Do Your Due Diligence

Winning the battle against counterfeit chips is mission critical

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Fraudsters are masters at sniffing out a good opportunity...and it doesn't get much better than a shortage of chips needed by manufacturers desperate to stay on a production schedule to meet customer demand. The existence of counterfeit semiconductor components in the market is nothing new. Counterfeiters have been working to infiltrate the high tech market for years. However, the confluence of the COVID-19 pandemic and other causative factors leading to the chip shortage is providing counterfeiters with new opportunities to peddle their fraudulent components.

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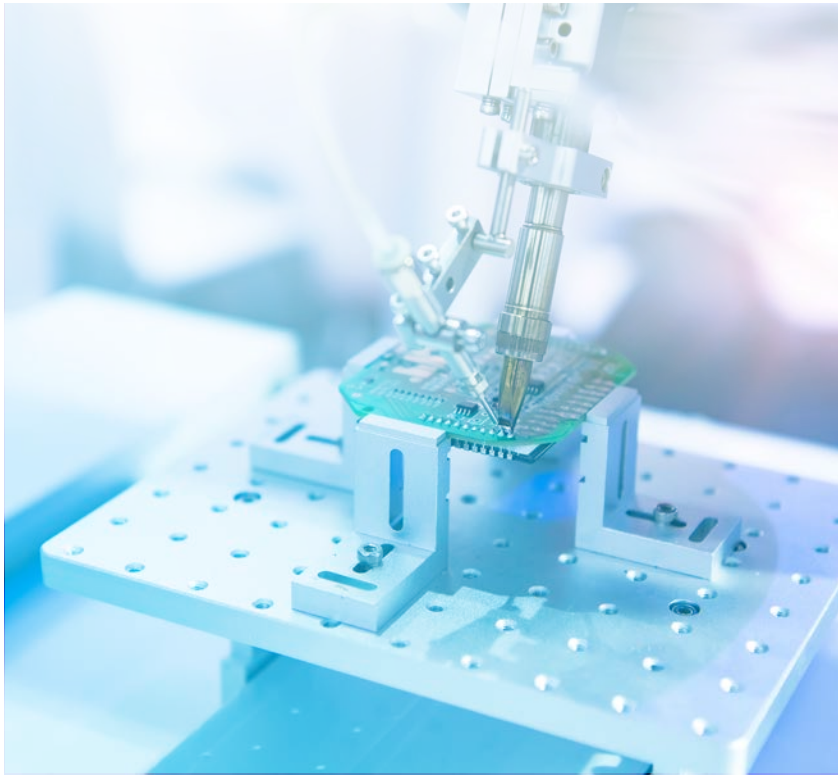


Getting to the root of the causes

What are the risks, and how can you protect against inadvertently using counterfeit chips in your products? We'll cover that, but first let's take a step back and look at how we got to this point.

It's clear by now that the main cause of the chip shortage is the COVID-19 pandemic. Lockdowns caused manufacturing companies to cut back or stop production. During this same period, a few other incidents such as the weather-related power outage in Texas caused some chip plants to temporarily shut down and a fire in Japan caused similar delays.

As the world went into lockdown the supply chain shifted. The automotive market and others held off on securing demand and took a wait-and-see approach toward the pandemic and demand. At the same time, the lockdown caused a surge in demand for laptop computers and other tech devices.

When demand for vehicles and other products returned, chip manufacturers had already shifted their production to other markets, leaving many companies with little to no added manufacturing capacity. And until capacity can be returned, many of these industries are either left in standby mode or forced to look elsewhere for supply.

The counterfeit chip market is growing with a worldwide estimated value at

$75B

Those counterfeits are believed to have been integrated into more than

$169B

of electronic devices

Source: Semiconductor Engineering

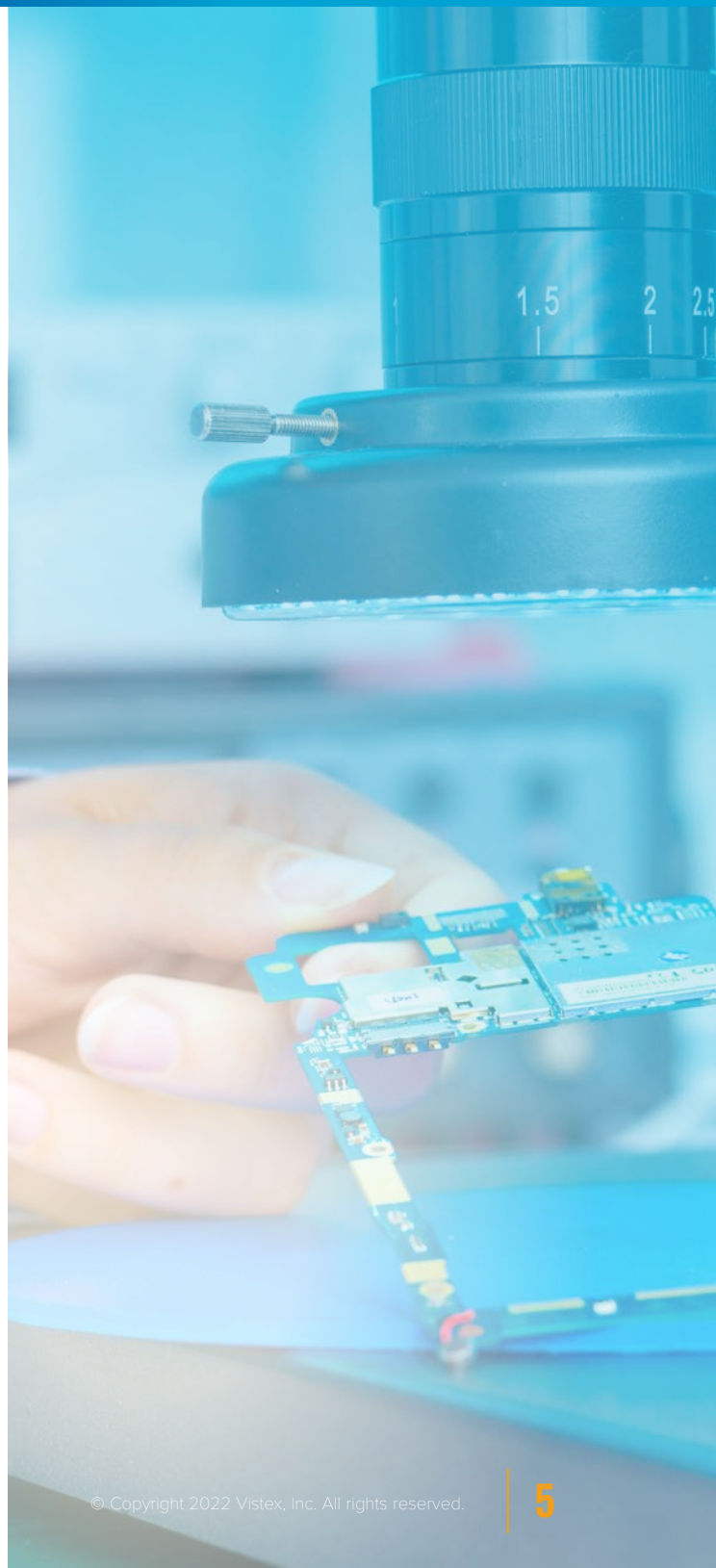
Brain freeze: the impact is crushing

Semiconductors, revered as the “brains” of modern technology have become the manufacturer’s biggest headache. Traditionally, even though semiconductors have been at the core of technological innovation and have changed the world beyond any other technology, they have often been seen as a commodity and rarely appearing in the spotlight.

This all changed with the acceleration of digital transformation across industries, work and lifestyles. Semiconductors are enabling new technologies and applications, such as AI and IoT, sparking a new wave of innovation for the industry.

In addition, the implementation of 5G networks coincides with the growing demand for faster high-performance computing devices in the Cloud and at the edge. Cars today are far more complex than ever before. They need anywhere from several hundred to more than a thousand chips that control everything from the engine motor control to the seat control. While fabricators are working around the clock to meet demand, some industries see this as a freeze on production ultimately, crushing sales.

Individual chips are packaged inside electronic control units. You can compare it to the inside of the human body where each organ has a different function equal to that of a chip’s function. Just as the brain tells the organ how to work, the chip tells the hardware what to do. In the auto industry for example, cars are just sitting idle in lots waiting to get the chips that control many basic functions in addition to the highly sought-after advanced tech features. This freeze has forced manufacturers like you to look at how chips and supply chains are managed in the short term. One solution, when you don’t have adequate supply, is to use less. And for the automotive industry that means less advanced tech features on cars. For you, it could equate to a similar compromise or perhaps one even more crushing to your business growth goals and reputation.



Stranger danger alert

There's not much buzz around the impact this shortage has on the many small (and not so small) manufacturing companies that are similarly affected. These businesses typically don't have the type of purchasing clout that multi-billion-dollar firms have. Due to lower purchase volumes, many companies purchase semiconductors from electronic component distributors.

About a quarter of all semiconductor sales go to companies that purchase through distribution channels. This problem can also affect multi-billion-dollar manufacturers. Although a company's overall sales revenue may be in the billions, their overall use of semiconductors may not be that significant. This essentially puts them in the same boat as a small manufacturer.

Alternative sources and dangers

How do smaller and mid-sized companies maintain their supply of chips? When the supply of chips dries up in the distribution channel due to increased demand, it is sometimes necessary to turn to alternative sources such as securing the services of a company that specializes in locating hard-to find components. But danger often lurks–and businesses like yours, no matter what the size, must be very cognizant of counterfeit parts.

The difference between genuine semiconductors and counterfeits couldn't be more extreme. As explained by the Semiconductor Industry Association, chip manufacturers spend billions of dollars each year developing, manufacturing, and testing products that will perform to the highest standards and reliability levels for many years. Counterfeit chips sneak quickly into the supply chain as desperate companies, hoping to resume production, turn to third-party marketplaces known as the gray market. "Gray" because while the purchase is legal (unlike the black market), the chips sold are misrepresented as genuine.

The gray market for semiconductors is not a new phenomenon and it frequently takes advantage of companies that cannot find the supply they need. Generally, these fake electronic components range from copies of the real deal to older parts that have been refurbished to look brand new. The final product might meet basic quality standards, and it may even function acceptably during your end-of-line testing process. However, it will not go through any of the long-term durability testing processes or reliability criteria that authentic chip manufacturers invest time and money into to validate authenticity.

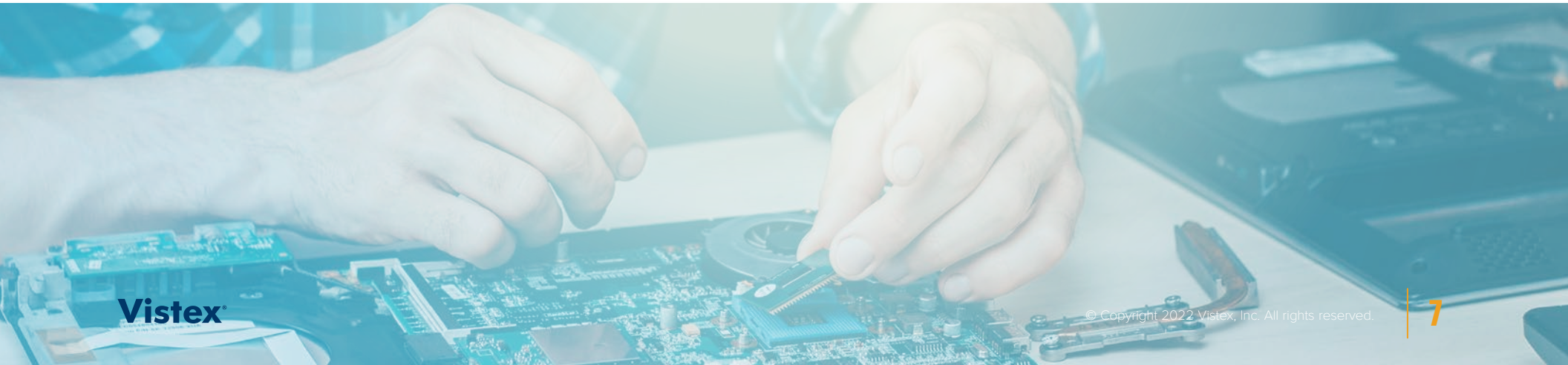
The component is bound to fail after some time or under certain conditions–and it could mean big trouble for the companies that purchased it to manufacture their products. Therefore, when purchasing parts from these specialty companies, manufacturers need to be extra vigilant to ensure that they are buying legitimate components. This is especially true when they are dealing with independent distributors, who buy and sell components on online open markets. Parts can change hands at various times and it can be difficult to trace back the origins and credentials of the original seller.

Purchases from the open market can turn into an extremely costly mistake, particularly if system failures result in millions of dollars in warranty expenses and liability claims against your company. Moreover, the cost of high failure rates on electronic systems due to counterfeit components can be even greater if these failures result in major damage to the brand and the loss of future business. Most importantly, the economic harm can be almost incalculable if counterfeit semiconductors result in critical infrastructure failure or tragically, if counterfeits in safety-critical electronic equipment cause loss of life.

Consumer and industrial businesses
are losing approximately **$250 billion**
each year because of counterfeit components.

Source: Industry Week

Due diligence in selecting a third party source therefore becomes mission critical.



Testing 1, 2, 3

A legitimate third party source will have access to a network of qualified partners that have the necessary test equipment and know-how to screen for potential counterfeit chips.

3 ways to test for counterfeit or reused chips:

Use a process known as embedded hardware security primitives and sensors. Hardware primitives produce electronic fingerprints which can be used to authenticate the component being tested. Specialized sensors offer additional countermeasures against counterfeits.

Test for counterfeits via the electrical testing of the chip, checking for performance abnormalities in its electrical behavior and other indicators of tampering.

Conduct an external and internal physical inspection of the chip. Counterfeit chips can have visible burn markings, discoloration, blacktop coating, dents, tooling marks, and numerous other defects on the exterior. A high-intensity microscope is often used to examine each chip down to the micron level to determine if it's safe or hacked. Internally, the compromised chip is tested using a 3D x-ray microscope to examine it layer by layer. Clues of tampering are often very subtle and require a trained eye plus precise equipment to identify.

An article recently published in the *Academic Times* profiled a promising new way of testing. Researchers at the Florida Institute for Cybersecurity (FICS) suggested a new way to detect recused and counterfeit electronic parts, especially chips. The technology holds promise in making supply chains more secure, protecting consumer safety, and runs at almost zero cost according to researchers. Dr. Forte, Dr. Maghari, and their collaborators, Sreeja Chowdhury and Fatemeh Ganji, had the insight that one extremely common component—low-dropout regulators or LDOs—could provide a methodology to validate chips. These researchers found that measuring how the LDO regulators respond to variations in the input presented to the chip's power supply yielded an aging signature which could be analyzed to determine if the chip is a recycled-type counterfeit or not.

Source: *E&E News Automotive*

In June Oki Engineering has opened a chip verification service. They received

150 **inquiries** by August.

After studying 70 cases it found **problematic chips** in approximately

30%

How long will it last?

Opinions vary on how long the shortage will last. A U.S. Department of Commerce survey indicates the shortage is expected to continue at least through the second half of 2022. The CEO of a major chipmaker estimated it will last through early 2023. One thing everyone can agree on—until more chip manufacturing capacity is available, the shortage will persist and so will the counterfeiters. It remains mission critical to adopt procurement policies requiring purchases through authorized sources to protect the health, safety, and security of everyone that depends on your electronic products and systems daily.

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About the author | Chris Phelan, Industry Principal, High Tech at Vistex

Chris Phelan specializes in multiple areas of manufacturing and high tech including advanced R&D, new product development, process and quality engineering, product management, and global sales management. With 25 years of experience, Chris has worked for GE Aircraft Engines, and New Venture Gear, a joint venture between General Motors and Chrysler. He also led global sales teams at Marquardt, a high-tech company specializing in electronic switches, sensors, and controls. Chris holds a BS from Rochester Institute of Technology and an MBA from Syracuse University.

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