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editor's word





Front cover - July_August 2016
Defense & Aerospace page 12

A picture of speed

In the olden days of B2B publishing, electronics magazines were full of diagrams. I like diagrams because I discovered, during a study of myself, that my 'learning style' is primarily pictorial. That said, due to *Electronics Sourcing's* non-technical editorial style, diagrams were never going to be in abundance.

However, if you turn to page 21 of this issue you will see a rather nice process flow diagram showing the steps a product takes from concept to market. Given that this process is predominantly managed by design and development engineers you may ask what is it doing in a purchasing magazine?

My argument for inclusion is simple. I suggest you photocopy the page; hand a copy to everyone in your purchasing team; ask them to circle the process steps where they think purchasing has an input; collate the results in a spreadsheet; and discuss.

I have a nagging feeling that different people will have different views on where purchasing can help. Some will demand to be involved early in the design process, others will argue that designers should be left alone. Naturally every company will have different ideas, depending on the nature of the products they manufacture and the markets they work in.

Once you decide where, when and why purchasing should get involved in the product development process, mark the diagram in red, stick it to the wall, and refresh your memory at least weekly. Purchasing has an important role to play in product development, never forget that.

Jon Barrett

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Simple ways to improve *chain of custody*

Memory Protection Devices' president, Tom Blaha, offer purchasing professionals five steps to strengthen their chain of custody



The media is filled with horror stories involving the electronics manufacturing and distribution supply chain being compromised by counterfeit components and other illegal business practices. Such problems are more likely to occur when there is a weak chain of custody. In an ideal world, the chain of custody is an unbroken path that tracks product integrity from raw materials through manufacturing, quality approvals, logistics and product distribution.

Supply chains are often highly complex, involving as many as 100 steps, which becomes further complicated when it involves outsourcing manufacturing, especially in countries where governmental regulatory control is either very weak or non-existent.

Rigorous standards are now being enforced for handling critical components used in military and aerospace applications. However, for most other industries, companies must either follow trade association recommended standards or self-police themselves in developing and maintaining a proper chain of custody. Here are some recommended practices to consider when evaluating your current policies and procedures.

Step 1: Use a uniform marking system to identify your materials
Develop a marking system to uniquely identify all components. A system that clearly differentiates every step and process from raw material analysis through product manufacturing, quality approvals, final inspections, packaging, and shipping.

Step 2: Standardize your record-keeping and documentation
It is essential for you to maintain detailed records that identify the lot, batch and date of manufacturing. This system will also help you to more easily identify and rectify potential quality problems.

Step 3: Develop and maintain key control points
Continually review all steps to identify control points where quality issues are most likely to arise, then develop specific policies and procedures to monitor control these critical stages.

Step 4: Properly assign individual responsibilities, accountability and authority
Individuals need clearly defined responsibility, authority, and accountability to design and implement an effective chain of custody monitoring system. Clearly defined roles and responsibilities also create strong incentives for career advancement tied to performance.

Step 5: Utilize internal reviews and external audits to ensure full compliance
In the words of former president Ronald Reagan, always 'trust but verify'. Don't simply take people on their word that the proper policies and procedures are being followed. Instead, involve in-house teams and outside experts to randomly verify that proper chain of custody policies and procedures are being followed. These auditing practices can also be used to continuously refine your best practices.

www.memoryprotectiondevices.com



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Disruptive product trends

As the electronic product landscape evolves, so will associated purchasing challenges. WPG Americas' RVP embedded display solutions, Tom Muldowne explains



New technologies outside the traditional electronics landscape have been evolving for decades now and at a lightning pace. Embedded (or single board) computers and flat-panel displays (FPDs) are two of the fastest-growing technologies worldwide. Both are disruptors in their own right: taking leaps into new application segments; opening new revenue streams for manufacturers and distributors; kick-starting innovations; and emerging as key differentiators in the wireless, mobile, sensor, M2M and wearable device markets.

A glimpse of the future

Looking out over the next three years, single board computers and flat-panel display designs in the embedded market will completely outpace growth in the traditional electronic markets of North America.

According to Technavio's report, the global embedded computer market is estimated to grow at a healthy CAGR of over 14 per cent by 2019, where the Americas account for nearly 40 per cent of the market share. When it comes to the global display market, research by Markets and Markets predicts it to hit $155.54 billion by 2020, at an estimated CAGR of six per cent. I have cited just two statistics, but most research reports give us more or less the same picture.

Growth drivers

Thin, lightweight and power-efficient FPDs represent a large and rapidly growing industry worldwide and are expanding into an increasingly diverse set of systems. As a result, most sectors including healthcare, automotive and consumer electronics are bidding goodbye to the traditional CRTs. Plus, the new and emerging demands of design flexibility and shrinking device sizes are more often the reason for the OEMs and ODMs to adopt FPDs as these are requirements CRTs could never meet.

Lower price points, lower power and higher performance processors have given industrial OEMs an opportunity to develop next generation product with off-the-shelf solutions. This has resulted in faster design cycles and time-to-market benefits.

FPDs are also finding homes in these industrial markets. One of the largest application areas lies in the low-cost human interface solutions with touch capacity; these are replacing tradition interfaces such as dials, knobs, and switches for industrial equipment.

Embedded computers and flat-panels are also seeing an up-lift from the Internet of Things and wearable markets. Considering the wide-ranging potentials of IoT within a multitude of different industry sectors, this alone could be the major factor that will drive long-term growth for both of these technologies. For now, organic light-emitting diodes (OLEDs) for wearables and ARM/Intel based boards for less than $100 a unit are currently winning their share of new designs.

Quickly becoming the most important driver of growth in the fast-moving and dynamic global electronic landscape, embedded computers and flat-panel designs will drive production in North America and will be an excellent growth engine in the electronics markets well into 2020.

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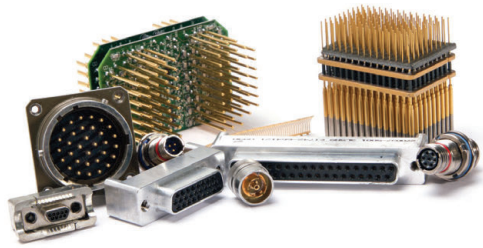
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news

The latest industry news from the North American electronics marketplace



Purchase supports custom, quick-turn demand

PEI-Genesis has enhanced its ability to produce low volume, quick turn, custom connectors by acquiring Arizona-based FilConn, a manufacturer of precision high reliability filter, transient suppression and custom configured connectors for the mil-aero, medical, transit and oil/gas industries. FilConn's ability to produce precision machined parts rapidly is expected to translate time to market into weeks instead of months.

Chief executive officer of PEI-Genesis, Steven Fisher, said: "Our suppliers have a range of standard products, but are not equipped for low volume special orders. Having the ability to do a drawing in 48-hours and to fabricate low volume specials within weeks will be the perfect complement to our existing design and value-add capabilities."

President of FilConn, Mark Pendergrass, added: "The PEI team is passionate about the same things we are creating custom, quick turn, interconnect solutions. By combining our teams, we are able to bring our capabilities to a much larger customer base."

PEI-Genesis will operate FilConn as a separate company, working with FilConn as an authorized supplier partner. It will also continue to support the existing FilConn distributors and rep network.

www.peigenesis.com



Distributor meets rugged defense demands

Astute Electronics has enhanced its line-up of rugged, high density, IP rated connectors by signing a franchise agreement with Lemo, a manufacturer of precision connectors for challenging environments.

Divisional manager, Gary Evans, commented: "Lemo's products will be of great benefit to our customer base. Highlights include the M series, the smallest multi-pin, fully shielded, vibration-secure and sealed connector available. Also the lightweight, high temperature F series targeting the defence, autosport and other harsh markets, and the T series, which is an update of Lemo's B series with a higher contact density and IP68 rating."

Also of interest to Astute's defence business is Lemo's recently announced NiCorAl surface treatment. This specially formulated nickel Teflon finish was developed particularly for the aluminium alloy bodied M series ratchet coupling connector range. Designed to offer a smaller alternative to MIL 38999 connectors, the aluminium bodied M series is tested according to AECTP 300 / MIL-STD-810 / MIL-STD-202 and has passed the 500 hour salt spray test target. The new finish satisfies both RoSH2 and forthcoming REACH 2017 regulations.

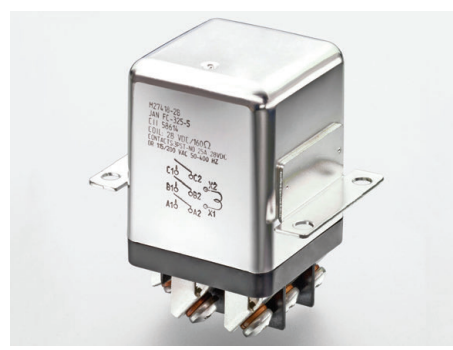
www.astute-inc.com

Mil-spec relays are ready to fly

Interstate Connecting Components, a division of Heilind Mil-Aero, is now stocking TE Connectivity's harsh environment CII FC-325 series relays.

These non-latching relays are constructed with a double make/break contact design for durability. Additional features like hermetic sealing, a corrosion-protected metal can and an all-welded enclosure are claimed to make FC-325 relays more reliable than similar alternatives.

CII FC-325 series relays are qualified to MS27418 and at 25A, accommodate higher current ratings than standard M83536 mid-range versions. Potential applications include launch systems, power distribution, fuel pumps, navigation and weapon systems, aircraft cabins and ground support equipment.



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Overmolding adds value in harsh environments

Connector and cable specialist, CDM Electronics, has added custom overmolded cable assemblies to its value-added services. Designed to withstand demanding environmental conditions in industries such as commercial, industrial, medical, military and agricultural, the overmolding process seals the connector/cable junction to protect against liquids, dust, heat and impact. It can also enhance strain and flex relief, as well as maintaining the integrity of connections in applications requiring repeated mating cycles.

Designed for long life and reliable performance, CDM's overmolded cable assemblies boast 360deg strain relief, electromagnetic and radio frequency interference shielding, optimized pull strength and flexible support at the cable exit. They are available with a variety of interconnects, cables and thermoplastic materials in a range of colors. Common materials include polypropylene, Santropene, polyvinyl chloride, polyethylene, acrylonitrile butadiene styrene and thermoplastic polyurethane.

All cable assemblies are manufactured in CDM's New Jersey facility by J-STD-001 and IPC-620 certified operators. This ISO 9001:2008 and UL listed facility houses a machine shop with computerized injection moulding equipment and a three-axis CNC milling machine.

Prototype, short-run and production quantities are catered for, with pricing and delivery determined by the specification.

www.cdmelectronics.com

More automation and control choice

Allied Electronics has been named as a national distributor for Sick, a manufacturer of sensors, safety systems, machine vision, encoders and automatic identification solutions for factory, logistics and process automation.

Allied product director, Joe Reed, said: "Sick products are a perfect fit for our industrial automation business, significantly strengthening our offering in industrial sensors and safety."

National distribution manager at Sick, Dan Minnich, added: "The combination of the Allied market reach and comprehensive Sick offerings will enable customers in factory, logistics, and process automation to keep their businesses running smoothly and efficiently."

Allied vice president of product management, Frank Cantwell, added: "Allied now provides another sensor option to our automation and control customers."

www.thinkallied.com

Expanded partnership maintains supply

Future Electronics' partnership with Microsemi has strengthened significantly following Microsemi's announcement to narrow its global distributor partners.

The distributor's field sales team will work closely with all customers to ensure their continuity of supply is maintained. Future will also support new design opportunities in all market segments through its field engineering organization, which includes system-on-chip, FPGA and networking specialists.

Executive vice president for Future Electronics, Dan Casey, said: "As a global distributor with a robust infrastructure, we are ready to support customers to the fullest. Microsemi is a leading edge supplier which continues to make smart financial investments as it expands its technology portfolio."

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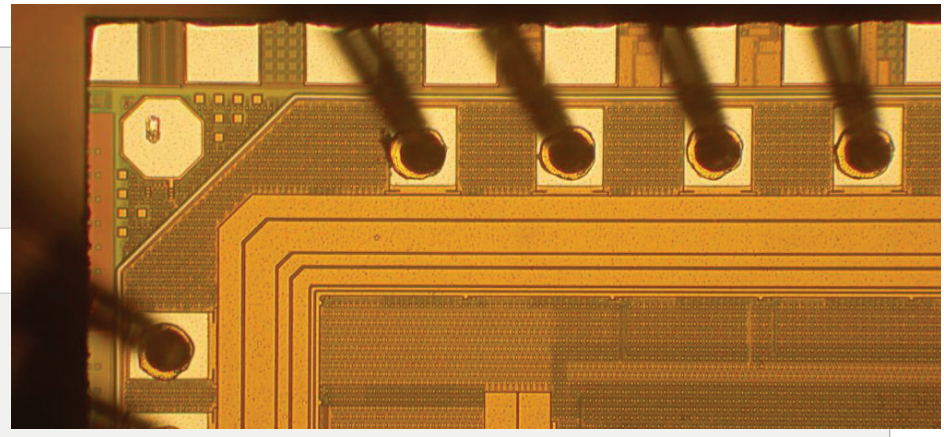
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As application risk increases, components will require additional testing

Risk control is the key to confidence

Counterfeiting continues to be one of the biggest threats to the electronic component supply chain. In order to abolish counterfeit parts, industry must control e-waste, improve material traceability and ensure expectations flow down to all levels of the supply chain. To reduce their risk, individual companies should use original component manufacturers and authorized sources whenever possible. They should also use risk-based methods to determine additional test and inspection for those parts that do not come from trusted sources.

Using a risk-based model throughout all phases in the procurement process should take into account the probability of receiving a counterfeit electronic part, the probability that inspection or test will detect a counterfeit part, and the consequences of a counterfeit part being used?

Supplier risk
Following the SAE's AS5553 standard is a great starting point. It encourages original equipment manufacturers and contract manufacturers to streamline purchasing practices and tighten supplier requirements. It emphasizes the importance of original component manufacturer or authorized distribution purchases, as well as thoroughly qualifying any open-market vendors.

OEM and CM electronics buyers should have a small number of independent distributors on their trusted sources list, but they need to use caution and limit their number of approved open market suppliers. Choose IDs with in-house labs which can provide inspection and testing to help authenticate material.

Component risk
Protection against obsolescence and parts shortages starts during design and qualification. For a mature product, however, component risk involves researching the lifecycle and market conditions of the components used. Stay current with product change and end-of-life notices by communicating with original component manufacturers, vendors, or independent data providers. These sources provide information about availability and potential part cross referencing.

If you have exhausted all traceable sources of material and need to procure from the open market, follow industry standard guidance. The minimum level of testing required for open market purchases generally includes parameters outlined in IDEA-STD-1010B, AS6081, and/or CCAP-101.

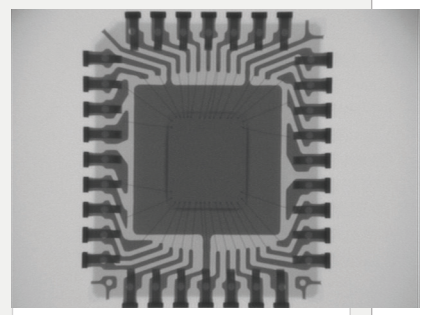
Recently, x-ray and die examination have become particularly important, in light of sophisticated counterfeits such as clone devices. Clones are redesigned exact copies of an original device and since they're newly manufactured, they pass traditional surface and marking tests. Most will pass basic electrical testing, so the best hope is utilizing image databases of known-good die and x-ray images, or performing full functional electrical testing across a range of specified temperatures. Independent distributors and test labs have been preparing for this and can help.

Application risk
End-use or application risk determines the potential consequences of counterfeit electronic parts being installed. This can compromise safety and operational effectiveness, potentially causing human injury, mission failure, reduced reliability and product recalls. As application risk increases, components will require additional testing. Electrical testing, confocal scanning acoustic microscopy and scanning electron microscopy can all aid component authentication or demonstrate reliability.

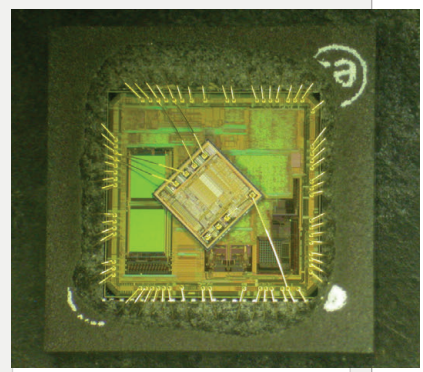
By implementing these strategies, procurement professionals provide crucial support towards ensuring component quality and reducing the risks associated with counterfeiting.

www.4starelectronics.com

Counterfeit risks must be assessed and controlled at every level of the supply chain—use trusted vendors, determine application risks, and inspect and test accordingly, suggests 4 Star Electronics



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James Carbone
contributing editor

Distributor value-added services still matter

Services such as IC programming, tape and reeling, kitting and cable assembly are not exciting, but they remain a key part of distributors' value proposition to OEMs and EMS providers. *By James Carbone*

Electronics distributors have been providing OEMs and electronics manufacturing services (EMS) providers with value-added (VA) services for almost as long as they have been selling semiconductors and other components.

As a result, VA services are often taken for granted by distribution customers. OEMs and EMS providers expect distributors to provide such services as IC programming, kitting and cable assembly among others. Distributors know if they stop providing such services they would lose component sales.

"Customers need those services and they will find a way to get them," said Alan Bird, president Americas for Arrow Electronics. "If we said 'hey we are getting out of programming' they (customers) would find someone to do it which would be one of our competitors," he said.

VA services have been a key part of distribution's business model and distributors have enhanced and expanded their services offerings to OEM and EMS customers over the years. In the 1980s and 1990s, VA services often involved modification of parts such as wire, cable and connector assembly, battery packs, kitting, parts labeling and tape and reeling. IC programming then became an important service for distributors as well as vendor managed inventory type services such as auto replenishment, bonded and consigned inventory and in plant stores.

Some distributors also began helping customers manage end-of-life parts and last time buys as well as assisting them manage risks in their supply chains.

Such value added services are integral to OEMs and EMS providers and remain in high demand, according to distributors.

Growing VA demand

Dave Doherty, president and chief operating officer for Digi-Key, said demand for value-added services involving the altering of parts or customizing the number of parts on a reel is growing.

Demand for reels of parts with a relatively small number of components is growing, he said. Digi-Key takes components from a part manufacturer's reel and puts them on another reel with the exact number of components that a customer has ordered.

Much of Digi-Key's business is selling parts to customers for new product introduction (NPI) or small production runs. Such customers require a smaller number of parts than large OEMs or EMS providers that need higher quantities of parts for large-volume production.

"MOQ (minimum order quantity) quantities are a necessity for component manufactures to produce optimum lots, often 5,000 parts per reel," said Doherty. "But a customer may just want 776 parts, not 5,000. They don't want to waste parts and that's a perfect match for our model," said Doherty.

He added that demand is also strong for other physical value-added services such as cable assemblies and IC programming.

Doherty said some customers may buy a ribbon cable and connector and it could be an opportunity for Digi-Key to provide a service to the customer. "If we see a customer buying some type of ribbon cable and connector maybe we should be prompting them" to use Digi-Key for cable assembly.

"We can ask them if we can help you by putting together ribbon cable and connector, would that be a value to you?"

Doherty said Digi-Key has a dedicated value-added services



"We still have a lot of customers that require value-added, whether it is re-reeling the parts, lead bending, solder re-dipping, kitting, parts relabeling," said Alan Bird, president Americas for Arrow Electronics



America II is offering customers component failure analysis as a value-added service, said Brian Ellison president of the distributor

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area at its facility and when an order comes in requiring a value-added service, the parts are picked and sent to that area for assembly. The majority of the VA assemblies will be shipped the same day the order comes in, according to Doherty.

He said customers ordering small quantities of parts for design or small production runs appreciate timeliness. "With small lots or NPI it is not about cost, it is about speed. "From that aspect, I think we have a distinct advantage," he said.

Providing bread-and-butter services
Of course Digi-Key isn't the only distributor that provides tape and reeling and other traditional value added services for OEMs and EMS providers.

"We still have a lot of customers that require value-added, whether it is re-reeling the parts, lead bending, solder re-dipping, kitting, parts relabeling," said Bird. "There's still a lot of that bread-and-butter value-added services that are in demand especially in the Americas."

However, VA has changed a little as needs of customers changed, he said. One example is IC programming. Arrow has been programming chips for years, but in recent years IP security has grown as an issue in the industry.

"If an OEM has designed and is manufacturing a product and part of its intellectual property is in programming, there is a high concern" about where that programming information goes, said Bird.

"I can tell you that a lot of customers are doing audits and reviews around how we ensure the customer's IP is secure in Arrow's facility. They definitely don't want that being given out or hacked," said Bird.



Future Electronics has "network of partners, whether you're looking at LCD integration or programming services," said Karim Yasmine, corporate vice president for Future



Demand for value-added services involving the altering of parts or customizing the number of parts on a reel is growing, said Dave Doherty, president and chief operating officer for Digi-Key

Some distributors provide some services in house and use third-party services providers for other services. For instance, Future Electronics has "network of partners, whether you're looking at LCD integration or programming services," said Karim Yasmine, corporate vice president for Future Electronics. He said Future also uses third party providers for other services such as cable assembly, tape and reeling and parts labeling too. Future does LED lighting value-added integration in house, he said. "Whatever the value-added service customers are looking for, we can support it," said Yasmine.

Analyzing faulty parts
While cable assembly and IC programming are traditional value-added services, at least one distributor offers a less traditional service. America II, based in St. Petersburg, Fla., has begun providing failure analysis services for components that fail in the field, said Brian Ellison, president of America II.

America II has historically been an independent distributor, but it is adding franchise lines and now is an authorized distributor for 70 product lines.

Ellison said there is a need for customers to find out what caused a part to fail on the circuit board. Buyers sometimes purchase parts from independent distributors. Many component manufacturers will not provide information about a component when there is a problem if the part was not purchased directly from the component manufacturer or from manufacturers' authorized distributors.

Ellison cited an instance when one of America II's customers, who had been purchasing a component from America II for eight years, suddenly started to have problems with the part. It failed a number of times in the field.

The component was genuine and could be traced back to its original manufacturer. The customer needed to find out why the part was failing, but the component manufacturer would not provide any information about the part.

America II hired a failure analysis firm to investigate and a factory level failure analysis found that there had been an engineering change order on the part. It had been using gold traces, but then switched to copper and copper was degrading in the field causing intermittent shorts.

"I was able to give the customer that information and that is a value-added service," said Ellison. "It is different than tape and reeling and all the other services we do."

He said America II was going to be "marketing more towards the factory level failure analysis support and design services. "Value-added has taken on a new identity."

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The legislation put forth in the 2012 and 2013 National Defense Authorization Acts (NDAA) has gradually solidified into law

Anti-counterfeiting: semantics matter

TTI's vice president of total quality, Kevin Sink, shows that attention to detail is vital in the fight against counterfeiting

The legislation put forth in the 2012 and 2013 National Defense Authorization Acts (NDAA) has gradually solidified into law resulting in the Defense Federal Acquisition Regulation Supplement (DFARS) which is now considered the standard for counterfeit prevention. While these measures have reduced the risk of counterfeit parts flooding the supply chain, the specific terminology in the published DFAR regulations have caused confusion and misinterpretation because they lack some common industry terminology.

To address this and other concerns, there is a current revision in process. However, the proposed revision introduces the term 'authorized dealer' to refer to the parties with which OEMs must work to prevent counterfeiting. Unfortunately, 'dealer' is not a common term within our industry and therefore makes the definition ambiguous. In the case of a regulatory documentation, semantics really do matter.

Another issue with the 'authorized dealer' term is that nearly any player in the industry can produce documentation that deems them authorized in some manner and OEMs don't have a standard to define what qualifies as authorized. With the confusion in the industry, leaders such as ECIA and TTI petitioned for terminology that would more clearly define the authorized provider by using phrases such as 'authorized distributor' in lieu of 'authorized dealer'. This term was introduced in the current open DFAR revision, DFARS 2014-D005 (252.246-7007). The amendment that will officially change this terminology is still under final review.

The other contentious terminology in the DFAR refers to software or firmware installed on components. The terms were likely included to discourage or uncover potential spyware or malware activity against US enterprises by foreign entities. However, given the breadth of functionality and specificity of the



Kevin Sink, TTI Vice President of Total Quality



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manufacturing specs regarding software and firmware, the regulations cause confusion rather than remedy the counterfeit component risk. The current proposal calls for the removal of 'embedded software or firmware' from the definition of 'electronic part'.

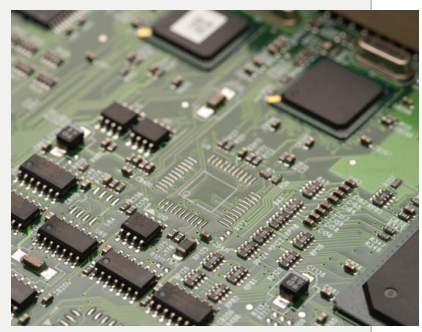
Quality control testing is another area where specificity and standardization are necessary. Because test labs can vary greatly in their services and fees, it was previously difficult for an OEM to understand the extent of testing they were getting. Fortunately, SAE AS6171 provides standardized techniques and requirements. This documentation has leveled the playing field for OEMs that can now use standard practices when sourcing their component testing.

As anti-counterfeit measures are becoming standardized, counterfeiters are also evolving. Some have moved beyond remarking, blacktopping and microblasting wherein used parts are altered and sold as new, to actually manufacturing their own counterfeit components. Due to the short lifecycle of many electronics these days and the expense of manufacturing even sub-quality components, counterfeiters are going after the more expensive parts and that is changing the ballgame for OEMs that frequently source from the open or independent markets.

Another risk in the supply chain is unexpected: the over-reporting of suspected counterfeit parts. While OEMs that place a priority on sourcing only authentic components should keep a keen eye on their supply chain, they should be careful when ascribing a part as counterfeit. There have been cases where an individual has jumped the gun and purported an electronics component counterfeit when it was really a misunderstanding of a simple thing such as a supplier's lot coding. When a flag is raised about a part being counterfeit, it involves many people and reputations are on the line. By the time the issue is resolved, it is likely that damage is already done.

While standardization of terminology is key, the most critical anti-counterfeiting tool for OEMs continues to be traceability. Risk is substantially reduced when you can identify every step in an electronic component's supply chain. Purchasing from the authorized supply chain—the manufacturer and their authorized distributors—makes this process significantly easier for OEMs. The supply chain within authorized distributors is short and includes oversight and contractual requirements to handle, store and ensure traceability of parts. So, even as definitions and regulations help to minimize risk, the industry must continue to think defensively and restrict purchases to the safest channels.

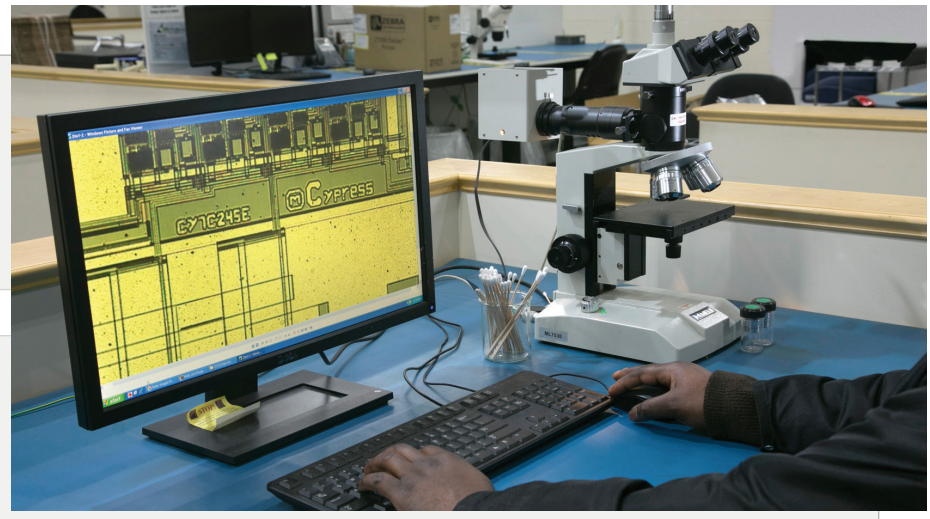
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Die evaluation process

Putting quality first

Everyone is aware of the risks in sourcing obsolete components from the open market. Although counterfeit material continues to affect the aerospace and defense sector, over the last few years the sector has been managing the issue fairly well. Government industry data exchange program reports have decreased, arrests and prosecutions continue and the sources of sub-standard product continue to be exposed. In order for this to continue and to improve, however, safeguards need to be maintained, improved and spread throughout the supply chain. OEMs outside the aerospace and defense sector will need to adapt and more suppliers in the open market will need to put product quality ahead of profits.

How have prime contractors reduced the number of suspect counterfeit items received and/or installed?
These companies implemented counterfeit mitigation procedures throughout their organizations: new positions were created; new inspection techniques implemented; intense supplier evaluations performed; and new sourcing procedures applied. Many of these procedures are documented in the SAE standard AS5553.

What role did suppliers in the broker market play?
Many suppliers underwent intense examination by the primes. Some passed, while others did not live up to the scrutiny. This process put many brokers out of business. Many suppliers began to improve their quality systems and pursue the necessary certifications to properly support the defense and aerospace sector. These include SAE standards such as AS6081 and AS9120.

What steps have been taken in the primes' procurement process?
Most primes have partnered with a select few suppliers for obsolete product procurement. The process for purchasing from a broker has become quite difficult, requiring multiple levels of management approval and all avenues of product substitution and redesign exhausted through component engineering.

What steps have suppliers taken to protect their prime partners?
Most of the few true counterfeit mitigation companies in the broker market have ceased or severely restricted their procurement from geographic areas known for great risk. These companies have put supplier evaluation procedures in place and spend much more time scrutinizing their sources of supply.

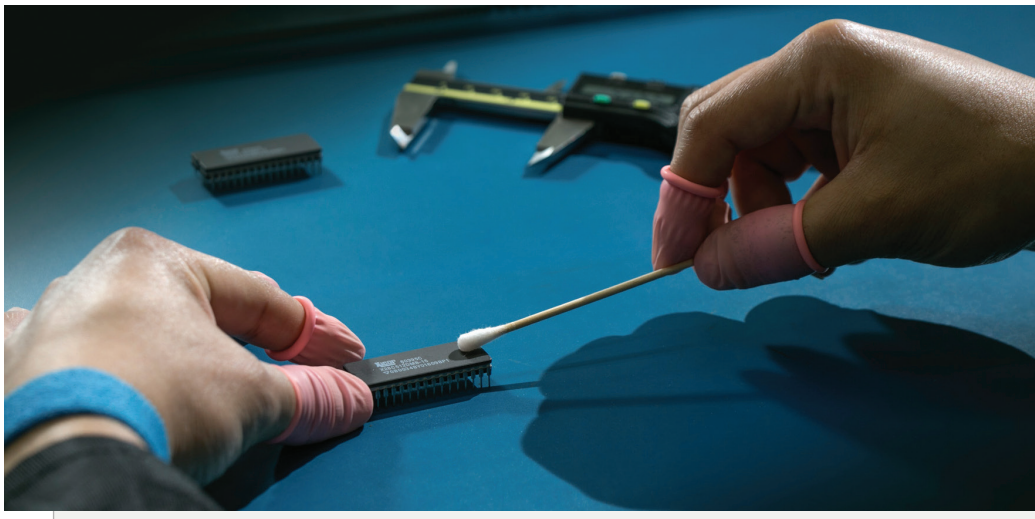
What is the next step for the aerospace and defense sector?
Proactive material management is the best defense. Bill of materials cleansing, end-of-life purchases, redesigns and advanced procurement of obsolete material left in the marketplace based on future use forecasts. These companies will need to establish a partnership with an open market supplier who can assist them with these initiatives.

What services do the open market suppliers/counterfeit mitigation companies provide?
These companies work in many ways: providing guidance on the levels of legitimate product left in the marketplace, BOM and EOL services, engineering services for part substitution and product testing. Excess inventory management and vendor managed inventory programs are also valuable as well as coordination services between the prime and their subcontractors. This ensures that overlaps of material are addressed and procurement of obsolete product is managed correctly.

For counterfeit safeguards to be truly successful, they need to be maintained, improved and spread throughout the supply chain, explains chief operating officer, North Shore Components, John Cronin



Chief operating officer, North Shore Components, John Cronin



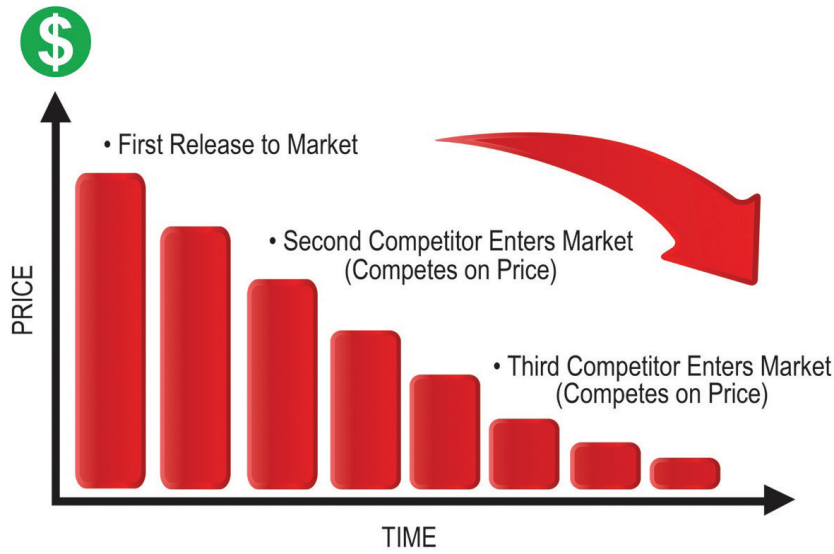
Part marking verification

Is this problem going away?
Simply, no. Product advancements, legacy programs, worldwide component manufacturing and surplus electronic equipment continue to pose a challenge. Fortunately, most companies have reacted aggressively and implemented strong measures to combat these issues. Companies throughout the supply chain will need to continue working together, establishing better processes and being ever cautious of the next potential problem that attempts to disrupt the business.

Overall, the procurement process has become more complicated, but today's supply chain management tools can help manage the situation. The aerospace and defense sector understands the importance of its products and will continue to adapt. The open market too will continue to adapt while consolidating and creating more effective ways to combat the distribution of sub-standard product. Those willing to change always do just fine.

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Price decreases as more competitors are added to the market

Don’t miss the boat on NPI

Just imagine you are one of the mythical unicorns standing on the shore watching Noah and the ark sail away because you arrived late and missed the boat. You don’t know it yet but you are extinct. That’s the effect of being late to the market.

Time to market excellence can represent a successful product launch or one that is doomed to failure. It makes little difference if it is an existing product or service, or one that is new and will change things for years to come.

In 2002, for example, Apple introduced the iPod. It was the first MP3 player to combine a software and hardware solution and it was so revolutionary, it took the competition two years to launch similar competitive products. For those competitors, the time that was lost meant the only thing they could compete on was the one thing businesses like to compete on least—price.

Ultimately, being the first to market allows the potential for higher margins as customers are willing to pay for superior features and benefits. These higher margins allow companies to more quickly recoup research and development costs. This enhances the company’s profit contribution from that product, which can make future R&D costs more readily available to begin the next product or features roll-out, before competition can launch a comparable product.

Initiate early involvement

How does all of this affect the supply chain community? Well, the threat to being first to market begins back at the design stage.

Component suppliers and their broadline distributors may well be eager to ‘win the socket’ and gain a pricing advantage, but unfortunately, in many situations, they may not be so eager to stage inventory for pre-production prototypes, new product introduction, or initial production. In the lifecycle of an idea it is extremely important to know that there is material available in each phase to enable OEMs to achieve time to market success.

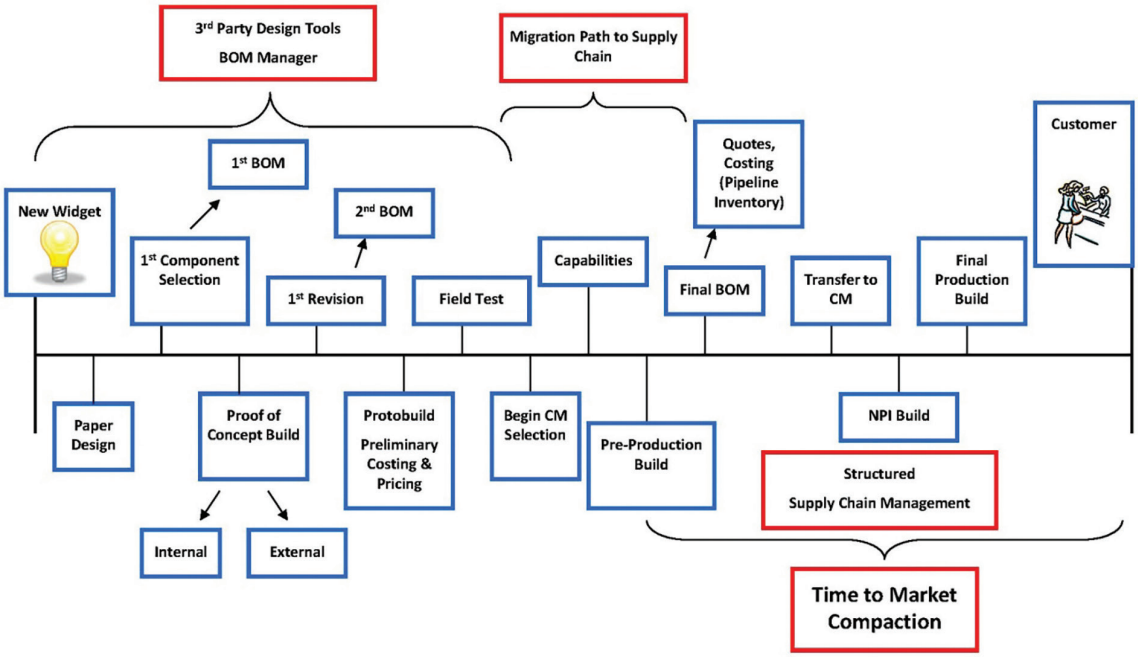
With its broad and deep stocking position and supply chain solutions, Digi-Key aims to enable forward-thinking companies to drive their value proposition to their customers. This ensures a solid foothold in their targeted customer space.

Digi-Key’s information tools and inventory depth make it the norm to begin this relationship at the design stage. Resources such as the BOM Manager and numerous design tools enable a quick start to any design. The ability to provide less than manufacturers’ minimum order quantities from stock gives designers a leg up in the bread boarding and first prototype arena.

What happens next is a key element to a successful product launch. Buyers should consider whether a product will launch when marketing says it will, whether there will be enough inventory in the channel to build the full amount of NPI products needed for launch; and what kind of services their suppliers offer to maximize the impact of the product’s entry to market.

As a company progresses through the lifecycle timeline, stocking distributors like Digi-Key are key partners. They can provide material staging and supply chain management solutions to assist the purchasing community and have materials positioned to be available when required.

Arriving first to market is the key to higher margins. According to vice president, supply chain solutions at Digi-Key Electronics, Steve Vecchiarelli, success depends on appropriate inventory management from the earliest design stages



The process of getting an idea to market involves complex materials management

Assess build options

Today's original equipment manufacturer has multiple build options, whether it's to build product internally or use an electronics manufacturing services provider. Using an EMS provider can add an additional level of complexity to the supply chain, but depending on the expertise and capabilities of the provider, OEMs then have a plethora of choices from quick turn, to prototype, to full service suppliers. The question is: does your supplier have the ability to deliver without having to do the 'place and chase' dance?

OEMs can set the stage at the concept level by involving suppliers early on in the design process. Digi-Key, for example, uses a multi-tool set to have inventory available when needed. A collaboration with the OEM and a service provider, if used, can yield the desired result.

Ensure lifecycle support

Despite being inevitable, variables such as last minute engineering changes, machine time availability, and component lead times can wreak havoc with manufacturing schedules. Digi-Key offers solutions from buffer stock to full-blown time-phased material management.

Buffer stock in the early stages of manufacturing can provide a hedge against early variables. A buffer sets a fixed amount of inventory that can be supplied instantly to an OEM or their service provider. These buffer stocks can be set to replenishment at their original levels to ensure manufacturing during the initial, perhaps unstable, demand phase. They can also be set to deplete to zero as products move to a more stable phase where a time-phased material management program can be employed.

Time-phased material management allows OEMs to share forecasts with their suppliers. This allows a tightly integrated supply chain solution with service providers. More often than not, this is employed until a product reaches some point of maturity, at which point, forecasts and anticipated customer demand can be re-assessed.

Regardless of whether an OEM, or their EMS provider, use a build to stock, or a build to order strategy, it is possible to design an appropriate supply chain program. Digi-Key employs material algorithms to provide stock within lead times, protecting customers against unplanned upsides. This helps alleviate the peaks and valleys of initial manufacturing.

Time to market for any company can set the stage for many prosperous years to come. Alternatively, if not properly planned, it can lead to disaster or playing catchup to other companies. Which path you take is up to you.

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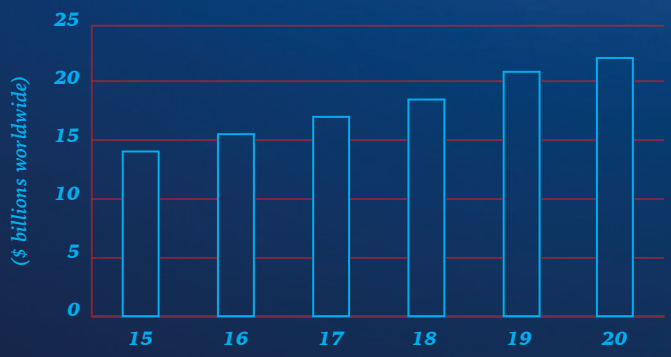


Vice president, supply chain solutions at Digi-Key Electronics, Steve Vecchiarelli

LED market will rise although prices will drop

LED sales revenue and unit shipments will rise at or near double-digit rates for the next five years as the devices are designed into more equipment

By James Carbone



LEDs post robust growth
The worldwide market for light emitting diodes will reach $22.3 billion by 2020
Source: IC Insights

Despite continuing price erosion, the global light emitting diode (LED) market will grow about 9.3 per cent annually through 2020 driven by a wide variety of applications ranging from automotive headlights to lighting in sports stadiums.

LED component makers say LEDs are just beginning to hit their stride in terms of their use in equipment and lighting applications. For most customer segments, "the saturation point for LEDs has not been reached yet and won't be for years," even though demand has been strong, said Rick Hamburger, senior director of product management for Lumileds. "Even in high-volume applications, there is very low penetration for LEDs. It may be less than 30 per cent right now," he said. That, of course, means there is plenty of room for growth.

While LED demand has been robust for years, demand will continue to be strong and sales revenue and unit shipments of LEDs will continue at a double-digit rate, according to LED component manufacturers and market researchers. IC Insights forecasts that the worldwide LED market, including high-brightness and standard LEDs, will rise from $14.3 billion in 2015 to $22.3 billion in 2020. Unit shipments will increase from 176.6 billion to 298.3 billion during that same time period.

High-brightness LEDs account for about 90 per cent of the overall LED market revenue.

LEDs are used in a wide range of systems including cell phones, televisions, computer monitors, traffic lights, electronic signage, vehicles and interior and exterior lighting among others.

Backlighting saturation

The one application where LEDs have reached the saturation point is in backlighting for televisions and computer monitors, which were early adopters of high brightness LEDs.

"Ten years ago one of the things that drove LED growth was backlighting of LCD screens," said Paul Scheidt, leader of product marketing, LED components, for LED manufacturer Cree, Inc.

Back then there was little if any LED adoption in that segment. But since then LEDs have replaced fluorescent tubes in LCD screens. "At this point there are no more fluorescent tubes used (in backlighting). LEDs are now the light source for backlighting. "That of course fueled a huge amount of growth" for the LED industry, he said.

However, because TV and monitor manufacturers all use LEDs for backlighting, LED demand for that segment is dependent on an increase in sales of monitors and televisions. TV-display backlighting sales of LEDs are forecast to grow by an annual rate of just 3 per cent from $2 billion in 2015 to $2.3 billion in 2020, according to IC Insights.

The good news for LED manufacturers is that demand from other customer segments is rising because average selling prices have declined so much that other lighting applications have switched to LEDs from other lighting technologies.

LED tags fall

In 2010 the average LED price was $0.086. In 2015, it had declined to $0.081 and by 2020, the average will be $0.075, according to IC Insights. Prices are higher for high-brightness LEDs and tags are falling at a higher rate for them than for standard LEDs. The average price for high-brightness LEDs is $0.10-$0.12, while a standard LED ASP price is in the $0.02-$0.05 range, the researcher said.

Because prices have declined, LED use is growing in general lighting applications.

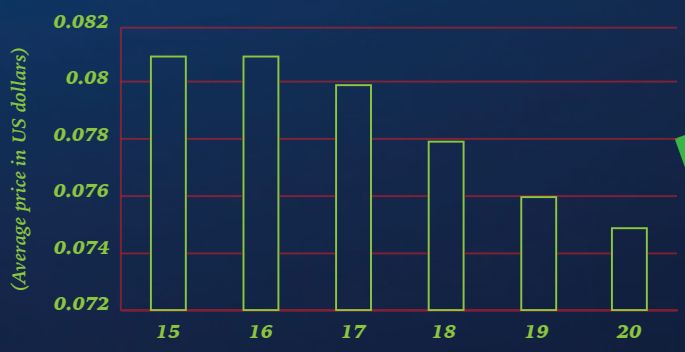
"Ten years ago we would get laughed out of the room if we talked about LEDs for general illumination," because the LED price was too high, said Scheidt. "Now LEDs are quickly becoming the light source of choice for many general illumination applications," he said. As a result, interior lighting LED sales are projected to grow 18 per cent annually to $4.9 billion in 2020 from $2.1 billion in 2015. Exterior lighting LED revenues are forecast to increase by an annual average rate of 11 per cent to $4.1 billion in 2020 from $2.4 billion in 2015, said IC Insights.

One reason that manufacturers have been able to reduce LED prices is they are moving to larger size wafers. With a 4-inch wafer, LED manufacturers were able to produce about 5,000 LEDs, said Rob Lineback, senior market research analyst with IC Insights. Today most manufacturers have moved to 6-inch wafers, and manufacturers can produce about 7,400 LEDs per wafer, he said.

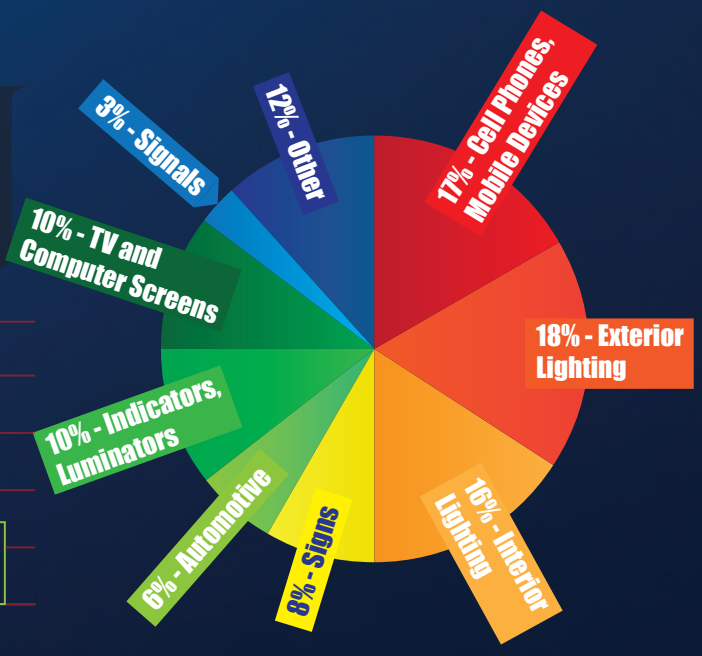
In the future LED manufacturers will transition to 8-inch wafers, which will allow for more cost reductions. Lineback said there have been a number of advances in the deposition of gallium nitride layers for light-emitting diodes on silicon substrates, said Lineback. "GaN-on-silicon promises 8-inch wafers for high-brightness LEDs and lower costs," he said. He added the use of 8-inch wafers is not expected to

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LED tags to fall
LED prices will continue to fall over the next five years
Source: IC Insights



Where LEDs are used
Exterior lighting systems is the single biggest customer segment for light emitting diodes
Source: IC Insights



be needed for several years, but the capability has been developed.

LED manufacturers have also been able to reduce prices by increasing throughput and speeding up the deposition of materials on wafers during production.

Supply glut
Increased LED production in China has also contributed to falling LED prices. "We saw tremendous price drops 2 to 3 years ago when China targeted high brightness LEDs as a strategic product," said Lineback. "The government basically subsidizes a lot of wafer fabs." Increased production in China resulted in a glut of LED products.

"The industry worked off the glut to a certain extent last year and going forward, we don't see a glut like we saw in previous years," said Lineback.

As a result of price declines more equipment and lighting applications are using LEDs. For instance interior lighting in homes and businesses accounted for about 15 per cent of the LED market in 2015. By 2020 that percentage will increase to 22 per cent, according to IC Insights.

LEDs by the Numbers

Source: IC Insights

$22.3 billion
The projected size of the global light emitting diode market in 2020

1.6 per cent
The annual average selling price decline of LEDs from 2015 to 2020

195.2 billion
The number of LEDs that will ship in 2016

$0.081
The average price of an LED in 2016

10 per cent
The rate of growth of the worldwide LED market in 2016

The auto industry is also using more LEDs.

"Automakers are converting to LEDs for the same reason as general illumination," said Hamburger. "They see the value of better performance and more flexibility."

LEDs are enabling the auto industry to do more with lighting than they could with conventional lighting technologies including halogen and incandescent. They are using LEDs as a way to brand their cars, designing in LEDs not just in headlights and signals, but in interior lighting to make the car look more attractive.

Because LED manufacturers have lowered the cost, LEDs have become a lower portion of the bill of materials (BOM) in systems. However, customers are now asking "what can you do with LEDs that help lower the rest of BOM from a thermal standpoint or from the driver standpoint," said Hamburger. "What are you doing to help me lower the total system BOM is what customers ask," he said.

Customers are also pushing manufacturers to improve the overall performance of LEDs.

"They always ask for more lumens per dollar or lumens per watt," but customers also looking for other enhancements, said Hamburger. Depending on the product, customers want LED manufacturers to improve the color quality, the color tuning capabilities and the life of LEDs.

Scheidt said LED performance will improve, "but we are getting to the point where we are reaching the end of our curve. Performance will get better but it will be more incremental improvements," he said.

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Sourcing military specification style connectors has become trickier over the last several months

Are you winning on connector allocation?

Electronic connectors are used in many applications in many industry segments. In the military, defense and aerospace markets, however, the sourcing of military specification style connectors has become quite a bit trickier over the last several months.

In fact, MS type connectors were already interestingly complicated without the additional threat of supply chain disruption due to 'stop shipment' notifications and material shortages. Even before lead times started to move out from about 12 weeks to as many as 26 weeks, the base requirements and fickleness of this connector category could drive a person crazy.

Navigating the spec

Purchasers already had to consider whether suppliers could meet all MS documentation requirements, including international traffic in arms, product part approval process, restriction on hazardous substances, counterfeit avoidance and conflict minerals reporting documentation. They also needed to address whether suppliers could meet documented traceability requirements including, certificate of conformity, certificate of origin, and the provision of lot and date codes to confirm material origin, compliance and age.

Other questions focused on whether the supplier is an original manufacturer or qualified parts list authorized source for MS connectors. Whether to buy direct and wait, or play with fire on fluctuating and erratic delivery dates.

Finally, purchasers may have considered second sourcing a particular product, negotiating the nuances of a connector that engineers and production people have come to love or hate.

Investigate re-engineering

These are just some of the factors to consider when supporting military specification connector needs, which, as you can imagine, means the total cost of ownership is complex and not simply associated with a product's price.

With lead times moving out and material shortages causing disruption, the complex process of sourcing military specification connectors just got even trickier, says president of ECCO Electronic Connector Company, Bernard Gizzi

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For instance, due to the defense industry's decisions to delay project funding, there is a reliance on aging equipment. This has prompted much in the way of product obsolescence support and has created a whole group of companies dedicated to serving this need. When part sourcing looks bleakest, when no one manufactures a given part anymore and it still shows up on the bill of materials, it may be possible to re-engineer it with the help of experienced industry veterans.

As Component Enterprises' Ted Hoffman points out: "The days of flying by the seat of your pants to source a hard-to-find part are gone. Now you need trusted sources with manufacturing and modification capabilities who can back their products with certifications and accreditations."

Specify authorized assembly

Clearly, as sourcing requirements continue to become more stringent, experienced, authorized sources are becoming more valuable to buyers. Not every authorized distributor, however, has the assembly capabilities and controls required to meet qualified parts list standards with OEM oversight and audit support.

To ensure standards are met, the Federal Government, in tandem with the manufacturer, allows this subset of assemblers to put MS connector series together. Series such as 5015, 24308, 26482, 26500, 38999, 81511, and 83723 can be assembled by a qualified group of 'value added' distributors who mark the parts with a 'born on' date and actual part number.

Thanks to their experience in assembling these components, this distributor network is very knowledgeable and can provide a valuable resource whenever supply issues arise.

Given the fickle nature of this product category, it's worth remembering that when supply chain issues occur and there are worries about delivering to production, there may be a manageable solution available through your authorized distributor resource.

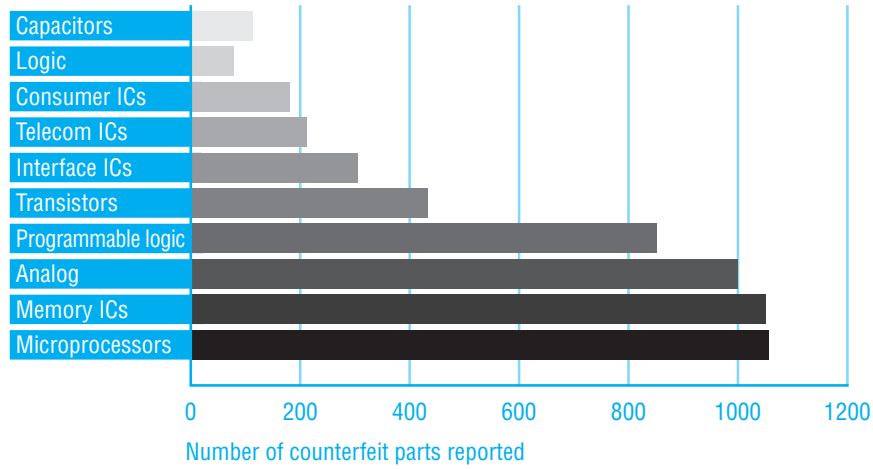
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President of ECCO Electronic Connector Company, Bernard Gizzi







MPUs are counterfeited the most
High value microprocessors are the most widely counterfeited component, but lower value parts are counterfeited as well.
Source: ERAI

Searching and finding genuine parts from authorized sources

It is often said that the best way to avoid buying counterfeit parts is to purchase directly from component manufacturers or from manufacturers' authorized distributors.

In fact, most purchasers buy the bulk of the components their companies need for production from component manufacturers or from authorized sources. However, when a component manufacturer discontinues a part, often there is still demand for the component by companies in such industries as defense and aerospace, medical, communications, networking equipment, which tend to have long product lifecycles.

Buyers in those industries often head to the open market for discontinued parts and buy them from independent distributors and brokers. In most cases, buyers can purchase genuine components from independent distributors and brokers, but sometimes the parts they purchase turn out to be counterfeit and fail when the electronics system that that they are used in fails during test or later in the field.

Obsolete or discontinued parts are often the target of counterfeiters, according to IHS Technology. The researcher says 67 per cent of counterfeit parts sold are for discontinued components.

Many purchasers say they look for discontinued parts on the open market only when they can't find them from authorized sources. However, component manufacturers, trade associations and authorized distributors say buyers in many instances don't search for authorized distributors as thoroughly as they could. In other cases, buyers may not be as concerned about purchasing from an authorized source as they are in finding the lowest price for the obsolete component sometimes, which sometimes can be found in the open market.

Many buyers purchase parts from a select number of preferred distributors and when those sources don't have the parts, buyers may mistakenly think the parts are not available from other authorized distributors.

Finding parts

In fact many times there are other sources and there are a number of search sites and tools buyers can use to find them. For instance, the Semiconductor Industry Association (SIA) sponsors the Electronics Authorized Directory www.authorizeddirectory.com. Buyers can find authorized distributors for dozens of semiconductor manufacturers at the site.

Another site, www.ECIAuthorized.com, allows buyers to search the inventories of 61 authorized distributors for older parts as well as parts still in production. The site is run by the Electronics Components Industry Association (ECIA) and the distributors on the site have parts listed from about 2,800 component manufacturers, said Robin Gray, chief operating officer for ECIA.

Buyers can search for components at Verical, a division of Arrow Electronics. Using Verical's Our DemandMatch quoting engine, a buyer can upload a list of parts that are in short supply and receive email responses back with a match list of available inventory, which is ready to ship

Sometimes buyers head to the open market in search of hard-to-find parts before they have considered all authorized sources

factory stock from Arrow's franchise distributor divisions around the world. Arrow has about $10 billion of inventory.

The match lists contain price, delivery and manufacturer part numbers and warranty information. About 700 manufacturers published inventory at the Verical site.

Arrow says all the inventory published to Verical.com is traceable and warrantied. Verical.com does not publish excess inventory from OEMs, EMS service providers, brokers or nonfranchised distributors.

While buyers search for obsolete and discontinued components from their preferred distributors, they may overlook aftermarket distributors and manufacturers that are authorized sources for billions of discontinued parts.

Such sources as Rochester Electronics, Lansdale, Micross and EV2 among others specialize in end-of-life and discontinued parts. Aftermarket distributors have large inventories of discontinued products in stock. Many also have wafers and die in stock and chips can be packaged based on the customer's needs either internally at the distributor or through a third-party. Such parts are marked with the original component manufacturer's logo and have full warranty coverage and post sales support, the SIA said.

Most authorized aftermarket distributors are also authorized to manufacture discontinued products. Some use the same fabrication processes, tools and packages that were used when the original products were fabricated, according to the SIA.

The aftermarket products have similar and sometimes better performance, quality, and reliability as the original products and they also carry full warranties from the authorized aftermarket distributors/ manufacturers, SIA said.

Not a problem

While there may be authorized sources available for discontinued components, some buyers prefer to buy from independent distributors because prices can be less than parts sold by authorized sources. Some buyers have developed relationships with a small number of reliable independent distributors over the years.

Many buyers say they have never had a problem with counterfeit parts buying from the open market and all the parts they purchase turned out to be genuine components from the original manufacturer.

Most independent distributors don't knowingly sell counterfeit parts. Most acknowledge that counterfeit parts are an issue and have installed rigorous inspection and screening programs involving state of the art X-Ray equipment. In many cases they can trace parts back to the original component manufacturers.

They also point out there have been instances when authorized distributors have unwittingly sold counterfeit components. This has happened when an authorized distributor sold parts that previously had been returned by a customer and those returned parts were not the same ones that the distributor had originally sold.

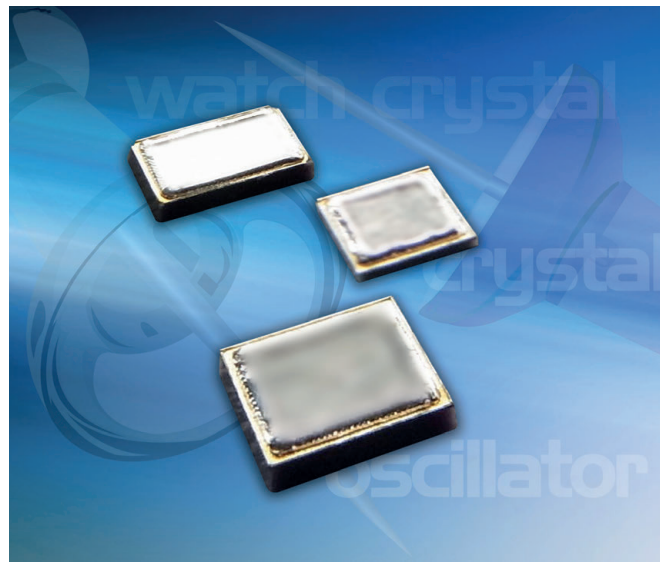
Independent distributors buy parts from multiple sources. They will buy excess inventories of OEMs and EMS providers as well as from other distributors including independent and authorized, and resell the parts.

In some cases, independent distributors buy components directly from component manufacturers. This can happen when a component manufacturer has built too many components and needs to get them off the books by the end of the month.

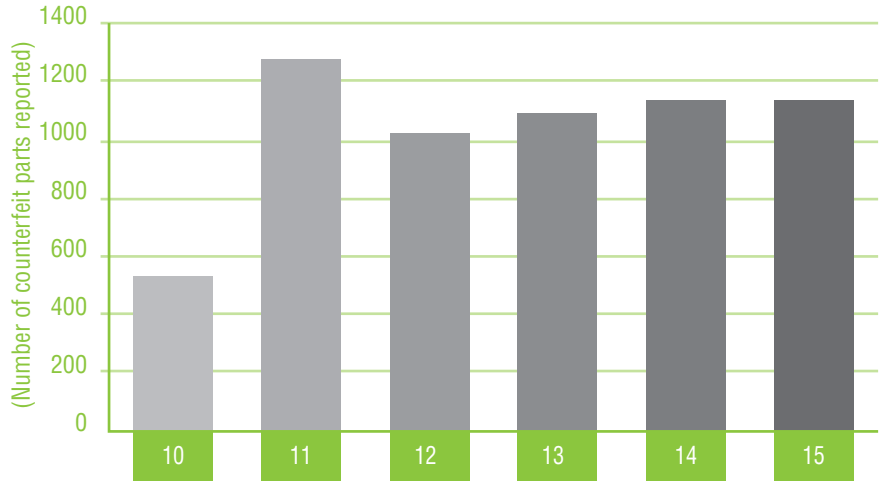
However, while most of the parts independent distributors sell may be genuine, there may be other problems with the components.



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Number of counterfeit parts stabilizes
Some in the electronics industry say increased vigilance in the supply chain has resulted in the stabilization of the number of reports of counterfeit parts.
Source: IC Insights

Semiconductors sold on the open market often are resold several times and if the parts were not handled or stored correctly, they may not perform up to the original specification of the part, according to the SIA.

For instance, many parts are prone to electrostatic discharge (ESD) damage if they are not handled properly. Careless handling can result in bent leads, or deformed solder balls. Chips stored in excessive heat or moist conditions can experience solderability problems. Missing or incorrect dry packaging can result in "popcorning" in the packaging of the semiconductor, the SIA said.

Reliable and reputable independent distributors may handle and store components properly, but they may have received the parts from other open market sources that weren't as conscientious about how the components were stored and handled.

Trade associations such as SIA and ECIA say buying from independent distributors and brokers is a risky business and parts should only be purchased from authorized sources. Buyers who purchase components from authorized sources eliminate the need for their companies to conduct costly, time-consuming authenticity testing, the SIA says.

Scrutinizing parts and suppliers

Some buyers who purchase parts from independent distributors are members of ERAI, an association that collects data about counterfeit parts in the supply chain.

ERAI offers its members access to a counterfeit parts database and e-mails members when there is a new report of the counterfeit component. The association has about 9,100 members who work at aerospace, defense, medical, nuclear and commercial OEMs as well as EMS providers, distributors, government agencies and industry associations.

Richard Smith, vice of business development for ERAI, said the association has been collecting information on bogus components since 2000.

"Since then we have put together the largest single database of suspect counterfeits and non-conforming components in the world," he said.

"We have a search screen that allows buyers to look up parts one at a time" to see if there've been any reports of counterfeit parts for that part number, said Smith. "You punch in the number and you can see if we have anything on that particular part," he said.

Buyers also get an e-mail alert every time a part numbers is added to the ERAI counterfeit parts database.

ERAI also offers a BOM scrubbing tool. A buyer can load a bill of materials and have it "scrubbed against our database," said Smith. A report is generated which will say if any parts on the BOM have been reported to be counterfeit or nonconforming, he said.

If there are part numbers that are listed as counterfeit, an OEM or EMS provider knows it needs to scrutinize the sources of the parts so it can take appropriate action.

Purchasers can also check to see if there've been reports of counterfeit parts of certain suppliers. "If you type in Intel we would see 17 pages of Intel devices that have been reported to us as being counterfeit or nonconforming," said Smith. The parts, of course, were not fabricated by Intel but by counterfeiters.

Buyers can also look up a distributor or broker or other company to see if there have been reports that the company had sold counterfeit components.

While counterfeit parts is not a new issue for the electronics industry, it is a continuing one that electronics purchasers have to deal with. They need to do their due diligence and make sure they only buy from reliable sources, preferably authorized ones.

Counterfeit by the numbers

67%
The percentage of counterfeit parts involving components that have been discontinued by component manufacturers Source: IHS Technology

1,139
The number of counterfeit parts reported to trade association ERAI in 2015

1,056
The number of microprocessors reported as counterfeit between 2010-015. Source: ERAI

$7.5 billion
The amount counterfeiting costs U.S.-based semiconductor companies per year. Source Semiconductor Industry Association

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Advanced Photonix, Inc.
Advanced Sensors/Amphenol
Advanced Thermal Solutions, Inc.
Advantech
Aeris
Aerospace Defense and Marine/ TE Connectivity
Agastat Relays/TE Connectivity
AIM-Cambridge/Cinch Connectivity Solutions
AKM Semiconductor, Inc.
Akros Silicon
Alcoswitch Switches/TE Connectivity
AlfaMag Electronics
All Sensors Corporation
Allegro MicroSystems, LLC.
Alliance Memory, Inc.
Alpha and Omega Semiconductor, Inc.
Alpha Wire
Altera
American Electrical, Inc.
American Technical Ceramics
Ametherm
Amgis
AMI Semiconductor (ON Semiconductor)
AMP Connectors/TE Connectivity
Amphenol
Amphenol Advanced Sensors (formerly GE Sensing)
Amphenol Aerospace Operations
Amphenol Commercial Products
Amphenol Connex (Amphenol RF)
Amphenol Industrial
Amphenol Pcd
Amphenol RF
Amphenol Sine Systems
Amphenol Tuchel Electronics
Ampleon
Amprobe
ams
Amulet Technologies LLC
Analog Devices, Inc.
Analog Devices, Inc./Hittite Microwave Products
Anaren
Angstrohm/Vishay
Antenova
Apacer
APEM Inc.
Apex Microtechnology
Apex Tool Group
API Delevan
API Technologies Corp.
APM Hexseal
Aptina (ON Semiconductor)
Arbor Solution
ARCOL/Ohmite
Arcolectric
Arcotronics/KEMET
Arduino
Aries Electronics, Inc.
ARM
Artaflex, Inc.
Artesyn Embedded Technologies
Asahi Kasei Microdevices
ASSMANN WSW Components
Astec America (Artesyn Embedded Technologies)
Astro Tool Corp.
Atmel
ATP Electronics, Inc.
Ault/SL Power
Avago Technologies US, Inc.
Aven
Avery Dennison
AVX Corporation
Axicom Relays/TE Connectivity
Aztronic/Vishay
B B Battery
B&B SmartWorx, Inc.
B&F Fastener Supply
B&K Precision
BCcomponents/Vishay
Bel Fuse Inc.
Bel Power Solutions
Bergquist
Beyschlag/Vishay
BI Technologies/TT Electronics
Birtcher
Bivar, Inc.
BlueCreation
BlueRadios, Inc.
Bluetechnix GmbH
BNS Solutions
Bomar (Winchester Electronics)
Bourns, Inc.
Bridgelux, Inc
Buchanan Terminal Blocks/ TE Connectivity
BUD Industries, Inc.
Bulgin
Burr-Brown/Texas Instruments
Bussmann (Eaton)
C&K Components
Caddock Electronics, Inc.
Califia Lighting
California Micro Devices (ON Semiconductor)
Calmark
Cannon
Cantherm
Capital Advanced Technologies, Inc.
Carclo Technical Plastics
Cardinal Components
Carling Technologies
Catalyst Semiconductor (ON Semiconductor)
CEL (California Eastern Laboratories)
Central Semiconductor
Central/Vishay
Cera-Mite/Vishay
CGS Resistors/TE Connectivity
CH Products
Chemtronics
Cherry
Chip Quik
Cicoil
CII/TE Connectivity
Cinch Connectivity Solutions
Cirronet
Cirrus Logic, Inc.
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Citizen Finedevice
Clarostat/Honeywell Sensing and Productivity Solutions
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Cogent Computer Systems
CogniMem Technologies, Inc.
Coiltronics (Eaton)
Comair Rotron
Comchip Technology
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Condor/SL Power
Conec
connectBlue
Connex/Amphenol
Connor-Winfield
Conxall/Switchcraft
Cooper Bussmann (Eaton)
Copal Electronics
Corcom Filters/TE Connectivity
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CR Magnetics, Inc.
Cramer Company
Cree, Inc.
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CTS Electronic Components
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Curtis Instruments
Custom Computer Services
CW Industries
Cymbet
Cynergy3
Cypress Semiconductor
Cypress Semiconductor/Spansion
Daburn
Dale/Vishay
Data Instruments/Honeywell Sensing and Productivity Solutions
DAVE Embedded Systems
DecaWave
Delta Product Groups
Delta Product Groups / EMI
Delta Product Groups / Fans
Delta Product Groups / Power
Desco
Deutsch Connectors/TE Connectivity
Dialight
Dialog Semiconductor
Dielectric Laboratories/Knowles
Digi International
Digilent, Inc.
Digital View, Inc.
Diodes Incorporated
DLP Design, Inc.
Draloric/Vishay
dresden elektronik
Dynastream Innovations Inc.
E Ink
Easy Braid Co.
Eaton (formerly Cooper Bussmann)
ebm-papst Inc.
Echelon
Econais
ECS Inc. International
EDAC Inc.
Elco/AVX Corporation
Elcon Connectors/TE Connectivity
Electric Imp
Electro Corp/Honeywell Sensing and Productivity Solutions
Electro-Films (EFI)/Vishay
Electronic Assembly GmbH
Electroswitch
Elmwood/Honeywell Sensing and Productivity Solutions
Elna America
Embedded Artists
Emerson Embedded Power (Artesyn Embedded Technologies)
Emerson Network Power Connectivity Solutions (Cinch Connectivity Solutions)
Energizer Battery Company
Energy Micro (Silicon Labs)
EnerSys
EnOcean
EPC
EPCOS (TDK)
Epson
Equinox Technologies
EREM
Essentra Components (formerly Richco, Inc.)
ESTA/Vishay
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E-T-A
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Evox Rifa/KEMET
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Future Technology Devices International, Ltd.
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General Semiconductor/Vishay
GeneSiC Semiconductor
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Henkel/LOCTITE
Henkel/Multicore
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Holsworthy Resistors/ TE Connectivity
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LED Engin
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LEM USA, Inc.
LEMO
Lighting Science Group Corporation
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MCB Industrie/Vishay
Measurement Specialties/
TE Connectivity
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Mills/Vishay
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MMB Networks
Molex
Monolithic Power Systems
MPD
MPS
Mueller Electric Co.
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Multi-Tech Systems, Inc.
Murata Electronics
Murata Power Solutions
Nakagawa Manufacturing USA, Inc.
National Semiconductor
National Semiconductor/
Texas Instruments
NDK
Nearson, Inc.
NEC-TOKIN/KEMET
NEI/Honeywell Sensing and
Productivity Solutions
Neohm Resistors/TE Connectivity
NessCap
NetBurner, Inc.
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Semiconductor, Inc.
OEG Relays/TE Connectivity
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Opto Diode Corporation
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Phyton, Inc.
PLX Technology/Avago Technologies
US, Inc.
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TE Connectivity
Power Integrations
Powerex, Inc.
Power-One (Bel Power Solutions)
PowerStor (Eaton)
PRD Plastics
Preci-Dip
Precision Design Associates, Inc.
Precision Electronic Components Ltd
ProAnt
Products Unlimited Transformers/
Relays/TE Connectivity
PUI Audio, Inc.
Pulsar
Pulse Electronics Corporation
PulseCore Semiconductor
(ON Semiconductor)
Q-Cee's/TE Connectivity
Qimonda
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Raychem Cable Protection/
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RECOM Power
Red Lion Controls
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Renesas Electronics America
RF Digital
RF Solutions
RFM
RFMD
Richtek
Riedon
Rigado
Roederstein/Vishay
ROHM Semiconductor
Rose Bopla
Roving Networks/Microchip
RPM Systems Corp.
Rubycon
Sagrad, Inc.
Samsung Electro-Mechanics
Samsung Semiconductor
Samtec, Inc.
SanDisk
Sanken Electric Co., Ltd.
Sanyo Semiconductor/
ON Semiconductor
Schaffner EMC, Inc.
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Schroff
Schurter
SCS
Seeed
Segger Microcontroller Systems
Seiko Instruments, Inc.
Semflex/Cinch Connectivity Solutions
Semtech
Sensata Technologies, Airpax
Sensotec/Honeywell Sensing and
Productivity Solutions
Sensym/Honeywell Sensing and
Productivity Solutions
Seoul Semiconductor
Serious Integrated, Inc.
Serpac Electronic Enclosures
Sfernice/Vishay
Sharp Microelectronics
Sigma Designs, Inc.
Sigma Inductors/TE Connectivity
Signal Transformer
Silicon Labs
Siliconix/Vishay
SiTime
SkyeTek
Skyworks Solutions, Inc.
SL Power Electronics - Manufacturer
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Soberton, Inc.
Souriau Connection Technology
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Spectra Symbol
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STMicroelectronics
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Sunon
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Synapse Wireless
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Specialties
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TE Connectivity Potter & Brumfield
Relays
TE Connectivity Products Unlimited
Transformers/Relays
TE Connectivity Raychem Cable
Protection
TE Connectivity Raychem Circuit
Protection
TE Connectivity Schrack Relays
TE Connectivity Sigma Inductors
TE Connectivity's CII
TE Connectivity's Q-Cee's
Teccor/Littelfuse
Techflex
TechNexion
Techno/Vishay
TechTools
Teledyne LeCroy
Telit Wireless Solutions, Inc.
Tensility International Corporation
Terasic Inc.
Test Products International (TPI)
Texas Instruments
t-Global Technology
Thermometrics/GE Measurement
& Control
Thin Film/Vishay
ThingMagic
Thomas Research Products
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Torex Semiconductor Ltd.
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Tripp Lite
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Solutions
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TT Electronics/Optek Technology
TT Electronics/Welwyn
Tusonix/CTS Electronic Components
Twin Industries
TXC Corporation
Tyco Electronics
U.S. Sensor
UDOO
United Chemi-Con
US-Lasers, Inc.
Varitronix International Ltd.
VEAM
Vector Electronics & Technology, Inc.
VersaLogic Corporation
Vicor
Virtium
Vishay
Vishay Foil Resistors
Vishay Precision Group
Vishay Precision Group/
Micro-Measurements
Vishay Semiconductor/Diodes Division
Vishay Semiconductor/Opto Division
Vishay/BCcomponents
Vishay/Beyschlag
Vishay/Dale
Vishay/Electro-Films
Vishay/Huntington Electric, Inc.
Vishay/Phoenix Passive Components
Vishay/Sfernice
Vishay/Siliconix
Vishay/Spectrol
Vishay/Sprague
Vishay/Thin Film
Vishay/Vitramon
Visual Communications Company, LLC
Vitelec/Cinch Connectivity Solutions
Vitramon/Vishay
Volgen/Division of Kaga
Electronics USA
Voltronics / Knowles
VPG/Micro-Measurements
Wakefield
Walsin Technology
Wandboard
Weidmüller
Weller
Welwyn/TT Electronics
Wickmann/Littelfuse
Wiha
Winbond Electronics Corp.
Winchester Electronics
Wintec Industries
Wiss
WIZnet
Wolfson/Cirrus Logic, Inc.
Wurth Electronics
Wurth Electronics Midcom
Xcelite
Xeltek
Xilinx
XMOS
XP Power
Xsens
xsens/Fairchild
Yageo
Zentri
Zetex Semiconductors
Zetex Semiconductors/Diodes Inc.
Zilog
Zilog/IXYS

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Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ACOUSTIC COMPONENTS											
BeStar Electronics Ind. Co. Ltd.	BeStar Technologies Inc.	520-439-9204	www.bestartech.com	Y	N/A	$250,000	N/A	100.00%	50	900	Y
CABLE & WIRING											
Alpha Wire	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,106	N/A	$0	93.00%	50	1000+	Y
ALPHA WIRE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	25,414	NA	0	99.98%	150	3,100	Y
Belden Wire & Cable	Mouser Electronics	800-346-6874	www.mouser.com	Y	5,863	N/A	$0	97.00%	50	1000+	Y
Electri-Flex Company	Electri-Flex Company	1-800-323-6174	www.electriflex.com	M	40	N/A	$150	100.00%	6	110	Y
Molex	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CIRCUIT PROTECTION											
BEL FUSE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,800	NA	0	98.45%	150	3,100	Y
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,462	N/A	$0	68.00%	50	1000+	Y
CBI Electric	Pridmore Corp	800 881 2072	www.pridmore.com	Y	35	$5,600	$0	100.00%	6	11	Y
Cooper Bussmann	Mouser Electronics	800-346-6873	www.mouser.com	Y	19,689	N/A	$0	42.00%	50	1000+	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,487	N/A	$0	100.00%	50	1000+	Y
Littelfuse	Mouser Electronics	800-346-6873	www.mouser.com	Y	28,790	N/A	$0	67.00%	50	1000+	Y
LITTELFUSE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	78,605	NA	0	80.89%	150	3,100	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	31,445	N/A	$0	68.00%	50	1000+	Y
DISPLAYS & LEDs											
Avago Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	403	N/A	$0	100.00%	50	1000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,390	N/A	$0	99.00%	50	1000+	Y
CREE INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	22,740	NA	0	99.99%	150	3,100	Y
Dialight	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,179	N/A	$0	84.00%	50	1000+	Y
FEMA	Pridmore Corp	800 881 2072	www.pridmore.com	Y	6	N/A	$0	100.00%	6	11	Y
Kingbright Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	$0	100.00%	50	1000+	Y
Kingbright Corp	Pridmore Corp	800 881 2072	www.pridmore.com	Y	179	$35,000	$0	100.00%	6	11	Y
LITE-ON INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,520	NA	0	99.49%	150	3,100	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,690	N/A	$0	100.00%	50	1000+	Y
ELECTROMECHANICAL											
AAVID CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,509	NA	0	54.87%	150	3,100	Y
ARTESYN EMBEDDED TECHNOLOGIES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,165	NA	0	98.85%	150	3,100	Y
B&K PRECISION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,090	NA	0	98.61%	150	3,100	Y
BERGQUIST	Digi-Key	1-800-344-4539	www.digikey.com	Y	484	NA	0	99.17%	150	3,100	Y
BUD INDUSTRIES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,708	NA	0	99.89%	150	3,100	Y
CHERRY	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,394	NA	0	92.54%	150	3,100	Y
COMAIR ROTRON	Digi-Key	1-800-344-4539	www.digikey.com	Y	610	NA	0	100.00%	150	3,100	Y
COTO CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,047	NA	0	99.71%	150	3,100	Y
CST CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,847	NA	0	99.96%	150	3,100	Y
DANAHER CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,230	NA	0	92.41%	150	3,100	Y
DESCO CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,382	NA	0	98.94%	150	3,100	Y
EBM-PAPST INC.	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,553	NA	0	99.87%	150	3,100	Y

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ELECTROMECHANICAL (continued)											
ESSENTRA COMPONENTS	Digi-Key	1-800-344-4539	www.digikey.com	Y	16,551	NA	0	100.00%	150	3,100	Y
GENERAL CABLE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,541	NA	0	98.76%	150	3,100	Y
GENERAL ELECTRIC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,612	NA	0	67.99%	150	3,100	Y
GRAYHILL INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	12,497	NA	0	97.22%	150	3,100	Y
ICCNEXERGY	Digi-Key	1-800-344-4539	www.digikey.com	Y	459	NA	0	97.39%	150	3,100	Y
ITW CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,434	NA	0	90.46%	150	3,100	Y
MEMORY PROTECTION DEVICES	Digi-Key	1-800-344-4539	www.digikey.com	Y	782	NA	0	100.00%	150	3,100	Y
NKK SWITCHES	Digi-Key	1-800-344-4539	www.digikey.com	Y	21,235	NA	0	97.58%	150	3,100	Y
ORION FANS	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,895	NA	0	100.00%	150	3,100	Y
PANDUIT CORP	Digi-Key	1-800-344-4539	www.digikey.com	Y	21,463	NA	0	99.91%	150	3,100	Y
PHIHONG USA CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,255	NA	0	100.00%	150	3,100	Y
QUALTEK	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,545	NA	0	100.00%	150	3,100	Y
RECOM POWER CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	25,578	NA	0	100.00%	150	3,100	Y
SCHAFFNER EMC INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,929	NA	0	100.00%	150	3,100	Y
SCHURTER INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	9,738	NA	0	99.97%	150	3,100	Y
SL POWER ELECTRONICS MANUFACTURE OF CONDOR/AULT BRANDS	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,115	NA	0	99.23%	150	3,100	Y
SUNON FANS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,716	NA	0	100.00%	150	3,100	Y
TELEDYNE LECROY	Digi-Key	1-800-344-4539	www.digikey.com	Y	570	NA	0	92.11%	150	3,100	Y
THOMAS RESEARCH PRODUCTS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,109	NA	0	78.18%	150	3,100	Y
VICOR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	195,401	NA	0	52.10%	150	3,100	Y
XP POWER	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,983	NA	0	100.00%	150	3,100	Y
ENCLOSURES											
Bud	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Bud Industries	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	$0	80.00%	50	1000+	Y
HAMMOND CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	13,206	NA	0	99.98%	150	3,100	Y
Hammond Manufacturing	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,839	N/A	$0	82.00%	50	1000+	Y
New Age Enclosures	Mouser Electronics	805-595-1310	www.newageenclosures.com	M	1,000+	N/A	$0	100.00%	32	N/A	Y
FERRITE CORES											
Samwha	Pridmore Corp	800 881 2072	www.pridmore.com	Y	17	$20,000	$0	100.00%	6	11	Y
WURTH CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	14,625	NA	0	99.17%	150	3,100	Y
FREQUENCY MANAGEMENT											
Abracon Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,780	N/A	$0	100.00%	50	1000+	Y
ABRACON LLC	Digi-Key	1-800-344-4539	www.digikey.com	Y	21,595	NA	$0	98.28%	150	3,100	Y
Abracon LLC	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Advanced Crystal Technology	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
AVX/Kyocera	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Bliley Technologies	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Bomar Crystal Company	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Cal Crystal Labs	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y

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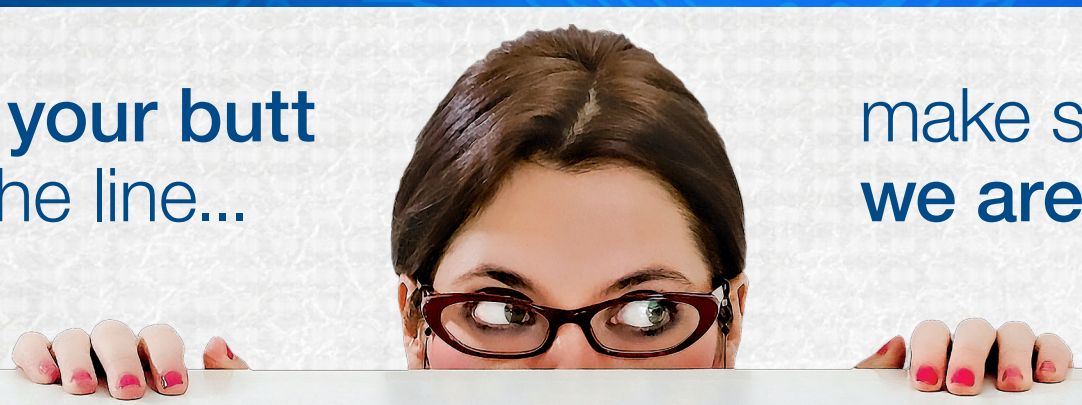
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FREQUENCY MANAGEMENT (continued)											
Cardinal Components	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Citizen	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,723	N/A	$0	N/A	50	1000+	Y
Citizen Finedevice	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Crystek Corporation	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
CTS Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,889	N/A	$0	100.00%	50	1000+	Y
CTS / CTS Valpey	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
ECS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,492	NA	$0	78.04%	150	3,100	Y
ECS Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,070	N/A	$0	100.00%	50	1000+	Y
ECS Inc	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Epson Electronics America	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Epson Toyocom	Mouser Electronics	800-346-6873	www.mouser.com	Y	178	N/A	$0	100.00%	50	1000+	Y
Fox Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	325	N/A	$0	100.00%	50	1000+	Y
Fox Electronics	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Hosonic Electronic Co Ltd	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
ILSI-MMD Corporation	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
InterQuip Electronics	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
IQD Frequency Products	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Mercury Electronics	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Micro Crystal	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
MtronPTI	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
NDK America	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
NEL Frequency Controls	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
PDI Precision Devices	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Pletronics	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Q-tech Corporation	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Rakon	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Raltron	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Pericom / Saronix-eCera	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
SiTime	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Statek Corporation	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Susumu Co Ltd	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,500	N/A	N/A	N/A	N/A	N/A	Y
Tai-Saw TST	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Taitien	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Transko	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
TXC Corporation	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Vectron International	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
ICs & SEMICONDUCTORS											
AKM SEMICONDUCTOR INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	379	NA	0	100.00%	150	3,100	Y
ALLEGRO MICROSYSTEMS, LLC	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,636	NA	0	85.02%	150	3,100	Y

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ICs & SEMICONDUCTORS (continued)											
ALPHA & OMEGA SEMICONDUCTOR INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,572	NA	0	100.00%	150	3,100	Y
ALTERA	Digi-Key	1-800-344-4539	www.digikey.com	Y	9,908	NA	0	69.65%	150	3,100	Y
AMS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,155	NA	0	95.41%	150	3,100	Y
ANALOG DEVICES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	47,828	NA	0	94.94%	150	3,100	Y
Analog Devices, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,749	N/A	$0	95.00%	50	1000+	Y
APEX MICROTECHNOLOGY INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	411	NA	0	74.70%	150	3,100	Y
APEX TOOL GROUP	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,623	NA	0	99.35%	150	3,100	Y
ATMEL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	22,854	NA	0	72.58%	150	3,100	Y
Atmel Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,840	N/A	$0	74.00%	50	1000+	Y
AVAGO TECHNOLOGIES US INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	12,132	NA	0	88.39%	150	3,100	Y
B&B ELECTRONICS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,283	NA	0	100.00%	150	3,100	Y
BIVAR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	16,927	NA	0	100.00%	150	3,100	Y
BRIDGELUX	Digi-Key	1-800-344-4539	www.digikey.com	Y	649	NA	0	100.00%	150	3,100	Y
CALIFORNIA EASTERN LABORATORIES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,191	NA	0	84.46%	150	3,100	Y
Central Semiconductor Corp.	Future Electronics	(800) 675-1619	www.futureelectronics.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	Y
CIRRUS LOGIC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,460	NA	0	76.63%	150	3,100	Y
Cirrus Logic Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	325	N/A	N/A	N/A	N/A	N/A	Y
CML CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,543	NA	0	96.01%	150	3,100	Y
Comchip	Pridmore Corp	800 881 2072	www.pridmore.com	Y	5	$4,000	$0	100.00%	6	11	Y
COMCHIP CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,343	NA	0	100.00%	150	3,100	Y
CYPRESS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	12,530	NA	0	78.29%	150	3,100	Y
Cypress Semiconductor Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,325	N/A	$0	81.00%	50	1000+	Y
DIALIGHT	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,279	NA	0	79.02%	150	3,100	Y
DIODES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	28,505	NA	0	87.80%	150	3,100	Y
FAIRCHILD CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	38,309	NA	0	99.00%	150	3,100	Y
Fairchild Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,654	N/A	$0	98.00%	50	1000+	Y
FINISAR CORP	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,515	NA	0	98.88%	150	3,100	Y
FREESCALE SEMICONDUCTOR	Digi-Key	1-800-344-4539	www.digikey.com	Y	16,147	NA	0	85.58%	150	3,100	Y
Freescale Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,866	N/A	$0	70.00%	50	1000+	Y
FTDI	Digi-Key	1-800-344-4539	www.digikey.com	Y	406	NA	0	100.00%	150	3,100	Y
FTDI	Mouser Electronics	800-346-6873	www.mouser.com	Y	94	N/A	$0	100.00%	50	1000+	Y
IDT	Digi-Key	1-800-344-4539	www.digikey.com	Y	43,565	NA	0	58.15%	150	3,100	Y
Infineon	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,580	N/A	$0	63.00%	50	1000+	Y
INFINEON TECHNOLOGIES	Digi-Key	1-800-344-4539	www.digikey.com	Y	11,089	NA	0	98.57%	150	3,100	Y
International Rectifier Corp	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,980	N/A	N/A	N/A	N/A	N/A	Y
INTERNATIONAL RECTIFIER CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,521	NA	0	73.39%	150	3,100	Y
INTERSIL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	23,045	NA	0	73.49%	150	3,100	Y
Intersil Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,782	N/A	N/A	N/A	N/A	N/A	Y
INVENSENSE	Digi-Key	1-800-344-4539	www.digikey.com	Y	147	NA	0	100.00%	150	3,100	Y

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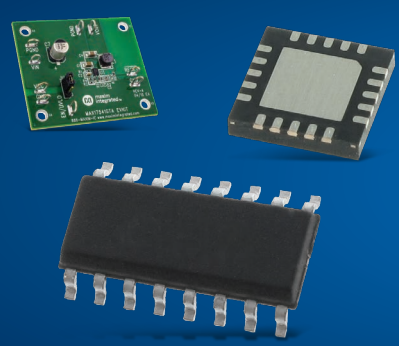
- Widest Selection
- Same-Day Shipping

MOUSER ELECTRONICS

Worldwide leading authorized distributor of semiconductors and electronic components.

Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
ICs & SEMICONDUCTORS (continued)											
ISSI	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,951	NA	0	81.75%	150	3,100	Y
IXYS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,403	NA	0	100.00%	150	3,100	Y
KINGBRIGHT COMPANY LLC	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,150	NA	0	99.84%	150	3,100	Y
LATTICE SEMICONDUCTOR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,584	NA	0	62.52%	150	3,100	Y
LINEAR TECHNOLOGY CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	34,867	NA	0	76.13%	150	3,100	Y
LINX TECHNOLOGIES INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	770	NA	0	67.00%	150	3,100	Y
LOGIC PD, INC.	Digi-Key	1-800-344-4539	www.digikey.com	Y	192	NA	0	71.35%	150	3,100	Y
M/A-COM TECHNOLOGY SOLUTIONS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,286	NA	0	97.51%	150	3,100	Y
MAXIM CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	67,995	NA	0	78.70%	150	3,100	Y
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	9,200	N/A	$0	89.00%	50	1000+	Y
MELEXIS TECHNOLOGIES NV	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,008	NA	0	99.11%	150	3,100	Y
MICREL INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	24,426	NA	0	84.47%	150	3,100	Y
MICRO COMMERCIAL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	9,752	NA	0	97.05%	150	3,100	Y
Microchip	Mouser Electronics	800-346-6873	www.mouser.com	Y	5,800	N/A	$0	100.00%	50	1000+	Y
MICROCHIP CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	36,484	NA	0	97.51%	150	3,100	Y
MICRON CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	9,429	NA	0	89.76%	150	3,100	Y
Microsemi	Mouser Electronics	800-346-6673	Mouser.com	Y	6,099	N/A	$0	50.00%	50	930+	Y
MICROSEMI CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	45,461	NA	0	68.37%	150	3,100	Y
MULTI-TECH CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	424	NA	0	98.82%	150	3,100	Y
NEWHAVEN DISPLAY INTL CORP	Digi-Key	1-800-344-4539	www.digikey.com	Y	651	NA	0	100.00%	150	3,100	Y
NXP	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,205	N/A	$0	100.00%	50	1000+	Y
NXP SEMICONDUCTOR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	37,481	NA	0	99.26%	150	3,100	Y
ON Semiconductor	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,486	N/A	$0	96.00%	50	1000+	Y
ON SEMICONDUCTOR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	54,376	NA	0	78.95%	150	3,100	Y
ON SHORE TECHNOLOGY INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	12,761	NA	0	99.99%	150	3,100	Y
OSRAM OPTO SEMICONDUCTORS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,545	NA	0	100.00%	150	3,100	Y
POWER INTEGRATIONS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,327	NA	0	86.74%	150	3,100	Y
RENESAS ELECTRONICS AMERICA	Digi-Key	1-800-344-4539	www.digikey.com	Y	11,482	NA	0	83.18%	150	3,100	Y
RFMD CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	720	NA	0	83.89%	150	3,100	Y
ROHM SEMICONDUCTOR CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	60,441	NA	0	99.85%	150	3,100	Y
SEMTECH CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,307	NA	0	86.33%	150	3,100	Y
SEOUL SEMICONDUCTOR INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	877	NA	0	99.89%	150	3,100	Y
SHARP CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,795	NA	0	81.14%	150	3,100	Y
SIGMA DESIGNS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	167	NA	0	75.45%	150	3,100	Y
SILICON LABORATORIES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	16,705	NA	0	95.82%	150	3,100	Y
Silicon Laboratories Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,141	N/A	$0	100.00%	50	1000+	Y
SKYWORKS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,922	NA	0	99.53%	150	3,100	Y
SMC Diode Solutions	Future Electronics	1-800-675-1619	www.futureelectronics.com	Y	155	N/A	$100.00	75.00%	4	60	Y
ST Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	8,145	N/A	$0	96.00%	50	1000+	Y

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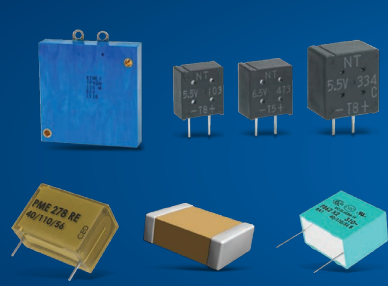
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ICs & SEMICONDUCTORS (continued)											
STMICROELECTRONICS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	40,618	NA	0	97.48%	150	3,100	Y
SWISSBIT NA INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	689	NA	0	100.00%	150	3,100	Y
Taiwan Semiconductor	Pridmore Corp	800 881 2072	www.pridmore.com	Y	426	$18,000	$0	100.00%	6	11	Y
TAOGLAS LIMITED	Digi-Key	1-800-344-4539	www.digikey.com	Y	492	NA	0	100.00%	150	3,100	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	29,676	N/A	$0	94.00%	50	1000+	Y
TEXAS INSTRUMENTS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	203,917	NA	0	88.33%	150	3,100	Y
Toshiba	Mouser Electronics	800-346-6873	www.mouser.com	Y	800	N/A	N/A	N/A	N/A	N/A	Y
TOSHIBA CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	11,177	NA	0	87.92%	150	3,100	Y
TRINAMIC MOTION CONTROL GMBH	Digi-Key	1-800-344-4539	www.digikey.com	Y	208	NA	0	100.00%	150	3,100	Y
VERSALOGIC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	384	NA	0	100.00%	150	3,100	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	53,781	N/A	$0	77.00%	50	1000+	Y
VISHAY CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	526,096	NA	0	80.84%	150	3,100	Y
XILINX INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,676	NA	0	47.03%	150	3,100	Y
INTERCONNECTION											
3M	Mouser Electronics	800-346-6873	www.mouser.com	Y	23,235	N/A	$0	46.00%	50	1000+	Y
3M CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	53,444	NA	0	97.49%	150	3,100	Y
Aero Conesys	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Amphenol	Mouser Electronics	800-346-6873	www.mouser.com	Y	165,853	N/A	$0	31.00%	50	1000+	Y
AMPHENOL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	107,278	NA	0	76.94%	150	3,100	Y
ASSMANN WSW COMPONENTS	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,317	NA	0	91.29%	150	3,100	Y
Cinch	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CONEC	Digi-Key	1-800-344-4539	www.digikey.com	Y	7,733	NA	0	99.99%	150	3,100	Y
CUI CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	14,054	NA	0	90.65%	150	3,100	Y
CW INDUSTRIES	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,365	NA	0	73.66%	150	3,100	Y
EDAC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	9,628	NA	0	99.86%	150	3,100	Y
ELEKTRON TECHNOLOGY CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,695	NA	0	100.00%	150	3,100	Y
FCI	Mouser Electronics	800-346-6873	www.mouser.com	Y	3,394	N/A	$0	73.00%	50	1000+	Y
FCI CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	106,672	NA	0	80.56%	150	3,100	Y
Fischer Connectors Inc.	Kensington Electronics, Inc.	512-339-3300	www.keiconn.com	Y	N/A	N/A	$50	N/A	4	30	N
HARTING	Digi-Key	1-800-344-4539	www.digikey.com	Y	15,958	NA	0	99.96%	150	3,100	Y
Harting	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,160	N/A	$0	51.00%	50	1000+	Y
HARWIN INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,754	NA	0	90.95%	150	3,100	Y
Hirose Electric	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,322	N/A	$0	86.00%	50	1000+	Y
HIROSE ELECTRIC CO LTD	Digi-Key	1-800-344-4539	www.digikey.com	Y	35,737	NA	0	88.07%	150	3,100	Y
Hypertronics	Kensington Electronics, Inc.	512-339-3300	www.keiconn.com	Y	N/A	N/A	$50	N/A	4	30	N
ITT Cannon	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
ITT CANNON-PEI/GENESIS	Digi-Key	1-800-344-4539	www.digikey.com	Y	112,142	NA	0	30.28%	150	3,100	Y
ITT CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	11,746	NA	0	30.07%	150	3,100	Y

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Electronic Components
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MOUSER ELECTRONICS

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INTERCONNECTION (continued)											
JAE ELECTRONICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,879	NA	0	100.00%	150	3,100	Y
JAE Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,02	N/A	$0	100.00%	N/A	N/A	Y
JST SALES AMERICA INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,940	NA	0	79.82%	150	3,100	Y
KEYSTONE ELECTRONICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,900	NA	0	98.78%	150	3,100	Y
LEMO	Digi-Key	1-800-344-4539	www.digikey.com	Y	26,346	NA	0	99.99%	150	3,100	Y
MILL-MAX MANUFACTURING CORP	Digi-Key	1-800-344-4539	www.digikey.com	Y	16,479	NA	0	93.56%	150	3,100	Y
Molex	Mouser Electronics	800-346-6873	www.mouser.com	Y	85,634	N/A	$0	89.00%	50	1000+	Y
MOLEX CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	105,547	NA	0	97.59%	150	3,100	Y
Neutrik	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,563	N/A	$0	100.00%	50	1000+	Y
NorComp	Digi-Key	800-457-2412	www.norcomp.net	Y	5650	N/A	0	96.00%	25	150	
Panduit	North Shore Components Inc.	631-504-6038	www.nscomponents.com	Y	1,000+	N/A	$100	N/A	3	20	Y
PARLEX USA LLC	Digi-Key	1-800-344-4539	www.digikey.com	Y	780	NA	0	98.33%	150	3,100	Y
PHOENIX CONTACT	Digi-Key	1-800-344-4539	www.digikey.com	Y	46,390	NA	0	99.99%	150	3,100	Y
Phoenix Contact	Mouser Electronics	800-346-6873	www.mouser.com	Y	30,044	N/A	$0	77.00%	50	1000+	Y
POWELL ELECTRONICS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	39,269	NA	0	57.33%	150	3,100	Y
SAMTEC INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	20,116	NA	0	99.91%	150	3,100	Y
Souriau	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,744	N/A	$0	27.00%	50	1000+	Y
SOURIAU CONNECTION TECHNOLOGY CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	19,121	NA	0	89.04%	150	3,100	Y
SULLINS CONNECTOR SOLUTIONS	Digi-Key	1-800-344-4539	www.digikey.com	Y	204,879	NA	0	97.74%	150	3,100	Y
SWITCHCRAFT CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,128	NA	0	81.71%	150	3,100	Y
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	$0	55.00%	50	1000+	Y
TE Connectivity	Mouser Electronics	800-346-6873	www.mouser.com	Y	123,613	N/A	$0	69.00%	50	1000+	Y
TE CONNECTIVITY CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	351,881	NA	0	94.23%	150	3,100	Y
TENSILITY INTERNATIONAL CORP	Digi-Key	1-800-344-4539	www.digikey.com	Y	685	NA	0	100.00%	150	3,100	Y
WALDOM CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	10,653	NA	0	92.54%	150	3,100	Y
WEIDMULLER	Digi-Key	1-800-344-4539	www.digikey.com	Y	35,794	NA	0	96.76%	150	3,100	Y
OBSOLESCENCE / HARD TO FIND											
	America II Electronics	800-767-2637	www.americaii.com	M	1,900	$1B	$0	75.00%	59	550+	Y
OPTO ELECTRONICS											
Avago Technologies	Mouser Electronics	800-346-6873	www.mouser.com	Y	7,165	N/A	$0	87.00%	50	1000+	Y
Cree	Mouser Electronics	800-346-6873	www.mouser.com	Y	582	N/A	$0	99.00%	50	1000+	Y
LedEngin, Inc	Mouser Electronics	800-346-6873	www.mouser.com	Y	437	N/A	$0	100.00%	50	1000+	Y
Osram Opto Semiconductors	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,927	N/A	$0	99.00%	50	1000+	Y
Sharp Microelectronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,415	N/A	$0	97.00%	50	1000+	Y
PASSIVES											
AMERICAN TECHNICAL CERAMICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,304	NA	0	100.00%	150	3,100	Y
API DELEVAN CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	28,463	NA	0	85.90%	150	3,100	Y
AVX	Mouser Electronics	800-346-6873	www.mouser.com	Y	42,454	N/A	$0	72.00%	50	1000+	Y
Bourns	Mouser Electronics	800-346-6873	www.mouser.com	Y	38	N/A	$0	78.00%	50	1000+	Y



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PASSIVES (continued)											
BOURNS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	54,738	NA	0	80.89%	150	3,100	Y
CADDOCK ELECTRONICS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	474	NA	0	78.69%	150	3,100	Y
CANTHERM	Digi-Key	1-800-344-4539	www.digikey.com	Y	814	NA	0	100.00%	150	3,100	Y
CITIZEN SYSTEMS AMERICA CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,050	NA	0	69.51%	150	3,100	Y
CONNOR-WINFIELD	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,293	NA	0	99.23%	150	3,100	Y
COPAL ELECTRONICS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,017	NA	0	99.93%	150	3,100	Y
Cornell Dubilier	Mouser Electronics	800-346-6873	www.mouser.com	Y	24,145	N/A	$0	71.00%	50	1000+	Y
CORNELL DUBILIER MARKETING INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	20,797	NA	0	70.57%	150	3,100	Y
CR MAGNETICS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	894	NA	0	99.66%	150	3,100	Y
CRYSTEK CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,692	NA	0	100.00%	150	3,100	Y
CTS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	30,995	NA	0	91.18%	150	3,100	Y
CTS Electronic Components	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
EATON CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	14,607	NA	0	98.53%	150	3,100	Y
EFC Wesco	Pridmore Corp	800 881 2072	www.pridmore.com	Y	6	$37,000	$0	100.00%	6	11	Y
ENERGIZER BATTERY COMPANY	Digi-Key	1-800-344-4539	www.digikey.com	Y	423	NA	0	61.94%	150	3,100	Y
EPCOS	Mouser Electronics	800-346-6873	www.mouser.com	Y	26,533	N/A	$0	98.00%	50	1000+	Y
EPSON CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,129	NA	0	67.43%	150	3,100	Y
FOX ELECTRONICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	5,918	NA	0	100.00%	150	3,100	Y
HEICO CORPORATION/Ohmite	Digi-Key	1-800-344-4539	www.digikey.com	Y	15,621	NA	0	61.01%	150	3,100	Y
JOHANSON CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	4,952	NA	0	97.08%	150	3,100	Y
Kanthal Globar / Sandvik	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
KEMET	Digi-Key	1-800-344-4539	www.digikey.com	Y	39,513	NA	0	89.11%	150	3,100	Y
Kemet	Mouser Electronics	800-346-6873	www.mouser.com	Y	77,568	N/A	$0	66.00%	50	1000+	Y
Kemet	Pridmore Corp	800 881 2072	www.pridmore.com	Y	476	$83,000	$0	95.00%	6	11	Y
KNOWLES	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,206	NA	0	N/A	150	3,100	Y
KOA Speer	Mouser Electronics	800-346-6873	www.mouser.com	Y	34,078	N/A	$0	58.00%	50	1000+	Y
KYOCERA ELECTRONICS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	63,419	NA	0	87.58%	150	3,100	Y
LEM USA INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	354	NA	0	99.44%	150	3,100	Y
MALLORY SONALERT PRODUCTS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,754	NA	0	93.22%	150	3,100	Y
MEASUREMENT SPECIALTIES INC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,517	NA	0	95.58%	150	3,100	Y
Murata	Mouser Electronics	800-346-6873	www.mouser.com	Y	33,780	N/A	$0	99.00%	50	1000+	Y
MURATA CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	55,875	NA	0	99.64%	150	3,100	Y
NDK	Digi-Key	1-800-344-4539	www.digikey.com	Y	936	NA	0	100.00%	150	3,100	Y
NICHICON	Digi-Key	1-800-344-4539	www.digikey.com	Y	34,931	NA	0	96.25%	150	3,100	Y
Nichicon	Mouser Electronics	800-346-6873	www.mouser.com	Y	20,389	N/A	$0	84.00%	50	1000+	Y
NVE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	598	NA	0	87.13%	150	3,100	Y
Ohmite	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,293	N/A	$0	55.00%	50	1000+	Y
PANASONIC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	144,312	NA	0	93.20%	150	3,100	Y
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	14,948	N/A	$0	100.00%	50	1000+	Y

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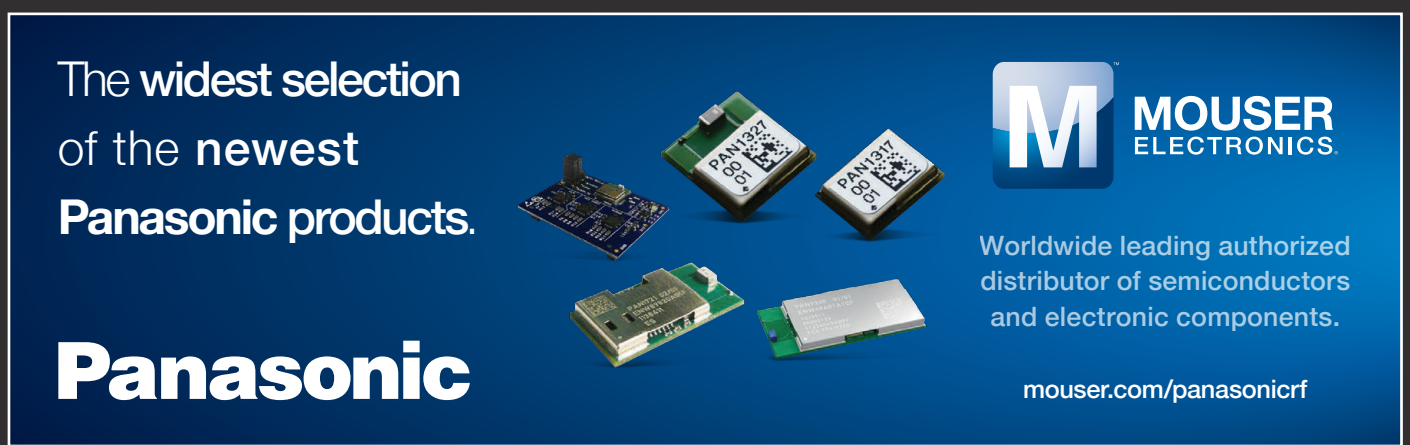


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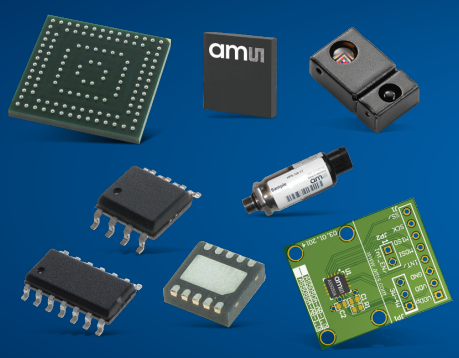
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Manufacturer	Distributor	Telephone	Website	Franchised Distributor (Y/N/M)	No. of Lines for Principle	Stock Value for Principle	Minimum Order Value	% Lead Free for Principle Range	No. of Technical Support Staff	Total No. of Staff	Pack and Hold
PASSIVES (continued)											
PUI AUDIO, INC.	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,177	NA	0	72.22%	150	3,100	Y
PULSE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,338	NA	0	92.71%	150	3,100	Y
RUBYCON	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,580	NA	0	100.00%	150	3,100	Y
SAMSUNG CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	18,446	NA	0	100.00%	150	3,100	Y
STACKPOLE CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	50,316	NA	0	99.43%	150	3,100	Y
STANDEX-MEDER ELECTRONICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	631	NA	0	99.37%	150	3,100	Y
SUMIDA AMERICA COMPONENTS INC	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,953	NA	0	81.73%	150	3,100	Y
SUSUMU	Digi-Key	1-800-344-4539	www.digikey.com	Y	41,437	NA	0	99.77%	150	3,100	Y
TADIRAN BATTERIES	Digi-Key	1-800-344-4539	www.digikey.com	Y	62	NA	0	100.00%	150	3,100	Y
TAIYO YUDEN	Digi-Key	1-800-344-4539	www.digikey.com	Y	14,741	NA	0	100.00%	150	3,100	Y
Taiyo Yuden	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,620	N/A	$0	98.00%	50	1000+	Y
TAMURA	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,352	NA	0	92.60%	150	3,100	Y
TDK	Mouser Electronics	800-346-6873	www.mouser.com	Y	6,663	N/A	$0	100.00%	50	1000+	Y
TDK CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	96,838	NA	0	99.21%	150	3,100	Y
TRIAD MAGNETICS	Digi-Key	1-800-344-4539	www.digikey.com	Y	1,413	NA	0	98.23%	150	3,100	Y
TRIPP LITE	Digi-Key	1-800-344-4539	www.digikey.com	Y	3,319	NA	0	85.51%	150	3,100	Y
TT ELECTRONICS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,788	NA	0	82.79%	150	3,100	Y
Tusonix CTS Electronic Components	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
TXC CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,836	NA	0	100.00%	150	3,100	Y
UNITED CHEMI-CON	Digi-Key	1-800-344-4539	www.digikey.com	Y	15,016	NA	0	86.48%	150	3,100	Y
United Chemi-Con	Pridmore Corp	800 881 2072	www.pridmore.com	Y	92	$25,000	$0	100.00%	6	11	Y
Vishay	Mouser Electronics	800-346-6873	www.mouser.com	Y	102,917	N/A	$0	64.00%	50	1000+	Y
VISHAY PRECISION GROUP CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	19,226	NA	0	40.99%	150	3,100	Y
Wurth	Mouser Electronics	800-346-6873	www.mouser.com	Y	934	N/A	$0	99.00%	50	1000+	Y
YAGEO CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	70,286	NA	0	67.00%	150	3,100	Y
Yageo Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	18,246	N/A	$0	100.00%	50	1000+	Y
POWER & BATTERIES											
APC	North Shore Components Inc.	631-504-6038	www.nscomponents.com	Y	1,000+	N/A	$100	N/A	3	20	Y
DELTA PRODUCTS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,712	NA	0	99.58%	150	3,100	Y
Emerson	Mouser Electronics	800-346-6873	www.mouser.com	Y	358	N/A	$1	85.00%	N/A	N/A	Y
Lineage Power	Mouser Electronics	800-346-6873	www.mouser.com	Y	301	N/A	$0	100.00%	N/A	N/A	Y
Power-One	Mouser Electronics	800-346-6873	www.mouser.com	Y	170	N/A	$0	60.00%	N/A	N/A	Y
TDK Lambda	Mouser Electronics	800-346-6873	www.mouser.com	Y	405	N/A	$0	80.00%	N/A	N/A	Y
PROGRAMMING											
DIGI INTERNATIONAL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,893	NA	0	89.60%	150	3,100	Y
REED SWITCHES											
HSI Sensing	HSI Sensing	405-224-4046	www.hsisensing.com	M	75	N/A	$200	100.00%	15	275	N
Standex-Meder Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	120	N/A	$0	82.00%	50	1000+	Y



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RESISTORS											
SRT Resistor Technology GmbH	BREL International	800-237-4564	www.brelintl.com	Y	550	NA	$0	100.00%	6	35	Y
SENSORS											
E-SWITCH	Digi-Key	1-800-344-4539	www.digikey.com	Y	8,424	NA	0	100.00%	150	3,100	Y
Freescale	Mouser Electronics	800-346-6873	www.mouser.com	Y	842	N/A	$0	97.00%	50	1000+	Y
HONEYWELL CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	25,956	NA	0	98.37%	150	3,100	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	12,059	N/A	$0	64.00%	50	1000+	Y
HSI Sensing	HSI Sensing	405-224-4046	www.hsisensing.com	M	75	N/A	$200	100.00%	15	275	N
Maxim Integrated	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,379	N/A	$0	45.00%	50	1000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,915	N/A	$0	59.00%	50	1000+	Y
Standex-Meder Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	120	N/A	$0	82.00%	50	1000+	Y
Texas Instruments	Mouser Electronics	800-346-6873	www.mouser.com	Y	914	N/A	$0	65.00%	50	1000+	Y
SWITCHES & KEYBOARDS											
APEM	Mouser Electronics	800-346-6873	www.mouser.com	Y	4,326	N/A	$0	83.00%	50	1000+	Y
APEM CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	6,719	NA	0	97.25%	150	3,100	Y
C&K Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	27,230	N/A	$0	90.00%	50	1000+	Y
C&K COMPONENTS CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	28,830	NA	0	95.27%	150	3,100	Y
Copal Electronics Inc	Pridmore Corp	800 881 2072	www.pridmore.com	Y	2	$450	$0	100.00%	6	11	Y
CTS Electronic Components	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
Honeywell Sensing and Control	Mouser Electronics	800-346-6873	www.mouser.com	Y	15,149	N/A	$0	73.00%	50	1000+	Y
NKK Switches	Mouser Electronics	800-346-6873	www.mouser.com	Y	13,976	N/A	$0	86.00%	50	1000+	Y
Omron	Mouser Electronics	800-346-6873	www.mouser.com	Y	10,669	N/A	$0	89.00%	50	1000+	Y
OMRON CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	65,022	NA	0	99.66%	150	3,100	Y
OTTO	ECCO	773-767-2200	www.eccoconnectors.com	Y	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OTTO	Mouser Electronics	800-346-6873	www.mouser.com	Y	500+	N/A	$0	100.00%	75	500	Y
Panasonic Electric Works	Mouser Electronics	800-346-6873	www.mouser.com	Y	2,748	N/A	$0	100.00%	50	1000+	Y
Standex-Meder Electronics	Mouser Electronics	800-346-6873	www.mouser.com	Y	120	N/A	$0	82.00%	50	1000+	Y
Switchcraft Corporation	Mouser Electronics	800-346-6873	www.mouser.com	Y	300	N/A	$0	55.00%	50	1000+	Y
TEST & MEASUREMENT											
Fluke	Mouser Electronics	800-346-6873	www.mouser.com	Y	1,008	N/A	$0	94.00%	50	1000+	Y
Teledyne LeCroy	Mouser Electronics	800-346-6873	www.mouser.com	Y	194	N/A	$0	96.00%	50	1000+	Y
THERMAL MANAGEMENT											
Aavid Thermalloy	Mouser Electronics	800-346-6873	www.mouser.com	Y	826	N/A	$0	73.00%	50	1000+	Y
CTS Electronic Components	Dove Electronic Components Inc	1-800-232-9825	www.doveonline.com	Y	1000+	N/A	$0	95%+	5	25	Y
NMB TECHNOLOGIES CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	2,838	NA	0	100.00%	150	3,100	Y
WIRELESS SOLUTIONS											
CSR PLC	Digi-Key	1-800-344-4539	www.digikey.com	Y	392	NA	0	97.45%	150	3,100	Y
LAIRD CORPORATION	Digi-Key	1-800-344-4539	www.digikey.com	Y	12,868	NA	0	97.02%	150	3,100	Y
Panasonic Electronic Components	Mouser Electronics	800-346-6873	www.mouser.com	Y	48	N/A	$0	100.00%	50	1000+	Y
RFM	Mouser Electronics	800-346-6873	www.mouser.com	Y	312	N/A	$0	90.00%	50	1000+	Y

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API Delevan
APM HEXSEAL
Applied Motion
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Arduino NEW
Aries
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Atmel
Atollic NEW
Ault / SL Power
Avago Technologies
Avery Dennison
AVX
Axiomtek NEW
Azoteq

B

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Belden
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Bosch Sensortec NEW
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Crydom
CRYSTEK CRYSTALS
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CTS Electronic Components
CW Industries
Cypress Semiconductor

D

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DBM Optix
Delphi
Deltron
Dialight
Dialog Semiconductor NEW
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Digi International
Digital View
Diode Laser Concepts
Diodes Incorporated
Displaytech Ltd.
DLP Design

E

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EasySync
Eaton
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Elpac
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Kavlico NEW
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KEMET NEC TOKIN NEW
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LedEngin
Ledil
LedLink
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Littelfuse
LMB/Heeger
Lorlin
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LS Research
Lumex
Lumileds NEW
Luminus Devices
Luxo Corporation

M

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MCC
Mean Well
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Meder
Melexis NEW
Menda
Merit Sensor NEW
Metcal
MG Chemicals
Micrel NEW
Microchip
Micronas NEW
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Microtips
Mide Technology NEW
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Mitsubishi Electric
Molex
Monolithic Power Systems (MPS)
MSI Sensors
Mueller Electric
Murata
Murata Power Solutions
Murata Wireless Solutions NEW

N

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NetBurner
Netduino
Neutrik
New Age Enclosures
Newhaven Display
Nichicon
NJR
NKK Switches
NMB
NorComp
Nordic Semiconductor
Noritake
NOVACAP
NovaSensor / GE Sensing
Nutaq
NXP Semiconductors

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OK Industries
Olimex Ltd.
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Optek Technologies
Optrex-Kyocera
Orion Fans
OSRAM Opto Semiconductors
OTTO NEW

P

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Plessey Semiconductors NEW
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Powercast
Power Integrations
Power-Sonic
Protek
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PUI Audio
Pulse

Q, R

Q-Cee's / TE Connectivity
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Quatech
Rabbit Semiconductor
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RAF Electronic Hardware
Ramtron
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Rectron
Red Pitaya NEW
Redpine Signals
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S

Sagrad, Inc.
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Sargent Tools
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SEEED STUDIO NEW
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Silex Technology
Silicon Microstructures NEW
Silicon Labs
Simpson
SiTime
SkyeTek
Skyworks Solutions Inc. NEW
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SMSC / Microchip
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Spectra Symbol
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SPI Westek
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Staco
STMicroelectronics
Stratos / Cinch
Sumida
Susumu
Swissbit NEW
Switchcraft
Syfer

T

Tadiran
Taiwan Semiconductor
Taiyo Yuden
Tamura
Taoglas
TDK
TDK-Lambda NEW
TE Connectivity
TechNexion NEW
Techspray
Tektronix
Teledyne LeCroy
Temp-Flex Cable
Terasic Technologies NEW
Texas Instruments
THAT Corporation
Thermometrics
Toshiba
Triad Magnetics
Tripp Lite
TriQuint Semiconductor
Triune Systems
Trompeter / Cinch
TT Electronics
Tusonix
Twin Industries
TXC
Tyco Electronics

U

UDOO NEW
Ultralife
United Chemi-Con
US Sensor

V

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Varitronix
VCC
Vector
Vectron International
Vishay
Vitelec / Cinch
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Voltronics

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Wahl
Wakefield
Walsin
Wandboard NEW
Welwyn
White-Rodgers
Wi2Wi
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