I've watched JIT in action in some very expensive manufacturing environments and two questions always niggle at the back of my mind.

Firstly, every component in an assembly will have its own individual manufacturing profile. Some will be very quick to make (small pressings etc) while others will take much longer (hand assembled interconnects etc). So, unless one hundred per cent of the disparity is accommodated via production capacity, someone, somewhere in the supply chain is going to have to hold stock.

Secondly, is it really feasible to build a JIT infrastructure that can accommodate every conceivable unexpected event? I guess it is, provided someone, somewhere, holds stock.

From my own perspective, there was never a better time for JIT than the last 30-years. The steady expansion of globalisation, unlimited labour, increasing automation, reducing border controls, stable governments, improving transport infrastructure, digital communications/commerce. Everything favoured the expansion and refinement of JIT.

However, things are changing. All of the above, apart from digital communications/commerce, is being impacted by events beyond any individual's control. From new diseases closing borders, decarbonisation increasing transport costs or shifting politics reducing access to cheaper labour, everything JIT relies on is changing.

There must come a point where the cost of chasing ever tighter JIT becomes more expensive than holding stock. My guess is that the next 30-years will see a strong focus on improving the efficiency of holding and moving industrial stock, just like the consumer sector is doing right now.

Jon Barrett

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ES News

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www.electronics-sourcing.com

Reduced component count

Mouser Electronics is now stocking Analog Devices' ADAQ4003 µModule data acquisition solution. Using system-in-package technology, the device reduces the development cycle by transferring component selection, optimization and layout from the designer to the device.

The component combines a low-noise, fully differential analog-to-digital converter driver; stable reference buffer; and a high-speed 18-bit, 2 MSPS successive approximation register ADC. It also incorporates Analog Devices' iPassives technology, supplying passive components with superior matching and drift characteristics, to minimize temperature dependent error sources.

Supplied in a 7 by 7mm BGA package, it can save up to 75 per cent board space compared with multi-component equivalent solutions, enabling smaller-form-factor instruments without sacrificing performance.

With the integration of multiple common signal-processing and conditioning blocks into a single device, the ADAQ4003 reduces end system component count along with development cycle time for systems such as automatic test equipment, machine automation, process controls, medical instrumentation and digital control loops.

www.mouser.com

Opting out of defense

In a new IPC industry survey and report, 24 per cent of electronic manufacturers say the costs and burdens of compliance with the Cybersecurity Maturity Model Certification (CMMC) may force them out of the US Department of Defense's (DoD) supply chain.

IPC president and CEO, John Mitchell, said: "Cybersecurity is a must for US national security, but the costs and burdens of achieving CMMC compliance under the current approach will likely force many small and medium-sized manufacturers out of the DoD supply chain, negatively impacting national security. The objectives of CMMC are well-intentioned, but they must not be achieved at the expense of other key aspects of supply chain health."

Most suppliers expect and are willing to spend upwards of $50,000 on CMMC readiness, and nearly one-third report that it will take them one to two years to prepare to undergo CMMC assessment. However, more than half of the suppliers say implementation costs of more than $100,000 would make CMMC readiness too expensive. DoD's own cost analysis estimated the cost of a CMMC Maturity Level 3 (ML3) certification to be more than $118,000 in the first year. This means DoD's own estimate of CMMC compliance costs is too high for 77 per cent of the IPC survey respondents.

www.ipc.org

High reliability connectors available across Europe

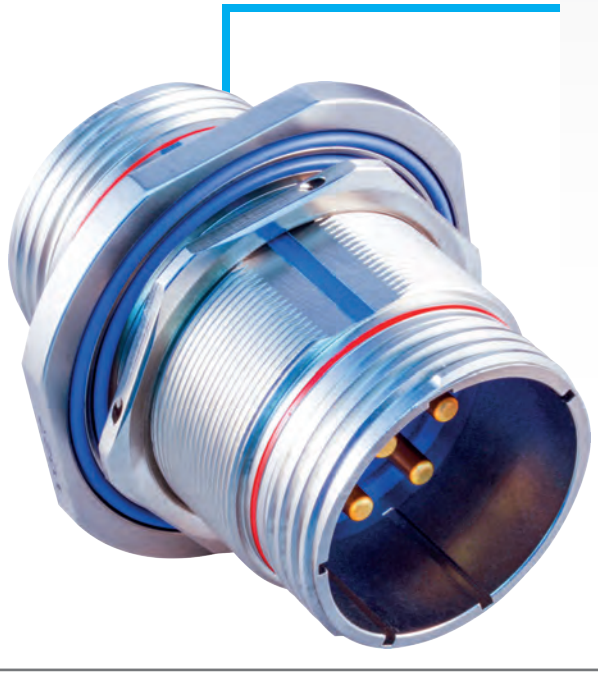
Glenair's high reliability glass-sealed hermetic connectors are available in Europe via Powell Electronics. They resolve gas, moisture and particle ingress problems and feature superior pressure resistance to >32,000psi. The devices suit harsh environment air-tight-seal applications such as submarines, satellites, underground applications, vacuum chambers, laboratory equipment and commercial/military aircraft.

The connectors benefit from: high resistance to extreme operating temperatures from -180 to 260°C; excellent mechanical strength; and no material breakdown or aging over time.

All hermetic connectors are 100 per cent tested prior to shipment. A helium leak test is performed to certify the hermetic seal. This test is conducted by inducing a 1atm vacuum on one side of the connector. Helium gas is released on the other side and a mass spectrometer counts the number of helium molecules that penetrate the connector seal.

Glass-sealed hermetic connectors are manufactured by Glenair in the United States and Italy for all Mil and EN-standard designs and for custom designs.

www.powell.com



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The more (API), the merrier

Platforms like CalcuQuote or BOM Connector offer basic data structure to customer procurement departments and prepare the field for direct APIs, thinks Avnet's Brian Wilken

AVNET EMEA'S VICE-PRESIDENT DIGITAL, BRIAN WILKEN

Once Avnet EMEA's data were live on BOM Connector last fall, enquiries from customers to connect went through the roof. Interestingly, the enquiry hype with one platform increased the appetite to connect Avnet EMEA and its business units through other, similarly popular platforms as well. As freshly announced in June 2021, the API connection to CalcuQuote has now been established and is ready to use.

CalcuQuote, based in Dallas/Tx, optimizes electronic components quoting and sourcing by taking into consideration the unique needs of each electronics manufacturing services (EMS) project. Avnet's customers have the ability to tailor their quotes with very granular specifications for speed, price, package, excess and much more. There is no IT overhead to get started, the software is easy to use.

CalcuQuote's platform provides Avnet pricing and delivery information, puts them through its configurable price function and delivers an optimal purchasing/packaging scenario—taking account factors specific to the project, such as delivery dates, production levels, and 'surplus' purchasing. The results are stored into a powerful SQL backend database and can easily be reused for similar projects or by other users in the company. Thus, the nemesis of all procurement—quoting—finds a time-optimized resolution.

Why two platforms, you may ask? Why only two, I would ask you back. Customers make choices and as a distributor and service provider, we mirror these choices to support and receive opportunities that in the past may have never shown themselves. What's more, the risk of 'death by a thousand quotes' can be greatly reduced and will enable both customers and us to spend time on many other mission-critical touch points in our relationship.

Ultimately, APIs—regardless if via platforms or directly to customers—provide the right answer to the complex task of mass data management at a high integrity and low error-rate level, without a huge investment in connectivity.

Arguably, the last six months have been a bit rough for the global electronics supply chain. And it doesn't look like the availability problems and their side effects will be over any time soon. Neither APIs nor procurement platforms can reduce or eliminate massive market swings, but they certainly can help build a more stable and efficient planning process.

www.avnet.com

N ES News

In Brief

Dedicated start-up solutions
Digi-Key has launched a microsite and help manual dedicated to startups. The site leverages resources, tools and knowledge Digi-Key has amassed in working with thousands of startups. The *Startups Survival Guide* manual is the second edition leveraging Digi-Key's partnership with *Startups Magazine*. Both resources follow the 10-step journey, from ideation and prototyping through production and support.
www.digikey.com

New sensor showroom
Following 12-months construction time, Leuze put its new international distribution centre into operation in Unterlenningen. It features a floor pallet warehouse, high bay warehouse and automatic small-parts warehouse. The small parts warehouse was designed as a two aisle shuttle warehouse, with 38 levels and five Gebhardt StoreBiter one level shuttles (OLS) in each aisle.
www.leuze.com

MMIC ready to ship
Digi-Key has signed a global distribution partnership with Mini-Circuits to offer its MMIC product line up of 50GHz, LTCC filters, baluns, couplers and patented reflectionless filters. Mini-Circuits products are used in commercial, industrial and military applications including cellular wireless, aerospace, satellite, mil-spec, CATV/broadband, RFID, test instrumentation and diagnostic imaging.
www.digikey.com

High performance and ready-to-use
Panasonic Industry has announced cooperation with Finnish mesh connectivity provider Wirepas, by combining the PAN1780 Bluetooth 5 low energy module with the Wirepas Massive firmware. Panasonic's Pascal Meier said: "The PAN1780 is the perfect vehicle for the ground-breaking Wirepas Massive technology and suits most flexibly our customers' requirements."
www.panasonic.com

Fab capacity on pace to meet surging demand

Semi's 200mm Fab Outlook Report states semiconductor manufacturers worldwide are on track to boost 200mm fab capacity by 950,000 wafers or 17 per cent from 2020 through 2024 to reach a record high of 6.6 million wafers per month. The equipment spending increase reflects, in part, the industry's push to overcome the current chip shortage with 200mm fab utilization continuing at high levels.

Semi president and CEO, Ajit Manocha, said: "The report shows that, during the same period, wafer manufacturers will add 22 new 200mm fabs to help meet growing demand for 5G, automotive and IoT devices that rely on analog, power management and display driver integrated circuits, Mosfets, microcontroller units and sensors."

The report also reveals that foundries will account for more than 50 per cent of fab capacity worldwide this year, followed by analog at 17 per cent and discrete/power at 10 per cent. Regionally, China will lead the world in 200mm capacity with 18 per cent share in 2021, followed by Japan and Taiwan at 16 per cent each.

www.semi.org

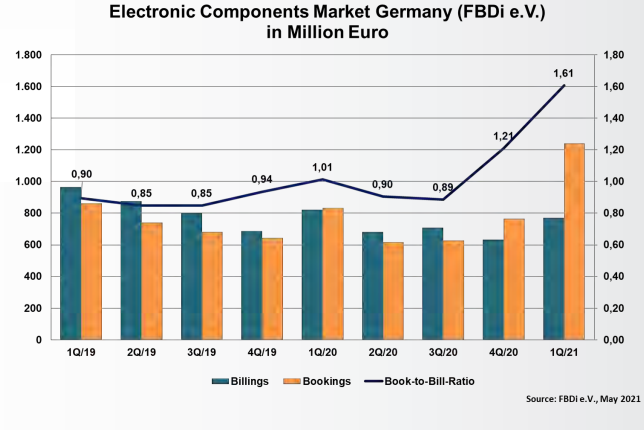
German distribution experiences massive surge

According to FBDi, German components distribution recorded an almost 50 per cent increase in orders in Q1 2021. Sales were still slightly down at -6.1 per cent and component shortages prevented better results.

Passive components, hit hardest in 2020, increased significantly by six per cent to 101 million Euros of sales. Semiconductors saw a decline in some product areas, resulting in an overall minus of -11 per cent and sales of 501 million Euros. Revenue with electromechanics were 2.9 per cent higher at 107 million Euros. Power supplies rose 8.7 per cent to 32 million Euros and assemblies 10.4 per cent to just under 10 million Euros grew comparatively strongly. Displays, sensors and semiconductors remained in the red.

FBDi chairman, Georg Steinberger, said: "Sales development in the semiconductor sector is somewhat disappointing, but in view of a 52 per cent increase in orders to almost 900 million Euros, a rather interesting 2021 is probably ahead, characterized by massive shortages and already foreseeable price increases by the manufacturers. It won't be much different for the other components."

www.fbdi.de



RF system-on-module is production ready

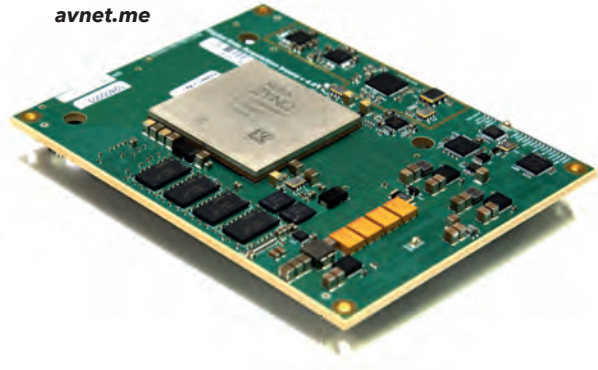
The Avnet designed XRF16 Xilinx RFSoC Gen 3 system-on-module (SoM) is now available for RF applications demanding small footprint, high-speed serial connectivity and real-time processing. The module offers RF direct conversion of signals with analog bandwidth up to 6GHz.

The module can digitize 16 ADC channels at 2.5 giga-samples per second (GSPS) and generate complex (I/Q) waveforms through 16 DAC channels at 9.85 GSPS.

Avnet's vice president of products and emerging technologies, Jim Beneke, said: "Together with Xilinx, we created a production-ready module solution that frees developers to focus on the differentiating features of their products. This is our latest offering designed to accelerate time-to-market allowing developers to more quickly deliver real business value."

Samtec's director of precision RF, Mike Dunne, added: "The XRF16 module and companion carrier card leverage best-in-class RF and signal integrity design techniques to provide high-speed connectivity across the platform."

avnet.me



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Crossing the MLCC supply void

Johanson Technology's vice president, Scott Horton, explains how domestic MLCC manufacturers are ramping capacity to fulfill orders for large format, high Q ceramic capacitors

Industrial, medical and military demand for high quality, high-voltage, multi-layer ceramic capacitors (MLCCs) has been hit hard by the insatiable requirement for smaller, lower voltage—and in some way—lower performance MLCCs fueled by 5G networks, smart phones and mobile devices. OEMs are experiencing delays up to six months, jeopardizing product release schedules, industrial market share and potentially even military readiness.

Due to a slowdown in capacitor demand in 2019, many OEMs and distributors were left holding surplus inventory and were hesitant to order inventory in 2020. As the market ramps up, so does MLCC demand despite low capacitor inventory. This further exacerbates shortages of larger high voltage, high Q MLCCs, since some manufacturers have focused production on smaller/lower voltage devices.

Johanson Technology vice president, Scott Horton, said: "There is a ripple effect to the industrial and military market sector that is not really fully understood. Although a shortage of electronic products used to manufacture smartphones and automobiles would be national news, the lack of larger, higher voltage MLCCs for industrial and military applications are typically under-reported.

However, it will continue to squeeze business customers and eventually end users." Industrial, medical and military consumers of MLCCs depend on high voltage and high-Q capacitors for power supplies, amplifiers, MRI coils, plasma generators, lasers and many other specialized applications.

In higher current circuits, higher-Q MLCCs are preferred to reduce self-heating.

The Q factor represents the efficiency of a capacitor's rate of energy loss. High Q capacitors lose less energy reducing the need to dissipate or cool the heat which protects the board from damage and performance loss in sensitive applications.

Not all MLCCs are created equal, even among the high performance MLCCs, yet ensuring a consistent level of performance is critical for the high reliability applications required by industrial and military end users.

Horton explained: "If an MLCC manufacturer is not tightly controlling the layer count, they might be providing 10-layer batches in one batch and then later deliver 17-layer parts in a subsequent batch. These two parts will not perform the same at high frequencies."

Domestic sources of MLCCs for industrial and military applications have been ramping up capacity. Increased domestic MLCC supply means industrial or military customers need not delay a product's build or shipment.

Drawing on its focus on high-Q and high voltage MLCCs, Johanson, for example, has expanded its capacity to fill some of the supply void caused by the market's shift to smaller capacitors.

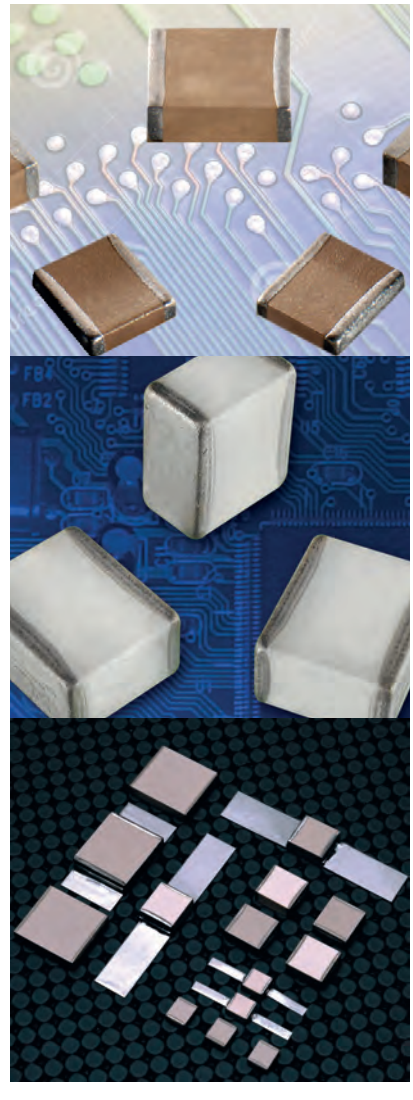
Horton added: "We've been investing in expanding our capacity for several years now through a modernization of our production facility and the opening of a second production line that will essentially double our MLCC output. We can take that even higher with more production shifts."

At the time of writing, Johanson is quoting large size high voltage MLCC order fulfillment times at 10-weeks.

Horton concluded: "There's just no reason to move away from ceramic for your high-voltage, high quality applications. There is now a growing domestic MLCC supply available to meet our domestic needs."

www.johansontechnology.com

Examples of MLCCs



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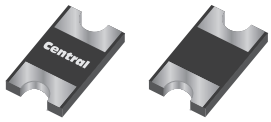

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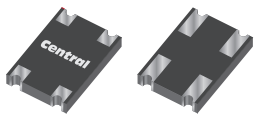

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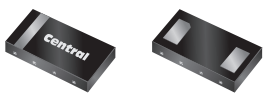
CMJA5050



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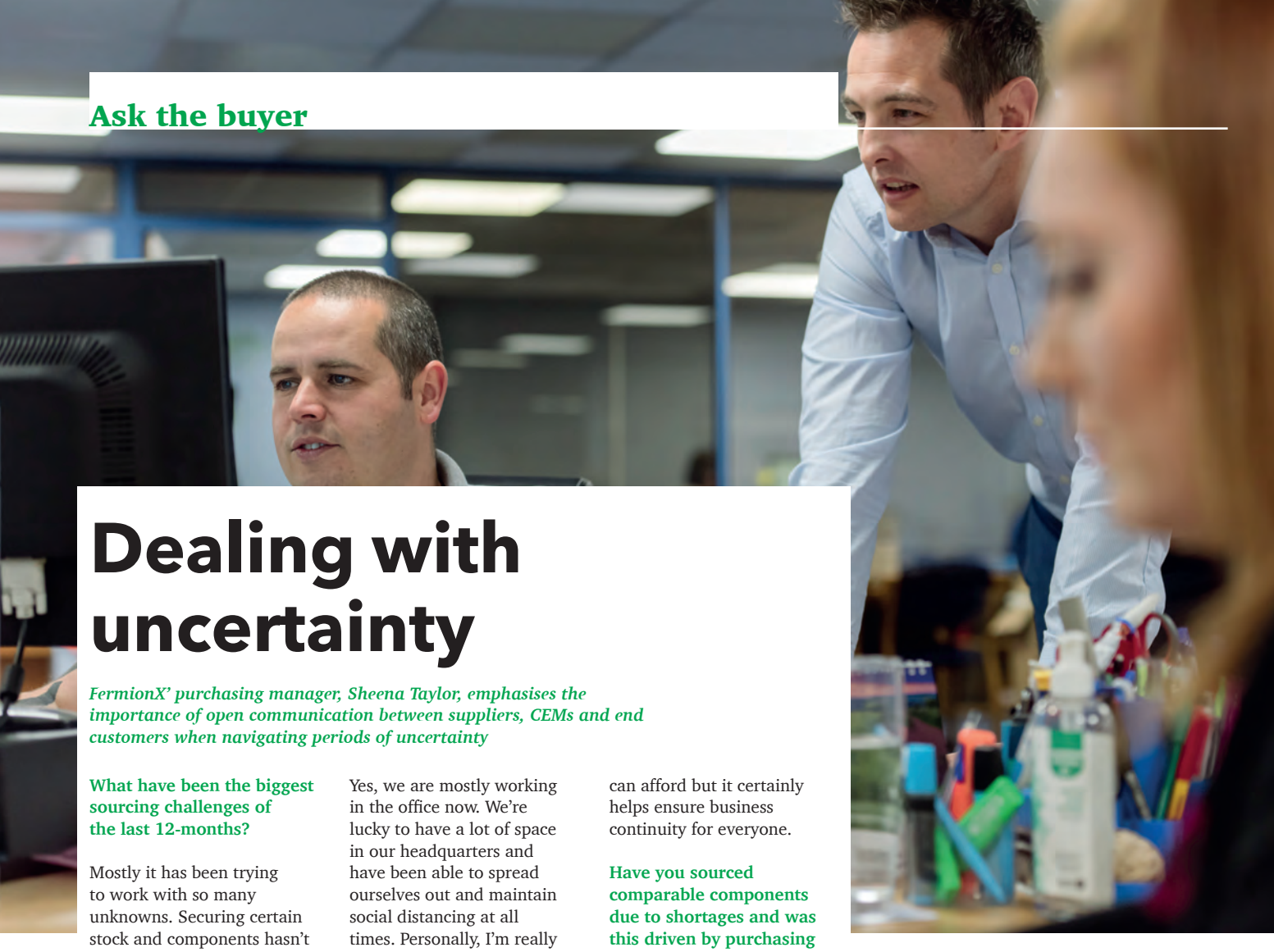

Dealing with uncertainty

FermionX' purchasing manager, Sheena Taylor, emphasises the importance of open communication between suppliers, CEMs and end customers when navigating periods of uncertainty

What have been the biggest sourcing challenges of the last 12-months?

Mostly it has been trying to work with so many unknowns. Securing certain stock and components hasn't been easy, during times of such uncertainty. There are so many factors all having an impact on the supply chain: soft allocation; knock on effects from OEM closures; customs delays; increased freight costs; the list goes on.

Have logistics and haulage costs increased?

Massively. We've seen increases everywhere and on top of this, the delays we've faced have also meant we've had to make changes to our production to maintain business continuity and continue to deliver products to customers on time.

What particular components are experiencing extended lead times?

It's forever changing, we've not really noticed a pattern in specific components. It has been quite random.

Are you and your colleagues working from your facility?

Yes, we are mostly working in the office now. We're lucky to have a lot of space in our headquarters and have been able to spread ourselves out and maintain social distancing at all times. Personally, I'm really enjoying the 'normality' of being back in the office and seeing my colleagues.

What could suppliers do to make your role easier?

Regular communication is vital. Whilst we understand this is a difficult time for everyone and there are so many unknowns, we appreciate the forewarning of potential future issues. This lets us relay information to our customers as soon as we hear. The earlier we know there is an issue the better so we can react and resolve it as soon as possible.

It's a frustrating time for all of us but we've just got to work together and do what we can to support one another.

Customers that have seen the least disruption are the ones that have been more robust in their forward ordering. This helps spread lead time risks through the supply chain. We appreciate this is not a luxury that every customer can afford but it certainly helps ensure business continuity for everyone.

Have you sourced comparable components due to shortages and was this driven by purchasing or engineering?

We do what we can to source suitable components, abiding by 'form, fit and function' where suitable. This is driven a number of ways: the supplier may offer an alternative; our engineering team advises on an alternative; and liaising with the end customer.

What 'bumps in the road' are you expecting over the next 12 to 18-months?

We're not out of the woods yet. It's going to be a tricky year with ongoing issues and further problems down the line. But we're all learning more as we go, securing stock when we can, forecasting further out.

www.fermionx.com/ecs

> **It's a frustrating time for all of us but we've just got to work together and do what we can to support one another**

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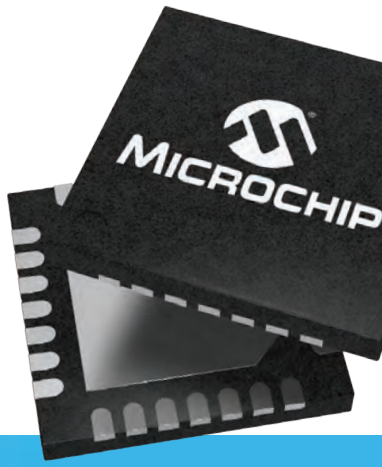

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Exploring global CEM activity

Manufacturing Market Insider's latest research highlights how the global CEM sector is responding to increasing demand across different regions and industry sectors

Manufacturing Market Insider has released its annual MMI Top 50 list of the world's largest CEM providers. In 2020, Top 50 sales accounted for $384 billion in revenue, an increase of $17 billion from 2019. MMI mainly tabulates its ranking information through an annual survey of over 100 of the largest CEM companies worldwide.

Top 50 sales increased from the previous year by 4.6 per cent, largely because the top ten CEM firms dominated industry growth. This included Foxconn, Pegatron, Wistron, Jabil, Flex, BYD Electronics, USI, Sanmina, New Kinpo Group and Celestica with growth rates ranging from -22.1 per cent (Asteelflash) to 31.1 per cent (Katek SE).

Foxconn alone reportedly achieved revenue growth of 5.2 per cent from 2019 to 2020 and accounted for over half the Top Ten revenue. All MMI international currency conversions are based on average annual conversion rates established by the US Federal Reserve.

Overall, the APAC region accounted for around 81.9 per cent of the Top 50 CEM revenue, with the Americas representing 16.2 per cent and EMEA 1.9 per cent. The APAC region achieved the highest growth of 6.0 per cent, while the Americas saw a -0.2 per cent decline and EMEA experienced -3.4 per cent negative growth. This illustrates that the APAC region has been the main beneficiary of communications and computer replacement/upgrades that took place in 2020. The medical equipment market expanded strongly for all three regions, as did EV automotive.

In addition to ranking providers by 2020 sales, the MMI Top 50 listing includes sales growth, previous rank, number of employees, number of plants, facility space, space in low-cost regions, number of SMT lines and customer data. This special data was published in the March 2020 edition of MMI and in April included market segmentation data obtained from the MMI survey.

www.mfgmkt.com

Rank 2020	Company	Headquaters	CEM Sales calendar 2020 (millions USD)	CEM Sales calendar 2019 (millions USD)	CEM 2019 rank	CEM Growth '19-'20 in US$ (%)
1	HonHai Precision (Foxconn)	New Taipei, Taiwan	181,893	172,878	1	5.2%
2	Pegatron	Taipei, Tawian	47,504	44,209	2	7.5%
3	Wistron	Taoyuan, Taiwan	28,868	28,418	5	1.6%
4	Jabil Circuit	St. Petersburg, FL	27,594	26,282	3	5.0%
5	Flex	San Jose, CA	24,578	24,951	4	-1.5%
6	BYD Electronics	Shenzhen, China	10,050	7,676	7	30.9%
7	USI	Shanghai, China	6,972	5,372	10	29.8%
8	Sanmina	San Jose, CA	6,876	7,886	6	-12.8%
9	New Kinpo Group	New Taipei, Taiwan	6,663	6,500	8	2.5%
10	Celestica	Toronto, ON, Canada	5,748	5,888	9	-2.4%
11	Plexus	Neenah, WI				
12	Venture	Singapore				
13	Shenzhen Kaifa	Shenzhen, China				
14	Benchmark Electronics	Scottsdale, AZ				
15	Zollner	Zandt, Germany				
16	Fabrinet	Grand Cayman, Cayman Islands				
17	SIIX Corp.	Osaka, Japan				
18	UMC	Saitama, Japan				
19	Kimball Electronics	Jasper, IN				
20	Integrated Micro-Electronics, Inc.	Laguna, Philippines				
21	Sumitronics	Tokyo, Japan				
22	ATA IMS Berhad	Johor Bahru, Malaysia				
23	Kaga Electronics	Tokyo, Japan				
24	VTech Communications	Hong Kong				
25	NEO Tech	Fremont, CA				
26	V.S. Industry Berhad	Senai, Malaysia				
27	Global Brands Mfg.	New Taipei City, Taiwan				
28	Asteelflash	Neuilly, France				
29	Pan International	Taipei, Tawian				
30	Scanfil	Sievi, Finland				
31	3CEMS Group	Taipei City, Taiwan				
32	VIDEOTON	Székesfehérvár, Hungary				
33	Creation Technologies	Burnaby, BC Canada				
34	Katolec	Japan				
35	TT electronics	Rogerstone, Wales, UK				
36	Enics AG	Zurich, Switzerland				
37	Neways Electronics	Son, The Netherlands				
38	DBG	Huizhou, China				
39	Shenzhen Zowee Tech	Shenzhen, China				
40	SKP Resources	Batu Pahat, Malaysia				
41	Katek SE	Munich, Germany				
42	Integrated Micro-Electronics, Inc.	Bangkadi, Pathumthani, Thailand				
43	Key Tronic	Spokane Valley, WA				
44	WKK Technology	Hong Kong				
45	Computime	Hong Kong				
46	Hana Microelectronics	Bangkok, Thailand				
47	GPV Group	Aars, Denmark				
48	Kitron	Billingstad, Norway				
49	Wong's Intl Holding, Ltd.	Hong Kong				
50	Ducommun, Inc.	Santa Ana, California				

TFT displays as kit solution

Distec has been appointed official distributor for robust, industrial TFT displays manufactured by KOE. The displays suit extreme operating conditions such as automation, industry 4.0, digital signage, public transport, agriculture and construction.

Distec's product manager components, Leonhard Spiegl, said: "These high-quality TFT displays can be perfectly controlled with our self-developed, robust Prisma TFT controllers. For easy operation, we therefore offer complete plug and play kit solutions with all necessary accessories. The long availability of the displays fits perfectly into our concept, which prioritizes customer satisfaction and high product quality."

TFT displays in KOE's Rugged series resist vibration and shock. An operating temperature range from -40 to 85°C allows operation in extreme cold or heat. In addition, the displays are designed to offer high brightness and a wide viewing angle with IPS technology for perfect readability in bright ambient light and when viewed from the side.

www.distec.de

Smart touch displays in compact format

Display Visions' uniTFTs series features a range of small touch displays which offer switch or control units the operating convenience of a tablet. With integrated graphics controller, graphics functions and numerous interfaces, the displays are ready-to-run without additional peripherals.

The smallest variant has a resolution of 320 by 240px on its 2.0in screen diagonal. Other sizes are 2.8in (320 by 240), 3.5in (480 by 320) and 4.3in (480 by 272).

These colour displays use improved IPS-panels with All Angle Color Stability (AACS) technology. The company states contrast and colours are retained even at extreme viewing angles and, unlike commonly used TN-panels, these displays do not have an inverse tilt effect. With typical 1,000cd/m² and more brightness, the displays offer rich contrast and are clearly readable in direct sunlight. All screens are equipped with an optically bonded, capacitive touch surface. This allows direct and intuitive interaction even with multiple gestures.

www.lcd-module.com

Unmasking workplace and company culture

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 wonders what post pandemic workplaces will look like given all the data squarely points to hybrid

Workplace • By John Denslinger

A careful look at a CDC demographic shows 62 per cent of the US adult population received at least one vaccine dose as of May 2021 and 50 per cent are now fully vaccinated. CDC guidance suggests vaccinated Americans can forego masks and social distancing: the two biggest impediments to everyday person-to-person interaction. As one would expect, the news generated swift policy changes across the country from state governments to business. America is open again.

Given the steady pace of vaccinations, business leaders must now orchestrate the post Covid employee workplace. Will it be a return to the old-school workplace circa 2019? Will it be a continuation of the 2020 new-school thinking: remote forever? Or will it be a hybrid? If hybrid, who, why, where, when, what conditions, and for how long are the likely questions employees will ask. For executives, the decision is extremely consequential to talent retention, morale, flexibility, inclusivity and bottom-line productivity. Good or bad, it will define the company and its culture.

So here are the numbers to digest. According to a March 2021 KPMG article, 45 per cent of CEOs do not expect 'normal' to occur until late 2022. Surprisingly only 30 per cent are considering hybrid working models with most requiring two to three workdays in the office. But the Genie is out of the bottle. Employees may resist if pushed too aggressively to return. Another survey by Gallup reports seven in ten white-collar workers are still working remotely. Forty per cent would like to continue working from home because they prefer it, while another 11 per cent would opt to stay remote citing Covid anxiety.

To be fair, management has legitimate concerns about productivity, worker motivation, spontaneous creativity, employee development, worker dedication and keeping teams engaged in a remote environment. Additionally, how does the company fairly assess and retain its talent pool, safeguard its data and circumvent potential cybersecurity threats? From the employee's perspective, what about long-term isolation from peers, lack of stimulation, a feeling of invisibility to management, timely tech support, and perceived response indifference. Caregiving responsibilities only serve to complicate matters.

The post Covid workplace model will not be an easy decision for any company. Misjudging employee sentiment could be a disaster. A May 2021 survey by Ernst & Young revealed 90 per cent of employees wanted work rule and workplace flexibility as to when and where they work. More than half said they would consider quitting their jobs absent this flexibility. Also, many workers made life-defining choices during the pandemic: where to live. That stat seems confirmed by Accenture plc who found 83 per cent of workers viewed the hybrid workplace as optimal. If not permitted to work remotely, retaining these employees will be problematic.

Office, remote or hybrid? All the data squarely points to hybrid, but that's not the end of the story. The new workplace must still assure the organization can deliver on its mission. While each company promotes a unique culture, the successful ones typically expound the virtues and value of agility, innovation, respect and customer focus. If employees can work from anywhere, achieve assigned goals, realize their own potential, be available when/where needed, and deliver on company values, then the hybrid model works for the long term.

Standalone enclosures offer cost savings

Rittal encourages buyers not to overlook the benefits of standalone products when compared with baying enclosures

Baying enclosures are frequently employed for freestanding applications but are not always the best approach. Rittal states the advantages of standalone products such as its VX SE represents a best-of-both-worlds solution midway between AX compact enclosures and the VX25 baying portfolio. Benefits include quicker time-to-delivery, faster and simpler assembly, greater safety and compatibility with other systems.

Applications for standalone enclosures include compact machinery and equipment and their power distribution and automation components.

Compared with baying enclosures with a frame and removable side panels, a freestanding enclosure has an all-in-one body made from a single piece of steel sheet or stainless. The side panels and roof are solid, so fewer components are required, making ordering and assembly easier and quicker. As the side panels, roof and frame are conductively connected, no additional earthing is required.

With no gaps between side panels, roof and frame, dirt and dust cannot collect. The basic VX SE has an IP55 rating, IK10 impact protection, automatic potential equalisation, high strength and stability (thanks to torsional rigidity), plus 1.5tonne load capacity. For challenging environments, IP66 and NEMA 4/4x protection is available. Integrated gland plates are designed to simplify cabling.

Rittal claims the VX SE, with widths up to 1,800mm, offers panel builders significant potential for savings. It can replace small baying combinations of up to three enclosures and there is then no need for seals, baying accessories, mounting-plate infills or multiple bases/plinths.

To retain the benefits of its baying system regarding interior components, Rittal has made its free-standing enclosure compatible. Panel builders who transition will not have to make major adjustments in terms of engineering, assembly or component installation.

As the base profiles are identical, accessories, such as gland plates and cable clamp rails, can be transferred. VX-wide compatibility for interior components is made possible by adaptor rails. This allows installation of VX25 punched sections, rail systems and partial mounting plates into the VX SE.

www.rittal.com

300mm deep version of Rittal VX SE enclosure

Benefits include quicker time-to-delivery, faster and simpler assembly, greater safety and compatibility with other systems

Navigating supply chain shortages

Digi-Key's director of regional supply chain solutions, Margaret Cunha, explains how the company is helping buyers weather the supply shortage storm

Digi-Key Electronics' director of regional supply chain solutions, **Margaret Cunha**

While the term borders on overuse 'unprecedented' certainly describes the current supply chain shortages of electronic components. Supply chains were beginning to tighten before Covid 19 and the effects of the global pandemic slowed or shuttered production of essential components for days, weeks or even months.

As we see light at the end of the tunnel, industries are beginning to ramp up production and electronic component demand is through the roof. While the 'perfect storm' of supply chain issues rains down, Digi-Key is helping purchasing professionals shore up electronic components and navigate shortages.

In nearly every industry demand for components has rapidly revved up, all at the same time. From automotive and smartphones, to medical and IoT markets, all need increasingly larger numbers of components for finished products.

The following examples highlight the issues. The smartphone market is expected to grow by a compound annual growth rate of 11 per cent from now through 2026. Smartphone manufacturers alone use approximately 1.5 trillion multilayer ceramic capacitors, accounting for 50 per cent of worldwide production.

In the automotive industry, global sales of electric vehicles are estimated to increase more than 30 per cent in 2021 and electric vehicle engines use up to 22,000 MLCCs each.

Gartner reports the IoT market will grow by more than six times from $212 billion in 2018, to $1,319 billion in 2026. IoT devices like smart home thermostats, doorbells, alarm systems, cameras, appliances, fitness equipment and more, need sensors and multiple components to run.

While demand has rapidly increased, supply has been under significant pressure due to the pandemic and a compounding range of challenges as described below.

Staffing capacity has been a common issue for many manufacturing facilities as they adhere to Covid prevention policies including social distancing.

For similar reasons, freight is taking longer to move, across all industries and countries. Fewer available commercial flights and port issues are causing delays in product transfers and receipt of materials, including the Suez Canal debacle in March.

Systemic issues include under-investment in eight-inch fabs, resulting in struggles to ramp up production. Without significant investment in a fab's early stages, the supply chain is impacted for many years. Unfortunately, under-investment in this standard size years ago is causing significant shortages today.

Extreme weather patterns are wreaking havoc on many areas including a drought in Taiwan which is forcing some manufacturers to truck water in, creating delays that could continue into June 2021.

Several major factory fires have impacted commodity production, from the Asahi Kasei Micro and Renesas Electronics plant fires in Japan, to the Panjit International factory fire in Taiwan. All these factories were critical in producing specific oscillators, semiconductors and chips, and could take several months to resume full operations.

Suppliers are doing their best to overcome these challenges and keep up with demand, working around the clock to get components where they're needed around the world. As with most storm clouds, there are silver linings. While increased demand puts pressure on suppliers, it is a positive sign of recovery. Many distributors, including Digi-Key, predicted this sharp spike in demand. They proactively invested in significant inventory, while working closely with suppliers to expedite orders to ensure enough product is on hand to help customers weather the storm now and into the future.

Working with global distributors like Digi-Key assures customers they will likely find what they need among 11.8 million available products, including 2.6 million in-stock parts from over 1,700 manufacturers.

digikey.com

Understanding EMC markets

Kemtron's chairman, David Wall, walks readers through the past, present and future of the EMC sector

How has the EMC, RFI and EMI sector evolved over recent years and what is the impact for purchasers?

The last 10-years has seen little change in traditional EMI shielding products such as knitted wire mesh gasket strip and conductive fabric over foam. However, as higher frequencies become the norm, performance materials such as electrically conductive elastomers are becoming more popular. A decade ago, EMI shielding up to 18GHz represented the upper end of requirements but 40GHz is now common, with 5G possibly going higher. Higher frequencies, coupled with the electrification and automation of things, has made EMC more important to ensure equipment works in harmony.

What EMC compliance solutions are available when a product is at R&D stage?

Kemtron always recommends customers discuss their EMI/RFI shielding needs early in the design stage so its engineering team can offer the best shielding advice for the application. Kemtron's web site shows the product ranges on offer however, there can be many variations on a theme. The skill is knowing which questions to ask to direct customers to the best, cost-effective product for their application. Fifty per cent of Kemtron's manufacturing is bespoke to ensure it fully meets customers' needs.

What shielding sectors are showing growth?

The pandemic has seen a reduction in commercial aerospace markets but defence and other traditional markets remain buoyant. Dramatic growth was seen in medical markets initially for the ventilator business which quickly levelled off, but medical diagnostics is still growing for obvious reasons. Organic growth is taking place in developing industries such as 5G infrastructure and Industry 4.0, the ongoing automation of traditional manufacturing and industrial practices. Other growth areas are within renewable energy and the electrification of the automotive industry which includes charging infrastructure and vehicle EMI mitigation.

How will EMC solutions advance in coming years?

Electrically conductive elastomers, now known as performance materials, are where most advances are being made. These products are silicones and fluorosilicones heavily loaded with electrically conductive particles. The most popular being silver plated aluminium and nickel coated graphite. Kemtron is launching a range of nickel plated aluminium filled silicones and fluorosilicones which offer excellent shielding effectiveness while also addressing the problem of galvanic compatibility with the gasket mating surfaces. The company's research and development department is also working on graphene and carbon nanotube loaded polymers to exploit their superior electrical and thermal characteristics. 3D printing of flexible electrically conductive polymers is an area being actively developed to enable production of complex soft flexible electrically conductive components.

kemtron.de

Kemtron's chairman, **David Wall**

> **Performance materials such as electrically conductive elastomers are becoming more popular**

Simplify your BoM process

Mouser Electronics' Mark Patrick explains how the company's intelligent FORTE tool is helping purchasing professionals ease the task of building bills-of-materials

As a product design heads towards completion and becomes production-ready, the chore of creating the bill-of-materials (BoM) takes hold. A crucial part of any new product development—and the key to unlocking future profits—creating the BoM demands diligence. BoMs may potentially include thousands of components, each with individual part numbers, challenging purchasing professionals with an arduous task of obtaining pricing and availability information.

Churning through each component becomes a repetitive task beset with part number and code challenges. For example, parts flagged as 'no longer suitable for new designs' require purchasing professionals to go back to engineering to check alternative part numbers. Even simple part code errors introduced when creating the BoM can take ages to rectify.

So, what can buyers do? Mouser Electronics suggests saving time, improving order accuracy and increasing purchasing confidence with its FORTE intelligent BoM tool.

FORTE removes the uncertainty of specifying and purchasing semiconductors and electronic components. To save time, buyers can upload their BoMs from a spreadsheet or CSV file or cut-and-paste it from another document. Designed to offer a clean, easy-to-understand interface, FORTE enables adding, amending and deleting parts and checking price breaks for multiple quantities without committing to changing the BoM.

Intelligent part number capabilities can analyse partial part numbers and part descriptions to check for correct part numbers and suggest alternative components. FORTE accesses Mouser's online database of millions of orderable part numbers to recommend alternatives that reduce product lifecycle risks. FORTE is free to use and no subscription is required.

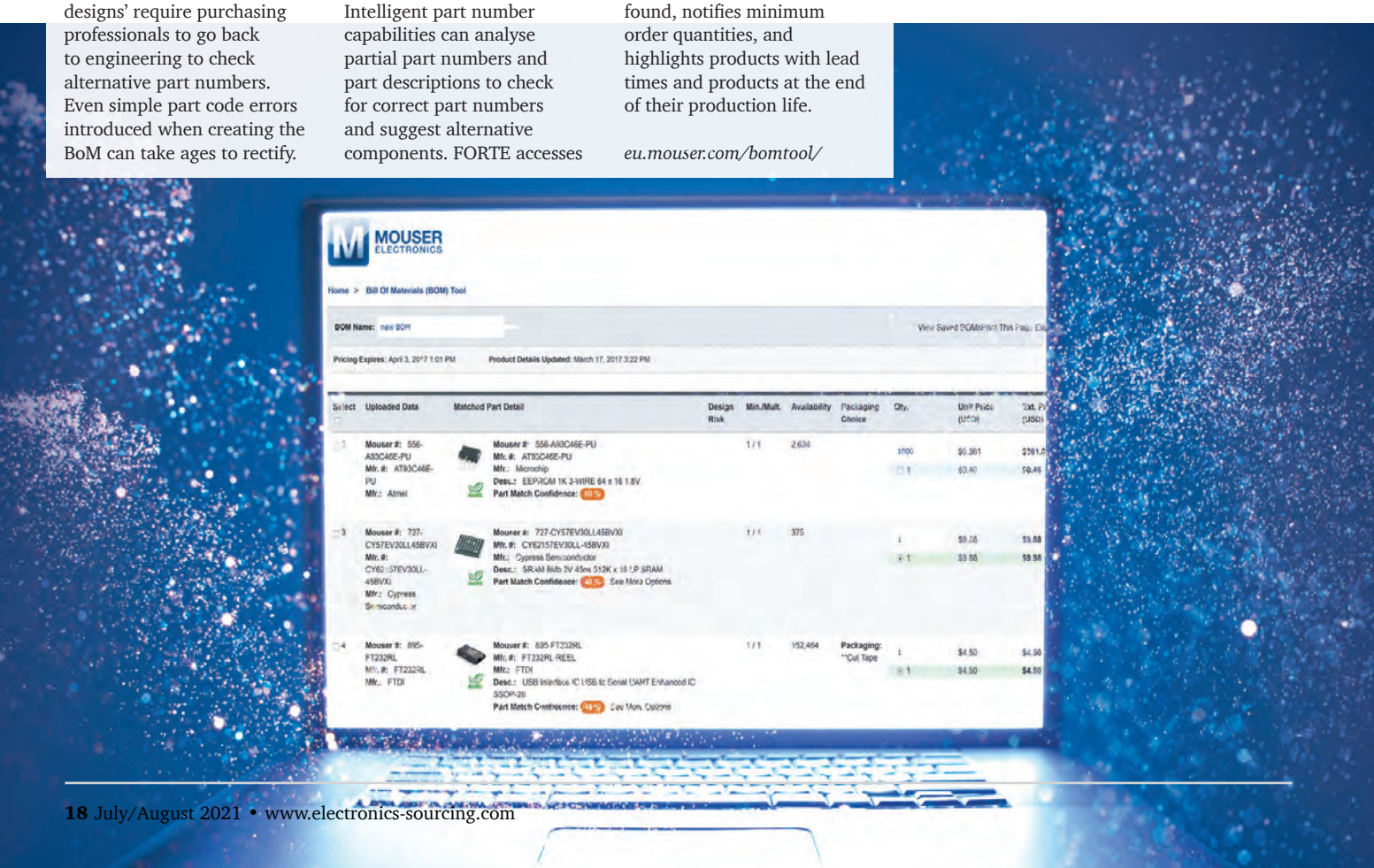
To try FORTE's intelligent and time-saving features, just log into your My Mouser account. Once logged in, select whether to upload a spreadsheet document in a Microsoft Excel or CSV file format or paste in part numbers or quantities. To start the import process, simply assign each column of your import file to the nominated BoM heading (part number, quantity, etc.). FORTE then processes the file and displays instances where a product match hasn't been found, notifies minimum order quantities, and highlights products with lead times and products at the end of their production life.

eu.mouser.com/bomtool/

FORTE THE INTELLIGENT BOM TOOL

MOUSER ELECTRONICS

Churning through each component becomes a repetitive task beset with part number and code challenges



Identifying products not recommended for new designs

Mouser explains that one of the simplest ways to manage obsolescence is to avoid components classed as 'not recommended for new designs'

In the quickly evolving world of electronic components, Mouser Electronics works hard to identify products not recommended for new designs (NRND). The company identifies end-of-life, obsolete and NRND products to avoid older components making their way into new designs.

Serving purchasing professionals sometimes involves telling customers what not to buy. This way, customers can be confident they're designing with the most advanced, genuine electronics available, and can subscribe to receive product notifications online.

Mouser Electronics' vice president of Americas sales and service, Coby Kleinjan, said: "We work closely with all our manufacturer partners to provide the fastest and easiest access to the industry's newest components. Having the 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."

Identifying product lifecycle and NRND products are two examples of Mouser's commitment to value-added services beyond component supply. The company also suggests component alternatives, including their risk level.

mouser.com

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

> **Serving purchasing professionals sometimes involves telling customers what not to buy**

It's not just semiconductors that are in short supply

Lead times are stretching and prices are rising for passives, connectors and power supplies

It's no secret that electronics purchasers are being challenged by allocations, shortages and long lead times for a variety of semiconductors including microcontrollers, diodes, graphics RAM chips and power semiconductors, among others.

However, while chip shortages seem to be garnering most of the attention, supply is tight and lead times are stretching for many capacitors, resistors, and other passive components, connectors, electromechanical devices and power supplies. Prices are also increasing for many electronic components , ranging from the mid-single digits to 30 per cent.

David Stein, vice president, global supplier management for Digi-Key Electronics, said the "supply situation with passives is tight" with lead times stretching to 35 weeks for some passives. For instance, in March multilayer ceramic capacitor (MLCC) lead times were about 16 to 20 weeks. In early May they moved out to 30 to 35 weeks, he said.

One reason is strong demand from automotive systems manufacturers. "Automotive demand has put a strain on most suppliers to some degree depending on how entrenched a supplier is to the automotive area," he said. Stein added there is also tight supply for thick-film resistors with some suppliers and not so tight with others. "It varies with their engagements with the automotive industry as well," said Stein.

He added there is also tight supply with "a different type of resistors called sense resistors. Those lead times are hovering around the one-year mark," said Stein. "You can blame automotive for that as well."

A sense resistor helps measure the amount of current that is flowing in an electrical system. It senses the current and can moderate the current if necessary if the current is too high.

He said another challenge for buyers is aluminum capacitors because demand is up significantly. "The problem with aluminum caps is that they are pretty heavy so shipping them by air is not an option," according to Stein. "They have been constrained because some of the supply-chain limitations involving ocean freight," he said. Lead times have been extended by 6-10 weeks because of the backlog in the supply chain" relating to ocean freight including a lack of containers and port delays."

Relays are also experiencing extended lead times. Lead times for general-purpose relays are 24-28 weeks. Automotive relays have been extended to the past 12 months to about 35 weeks, said Stein.

Lead times vary by product

Eric Pratt, senior vice president of global marketing for component manufacturer AVX, said one reason for rising lead times is robust demand. Demand for tantalum, ceramic and polymer capacitors "has been very strong and we are projecting demand to remain strong through the balance of the calendar year and probably through the first half of next year," he said.

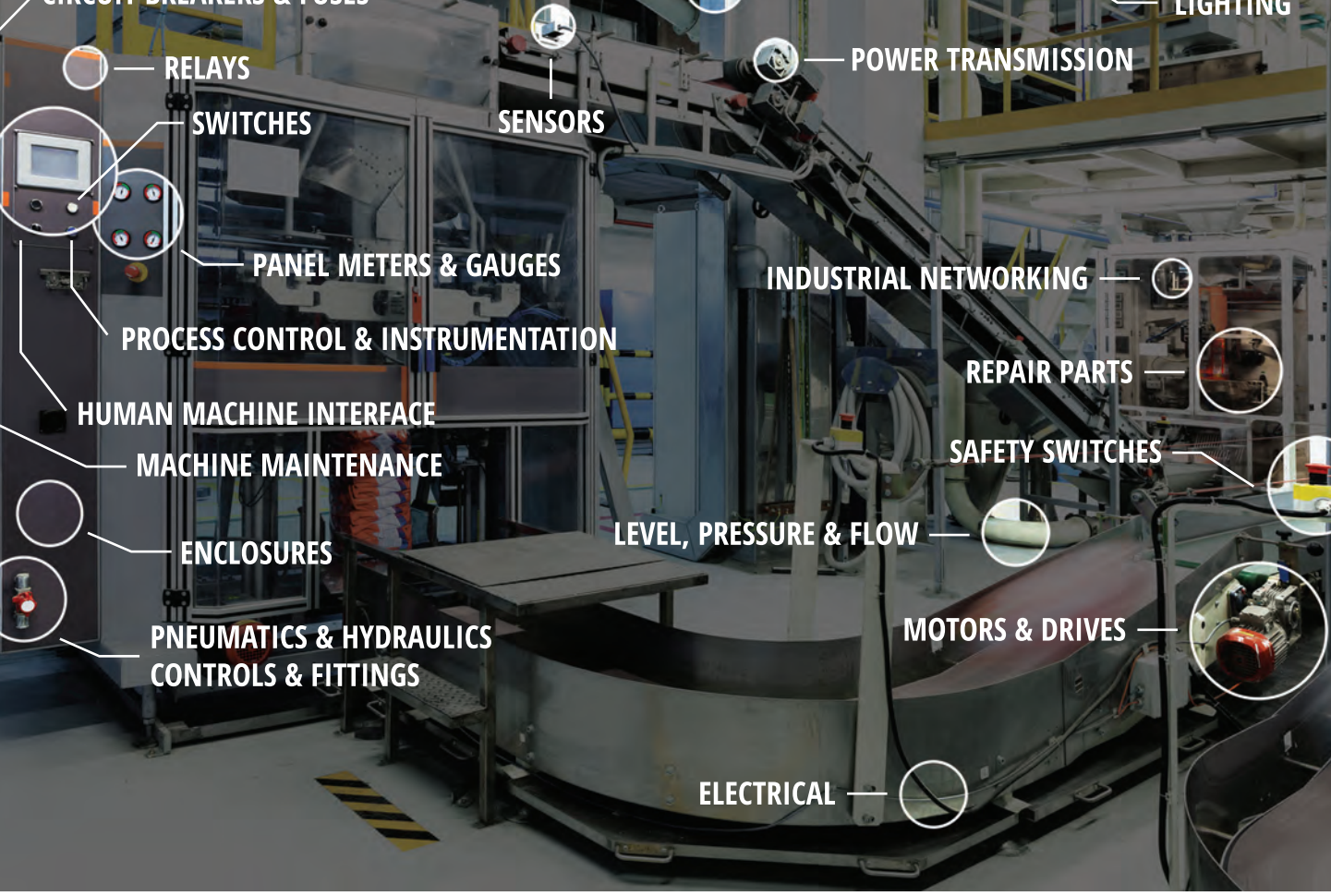
AVX's lead times "vary by product and can vary by a customer or where we have contracts. But our general lead times for passives have gone out 6 to 8 weeks" since the first of the year. Lead times range from 12 weeks to 22 weeks, depending on the product. Normally AVX's lead times would be off the shelf to 2-8 weeks.

"Supply is very tight. Some parts are in shortage situations, including certain mixes of ceramic capacitors, and tantalum capacitors," said Pratt.

While demand for AVX's components is strong, the passive manufacturer's business is being impacted by the semiconductor shortage. "If OEMs are not building boards because of a shortage of semiconductors, they don't need passive components either," said Pratt. However, some electronics manufacturing services providers seem to be very aggressive in trying to secure an inventory position for passives. "A materials manager does not want a build to be held because some lower-cost passive component" was not in stock, he said. AVX's business is also being

We need 30 to 50 different components and you only need one on allocation to sabotage our lead times

Christoph Wolf, president of power supply manufacturer **RECOM's** American business unit



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impacted by tight supply and rising prices for raw materials. Pratt noted that the price of copper has tripled over the last year and the price of palladium has doubled. Prices for rubidium, silver and resins also have increased. "Resins have gone up significantly because of the petroleum industry. With the price of oil increasing that has a direct impact on the price of resin," said Pratt.

Higher material costs mean higher component prices. "When we see materials cost increases we certainly have to react to that," he said. Component prices have increased mid-single digits to 30 per cent due in large part to increased cost in raw materials and logistics costs, according to Pratt. "We don't do opportunistic pricing to the channel," he said. "We have long-term contracts with most of our partners and we honor all those contracts," said Pratt.

AVX is adding capacity which could help to lower lead times and prices eventually. "We have a long-term capacity expansion plan and we are holding to that. We are doing big investments in ceramic caps, tantalum and some other products," said Pratt.

He added AVX has 30 operational facilities. "Almost all of our facilities are now operating very close to 100 per cent" after production slowed or stopped last year because of the pandemic, he said.

Longer waits for power supplies

Long lead times for passives are impacting power supplies. Lead times for power supplies have stretched to about 30 weeks, according to Stein.

Christoph Wolf, president of power supply manufacturer RECOM's Americas business unit, said power supply lead times are stretching because of shortages of some semiconductors and passives used in power supplies. RECOM builds power supplies for industrial, medical and transportation systems.

"There are allocations for many of the components that we need to build our power supplies," said Wolf. "We need 30 to 50 different components and you only need one on allocation to sabotage our lead times." He said logistics is also an issue that is driving lead times. Demand for logistics services is surpassing capacity, which is contributing to longer wait times for parts and to higher prices.

Strong demand is also contributing to longer lead times and higher prices for power supplies and in sales increases for RECOM. Despite the pandemic, which temporarily halted a lot of electronics equipment production last year, RECOM's power supply sales increased 18 percent in 2020 and the company expects to post a 20 per cent increase in revenue in 2021, said Wolf.

RECOM was not the only power supply manufacturer that had robust sales in 2020. Mohan Mankikar, president of power supply research firm Micro-Tech Consultants, said the power supply market did better than expected last year. He said the global switching power supply market had been expected to decline about 1 per cent because of the disruption caused by COVID-19. However, revenue ended up rising about 4.5 per cent for the year. Switching power supplies should grow another 7.5 per cent in 2021, he said. However, there is uncertainty in the market.

Mankikar said the first half of 2021 will likely be strong "but we don't know what's going to happen in the second half. It could be the same as the first half of 2021 but nothing is simple anymore. Business is up and down. There are so many variables," because of the pandemic, he said.

Power supply demand strong

Still, Mankikar forecasts the global switching power supply market will rise to $35.4 billion in 2021 and will post a compound annual growth rate of 5.9 per cent through 2025. Strong demand, however, most likely means lead times will likely remain long for the year for power supplies and components.

"There are many verticals that need components besides automotive, " said Stein. Applications involving 5G, industrial automation, medical, and others all require components and demand for them continues to grow.

Stein said lead times will not get any shorter before the end of this year. If demand continues to grow, "I would not be surprised in a month or two suppliers might use the allocation word and a capacity reservation order will be necessary. It certainly is heading that way," he said.

Longer lead times for connectors

Strong demand is also occurring with connectors. Don Hnatyshin, senior vice president supply chain for connector manufacturer Molex, said connector demand is rising for a range of reasons including cloud and data center expansions, Industry 4.0 requirements, electric vehicle growth, greater adoption of factory automation, and advancements in technology such as artificial intelligence.

Strong demand combined with "force majeures" in the resin supply chain have contributed to long lead times for connectors. Production of resin, which is used in many components, connectors and printed circuit boards, slowed or shut down earlier in the year after a major storm knocked out power in Texas where a lot of resin is produced.

The impact is still being felt. Hnatyshin said lead times for some connectors, such as FAKRA connectors used by the auto industry, have increased byalmost 100 per cent.

We see demand for connectors continuing to increase, especially for 5G and 5G-related systems and device implementation in computers, communications and consumer electronics.

Don Hnatyshin, senior vice president supply chain for connector manufacturer **Molex.**

"Lead times for mini-FAKRA connectors are expected to increase as this technology ramps in automotive," he said. Capacity constraints for custom connectors also will occur without long-term forecasts in place. Lead times for off-the-shelf connectors have increased from 12 to 26 weeks, while lead times for USB connectors now are stable, according to Hnatyshin.

Some of the tight supply of connectors is due to extended lead times from material suppliers, he said. Metals used for contacts and assemblies and resins are in very tight supply. "Due to the February storms in the southern and central parts of the United States, many resin suppliers have applied force majeure contract clauses and are not able to supply materials," said Hnatyshin.

He said many metal and resin suppliers were unprepared for the "quick snap back in demand, particularly in automotive segments" and most are extending their lead times.

Prices increase

He said connector prices are rising because of higher materials and logistics costs. "Copper, gold, zinc, aluminum and other metals, in addition to resins are all at multiyear record highs," said Hnatyshin. Some of the cost has been absorbed by connector manufacturers but some are being passed along to customers.

The same is true with increased freight and logistics costs. "The cost of air freight since the beginning of the pandemic has increased as much as 4X, in some cases," said Hnatyshin. At the same time, overall capacity has been drastically reduced, due to commercial airlines operating fewer transpacific and transatlantic routes. As an alternative, relying on ocean freight has added to lead times in the supply chain that then have been compounded by port backups, he said.

Connector supply will likely remain tight this year due in part to the auto industry, said Hnatyshin. In fact, the largest demand for connectors for Molex will be the auto industry. " Primarily, this is due to the rapid increase in the production of electric vehicles (EVs)," he said. "Electronic content in EVs is considerably higher than combustion engine vehicles and both are getting tailwinds from the growth of autonomous capabilities."

Strong demand from automotive combined with growing demand from other customer segments could mean tight supply and long lead times for several years unless substantial capacity is added.

"We see demand for connectors continuing to increase, especially for 5G and 5G-related systems and device implementation in computers, communications and consumer electronics," said Hnatyshin. " The rollout of 5G technology is gaining momentum at all levels, spanning infrastructure to handsets, he said.

Also contributing to greater connector demand by automotive is the quickening pace of "new product cycle times, which will result in the full-scale transformation of cars and the entire automotive industry," said Hnatyshin This includes everything from electrification, autonomous vehicles, ridesharing, 5G communication and other functions delivered via the cloud, he said.

As these trends accelerate, so does the need for more connectors, resulting in a positive outlook for the connectors market from a long-term perspective, according to Hnatyshin. "We estimate a compound average annual growth rate of greater than 5 per cent percent for the next three-to-five years as the market expands to fulfill continued demand."

Due to the February storms in the southern and central parts of the United States, many resin suppliers have applied force majeure contract clauses and are not able to supply materials

Manufacturer	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
CABLE ASSEMBLY & HARNESSING												
Amphenol	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,000	N/A	0 €	N/A	50	2,500+	Y
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	50	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	600	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,550	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
CIRCUIT PROTECTION												
Bourns	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,800	N/A	0 €	N/A	50	2,500+	Y
EPCOS/TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,950	N/A	0 €	N/A	50	2,500+	Y
Littelfuse	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	11,450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
ENCLOSURES												
Bud Industries	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,600	N/A	0 €	N/A	50	2,500+	Y
Hammond	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,350	N/A	0 €	N/A	50	2,500+	Y
Metcase Enclosures	OKW Enclosures	+44 (0) 1489 583858	www.metcase.com	EU	N/A	288	£40K	0 €	100%	5	22	Y
New Age Enclosures	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	150	N/A	0 €	N/A	50	2,500+	Y
FREQUENCY MANAGEMENT												
ABRACON	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,750	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	150	N/A	0 €	N/A	50	2,500+	Y
ECS	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Epson	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	900	N/A	0 €	N/A	50	2,500+	Y
IQD Frequency Products	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,500	N/A	0 €	N/A	50	2,500+	Y
Kyocera	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	950	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	550	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	500	N/A	0 €	N/A	50	2,500+	Y
TXC Corporation	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	500	N/A	0 €	N/A	50	2,500+	Y
HEATSINKS												
Aavid	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	200	N/A	0 €	N/A	50	2,500+	Y
ICs & SEMICONDUCTORS												
Alliance Memory	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	500	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	18,700	N/A	0 €	N/A	50	2,500+	Y
Broadcom Limited	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	200	N/A	0 €	N/A	50	2,500+	Y
Central Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,250	N/A	0 €	N/A	50	2,500+	Y
Cirrus Logic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	200	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	200	N/A	0 €	N/A	50	2,500+	Y
Diodes Incorporated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	8,200	N/A	0 €	N/A	50	2,500+	Y
FTDI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	100	N/A	0 €	N/A	50	2,500+	Y
Infineon	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	8,300	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,750	N/A	0 €	N/A	50	2,500+	Y
Maxim Integrated	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	14,050	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	24,200	N/A	0 €	N/A	50	2,500+	Y
Micron Technology	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	600	N/A	0 €	N/A	50	2,500+	Y
Monolithic Power Systems (MPS)	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	850	N/A	0 €	N/A	50	2,500+	Y
Nexperia	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	7,600	N/A	0 €	N/A	50	2,500+	Y
Nordic Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	60	N/A	0 €	N/A	50	2,500+	Y
NXP	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,700	N/A	0 €	N/A	50	2,500+	Y

Manufacturer	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
ON Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	18,700	N/A	0 €	N/A	50	2,500+	Y
Power Integrations	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	750	N/A	0 €	N/A	50	2,500+	Y
Qorvo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	700	N/A	0 €	N/A	50	2,500+	Y
Renesas Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
ROHM Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
Semtech	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	350	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
Skyworks	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	550	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	10,050	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	39,050	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	10,850	N/A	0 €	N/A	50	2,500+	Y
Xilinx	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
INTERCONNECTION												
3M	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,750	N/A	0 €	N/A	50	2,500+	Y
Amphenol	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	33,200	N/A	0 €	N/A	50	2,500+	Y
Amphenol	PEI Genesis	+44 8716060	www.peigenesis.com	EU	Y	N/A	£1.3m	10 €	N/A	N/A	85	Y
Cinch Connectivity Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,250	N/A	0 €	N/A	50	2,500+	Y
FCI / Amphenol	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
HARTING	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	6,800	N/A	0 €	N/A	50	2,500+	Y
Harwin	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,950	N/A	0 €	N/A	50	2,500+	Y
Hirose Electric	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	7,850	N/A	0 €	N/A	50	2,500+	Y
Hirose Electric Europe B.V		0031-(0)2 655 7460	www.hirose.com/eu	EU	Y	50,000	N/A	0 €	N/A	N/A	4,190	Y
ITT Cannon	PEI Genesis	+44 8716060	www.peigenesis.com	EU	Y	N/A	£1.3m	10 €	N/A	N/A	85	Y
JAE Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	23,600	N/A	0 €	N/A	50	2,500+	Y
ODU		+49 8631 6156-0	www.odu.de	EU, USA, ASIA			N/A	0 €	N/A	50	1,650	
Phoenix Contact	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	17,150	N/A	0 €	N/A	50	2,500+	Y
Radiall	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
Samtec	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	16,300	N/A	0 €	N/A	50	2,500+	Y
Souriau	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,300	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	41,850	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,650	N/A	0 €	N/A	50	2,500+	Y
OPTO ELECTRONICS												
Broadcom Limited	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
Cree, Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,800	N/A	0 €	N/A	50	2,500+	Y
Intel	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	20	N/A	0 €	N/A	50	2,500+	Y
Osram Opto Semiconductor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Toshiba	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	450	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
PASSIVES												
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

Manufacturer	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
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	EU	Y	N/A	N/A	0 €	100%	250	4,000	Y
Yageo	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	21,450	N/A	0 €	N/A	50	2,500+	Y
POWER & BATTERIES												
RECOM Power GmbH	Various Distributor	+43 7612 88 325 700	www.recom-power.com					0 €	100%	3	560	Y
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	Y
Bel Power Solutions	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	600	N/A	0 €	N/A	50	2,500+	Y
CUI Inc.	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
MEAN WELL	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,400	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1500	N/A	0 €	N/A	50	2,500+	Y
RECOM	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,150	N/A	0 €	N/A	50	2,500+	Y
TDK-Lambda	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,900	N/A	0 €	N/A	50	2,500+	Y
TRACO Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Vicor	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,300	N/A	0 €	N/A	50	2,500+	Y
XP Power	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,200	N/A	0 €	N/A	50	2,500+	Y
SENSORS												
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
Sensirion	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	80	N/A	0 €	N/A	50	2,500+	Y
STMicroelectronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	75	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	650	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	850	N/A	0 €	N/A	50	2,500+	Y
SWITCHES & KEYBOARDS												
Apem	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,850	N/A	0 €	N/A	50	2,500+	Y
C&K Switches	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,550	N/A	0 €	N/A	50	2,500+	Y
CHERRY	RS Components	08457 201201	www.rs-components.com	EU	Y	600	N/A	0 €	N/A	50+	3,500+	Y
E-Switch	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	2,350	N/A	0 €	N/A	50	2,500+	Y
EAO	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,800	N/A	0 €	N/A	50	2,500+	Y
Honeywell	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
NKK Switches	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,000	N/A	0 €	N/A	50	2,500+	Y
Omron	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,700	N/A	0 €	N/A	50	2,500+	Y
Panasonic	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	550	N/A	0 €	N/A	50	2,500+	Y
Rubbertech 2000	Rubbertech 2000	+44 1594 826019	www.rubbertech2000.co.uk	EU	N/A	N/A	£40k	100 €	N/A	N/A	25	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,350	N/A	0 €	N/A	50	2,500+	Y
TERMNINAL BLOCKS												
Molex	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,850	N/A	0 €	N/A	50	2,500+	Y
Phoenix Contact	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	13,550	N/A	0 €	N/A	50	2,500+	Y
TE Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,750	N/A	0 €	N/A	50	2,500+	Y

Buyers' Guide

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THERMAL MANAGEMENT												
Bergquist Company	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	250	N/A	0 €	N/A	50	2,500+	Y
Delta Electronics	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	700	N/A	0 €	N/A	50	2,500+	Y
ebm-papst	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
Sanyo Denki	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,450	N/A	0 €	N/A	50	2,500+	Y
TRANSFORMERS & INDUCTORS												
Bourns	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,900	N/A	0 €	N/A	50	2,500+	Y
Coilcraft	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	5,500	N/A	0 €	N/A	50	2,500+	Y
EPCOS / TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,300	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	6,900	N/A	0 €	N/A	50	2,500+	Y
TDK	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	4,050	N/A	0 €	N/A	50	2,500+	Y
Vishay	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	1,200	N/A	0 €	N/A	50	2,500+	Y
Wurth Elektronik	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	3,400	N/A	0 €	N/A	50	2,500+	Y
WIRELESS SOLUTIONS												
DIGI	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	200	N/A	0 €	N/A	50	2,500+	Y
Espressif	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	30	N/A	0 €	N/A	50	2,500+	Y
Laird Connectivity	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	100	N/A	0 €	N/A	50	2,500+	Y
Lantronix	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	25	N/A	0 €	N/A	50	2,500+	Y
Microchip	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	150	N/A	0 €	N/A	50	2,500+	Y
Murata	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	30	N/A	0 €	N/A	50	2,500+	Y
Silicon Laboratories	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	150	N/A	0 €	N/A	50	2,500+	Y
Texas Instruments	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	20	N/A	0 €	N/A	50	2,500+	Y
u-blox	Mouser Electronics	0049 (0)89 520 462 110	www.mouser.com	EU	Y	10	N/A	0 €	N/A	50	2,500+	Y

PCB Buyers' Guide

Manufacturer	Telephone	Website	Service Provided (i.e Broker, Manufacture &/or Repair)	Location	Approvals	Volume - Small, Medium, Large	Double-sided	Multi-layer 4-10/10-20-30	Metal PCBs	Flexi / Flexi-Rigid	Obsolescence Solutions	Modifications	Prototyping
Elvia PCB Group	+33 233 763 200	www.gepcb.com	M/B	France, Tunisia, China	AS9100, PRI-NADCAP, ISO-TS16949, ESA, UL, ISO9001, ISO14001	S/M/L	Y	1-30	Y	F, F/R	Y	Y	Y
Graphic Plc	00441363 774874	www.graphic.plc.uk	M	UK/China	AS9100, NADCAP, ISO 9001, AISO14001, OHSAS 18001, Mil 31032, Mil 55110, Mil 50884	S/M/L	N	4-10	Y	Y	N	Y	Y

Contract Manufacturers Buyers' Guide

Manufacturer	Telephone	Website	Turnover	Location	Approvals	Employees	Number of Surface Mount Lines	BGA Capacity	Lead Free Manufacturer	Prototyping	Design Capability	Full Turnkey	Cables and Harnessing
AWS Electronics Group	+44 (0)1782 753200	www.awselectronicsgroup.com	£40m	UK & Slovakia	AS9100, ISO9001, 13485, 14001, TS16949, IPC-A-610 Class 3, NADCAP	430	11	Y	Y	Y	Y	Y	Y

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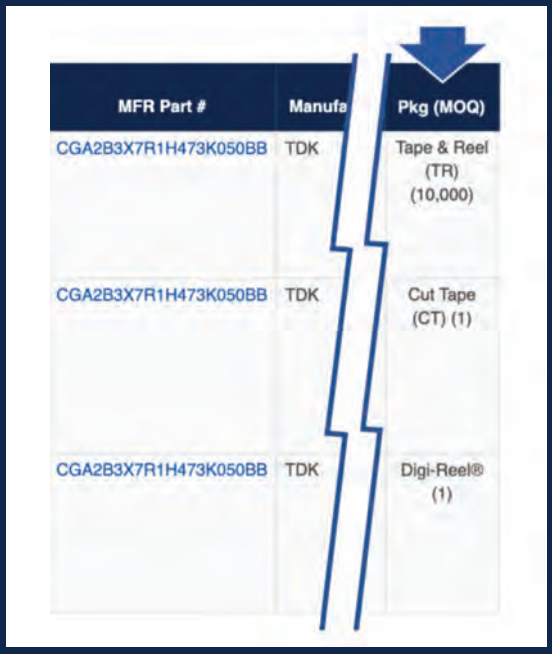

MFR Part #	Manufa	Pkg (MOQ)
CGA2B3X7R1H473K050BB	TDK	Tape & Reel (TR) (10,000)
CGA2B3X7R1H473K050BB	TDK	Cut Tape (CT) (1)
CGA2B3X7R1H473K050BB	TDK	Digi-Reel® (1)

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