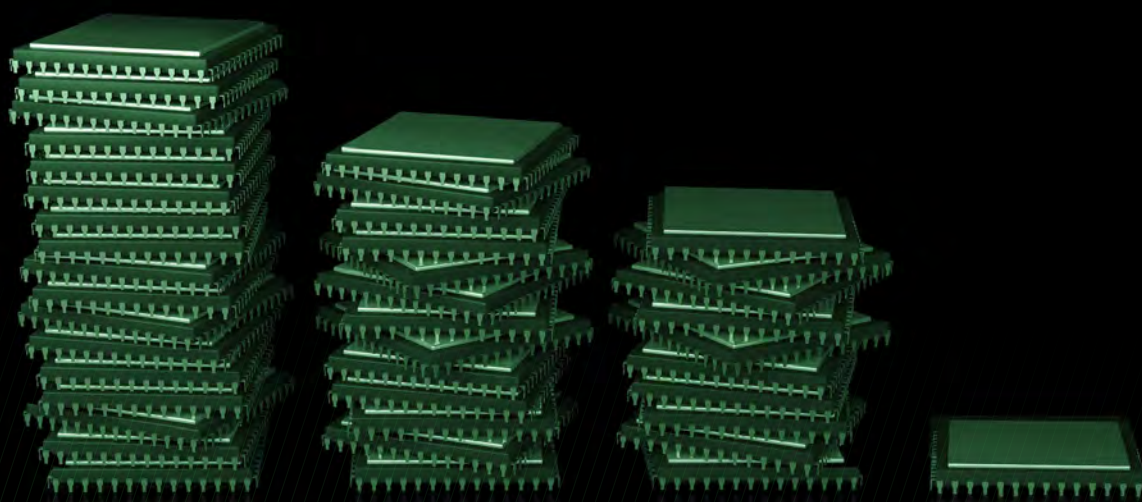


# / DECONSTRUCTING THE CHIP SHORTAGE

The impact on engineering and product design



# DESCONSTRUCTING THE CHIP SHORTAGE

## How it's upending product design, sparking resourcefulness

As our survey results confirm, the global semiconductor shortage has resulted in longer lead times, higher prices, more time spent searching for parts, and the adoption of new tactics to compensate when preferred parts are not available. The survey also shows that engineers don't expect the situation to change much over the next 12-18 months.

A key theme underscored in the data is the high degree of resiliency and resourcefulness with which design engineers have responded to the problem — a storyline overshadowed by the very real logistical challenges facing the industry.

As the global chip shortage persists, product design engineers are pursuing new ways to get their jobs done. They have had to be resourceful, impacted by a shortage that continues to be fueled by surging demand as pandemic-related production and distribution disruptions drag on, amplified by capacity issues in wafer, assembly and test. The results: Skyrocketing chip prices and more time spent searching for parts versus focusing on design.

### RESEARCH HIGHLIGHTS:

- More than three-fourths of respondents say finding the parts they need has been a "very significant challenge."
- Respondents report that microcontrollers (MCUs) are the most constrained of all parts.
- Among those who reported a significant impact from the chip shortage, close to all (93%) said they are experiencing longer lead times. A strong majority expect lead times to worsen and prices to rise in the next 18 months.
- The shortage is changing the priorities for engineers when choosing parts; 64% say that availability drives the selection process today.

- The use of alternative parts is causing engineers to redesign boards and make changes in software and firmware.
- Design engineers are using alternative sources for parts.
- When using non-authorized distribution channels, engineers have significant concerns about counterfeit parts control, which could compound design and quality issues.

The survey unveiled a significant opportunity for distributors to recognize and support their engineering customers' resourcefulness by becoming even more of an information hub. As customers continue to navigate the shortage, distributors can deliver access to data on parts and alternative options and provide expertise and insight. They can also help customers rethink their design process in the context of market trends.

### SURVEY METHODOLOGY

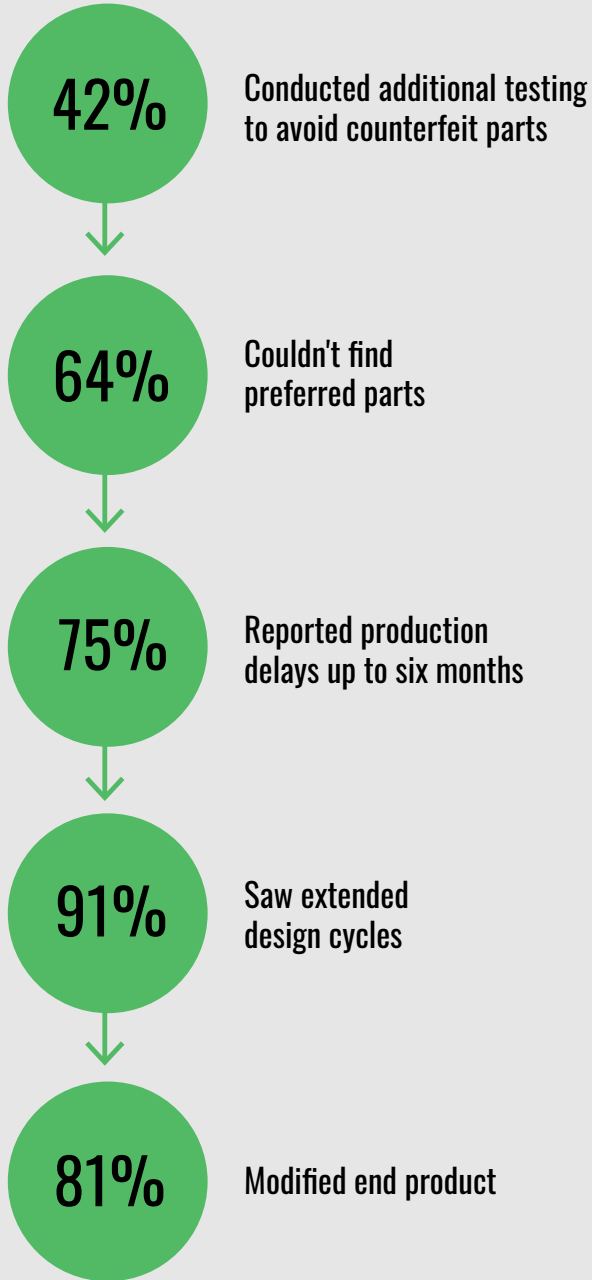
This Avnet Insights report documents how the ongoing chip shortage is impacting how engineers buy and design with electronic components. The survey was conducted among 530 global engineers who are Avnet customers. By Avnet business region, 31% of respondents were based in the Americas, 56% in EMEA, 10% in Asia and 2% in Japan. The respondents represent a wide range of companies from contract manufacturers to electric vehicle makers.

The survey results reflect the experience of engineers who took the survey and are not representative of the overall population and market conditions.

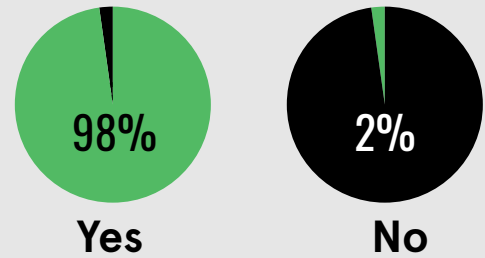
**"ONE IMPACT OF THE CHIP SHORTAGE HAS BEEN THE SHIFT FROM ENGINEERS DESIGNING IN THEIR FIRST CHOICE OF COMPONENTS TO THE FIRST AVAILABLE. TO AVOID COMPROMISING QUALITY, THIS REPRESENTS AN OPPORTUNITY FOR THEM TO SELECT PARTNERS WITH ADDED VISIBILITY INTO THE SUPPLY CHAIN TO ENSURE THEY ARE CREATING FLEXIBILITY IN THEIR DESIGNS BASED ON MARKET CONDITIONS."**

**— PEGGY CARRIERES, AVNET VICE PRESIDENT, SALES ENABLEMENT & SUPPLIER DEVELOPMENT**

# CHIP SHORTAGE IMPACT ON ENGINEERS

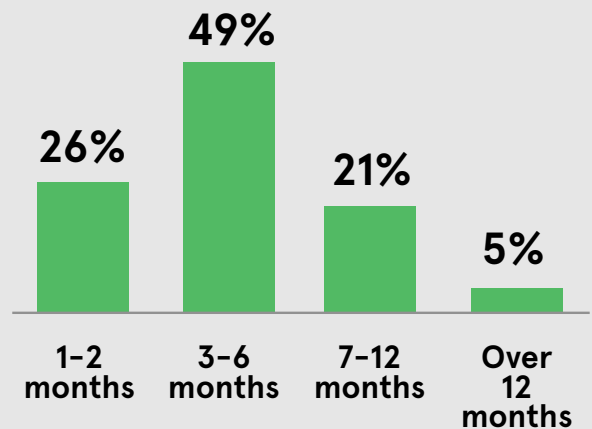


## Has parts access been a challenge?



As customers continue to navigate the shortage, distributors can deliver access to data on parts and alternative options and provide expertise and insight while also helping customers rethink their design process in light of market trends.

## Production delay due to shortage



# CHIP SHORTAGE IMPACTS

## THE SHORTAGE IS WREAKING HAVOC ON PRICES AND LEAD TIMES

Our survey confirms what many OEMs have been coping with over the past two years: The parts shortage is having a major impact on engineers in every region of the world and nearly every industry.

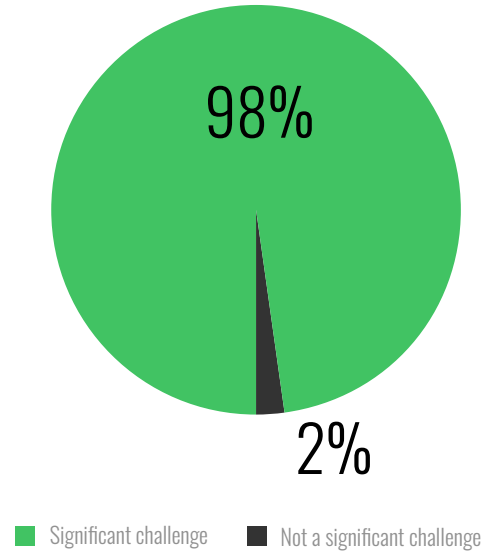
It's also driving prices up and resulting in extended lead times to get parts, impacting design and production schedules. Our data is consistent with [findings issued](#) by the U.S. Commerce Department in January 2022. Chip demand is outstripping availability, inventories are falling overall as companies pull from buffer stock to meet immediate production needs and design cycles and production schedules are being pushed out.

To what extent has the shortage of electronic components been a challenge for engineers? Virtually all survey respondents think the shortage is significant (98%), with 78% calling it a "very significant challenge."

Across industries, engineers working in the telecom, consumer electronics, automotive and aerospace sectors express the most concern. Although all regions worldwide are showing strain, respondents from EMEA and Japan expressed the most concern. The Americas aren't far behind.

## Engineers report major impact from chip shortage

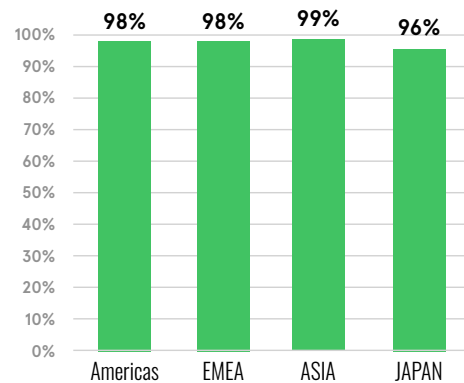
(% respondents)



■ Significant challenge ■ Not a significant challenge

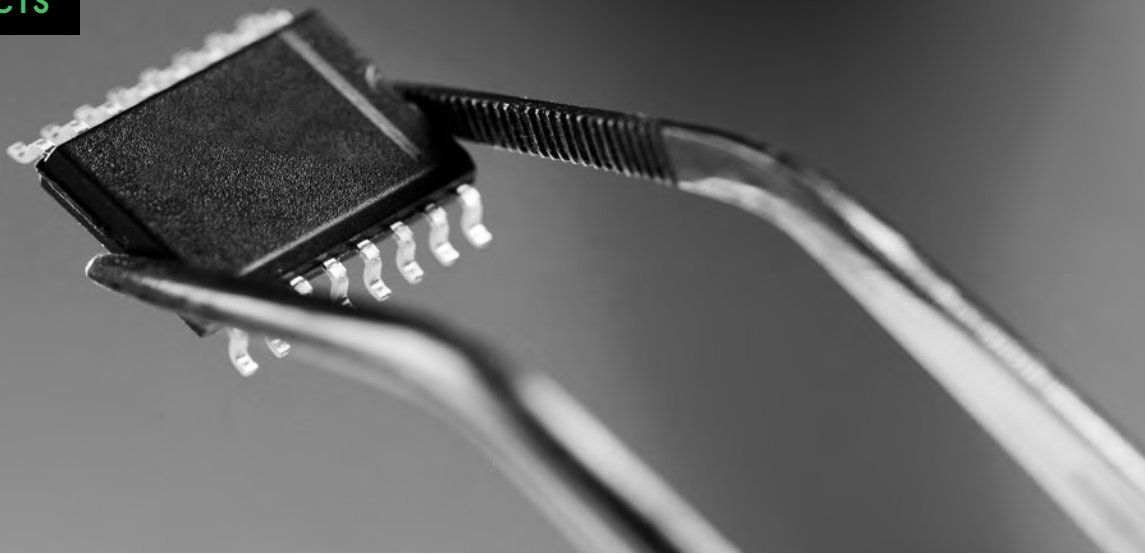
## All regions impacted by shortage

(% respondents)



“WHEN WE TALK WITH SUPPLIERS AND ASK, ‘WHAT’S YOUR AVAILABILITY HORIZON?’ THEY’LL TELL US IT’S 50 WEEKS OUT. BUT YOU CAN’T JUST DELAY A PRODUCT INTRODUCTION FOR 50 WEEKS.”

— EV ENGINEER



### MCU SHORTAGE IS CAUSE FOR MOST CONCERN

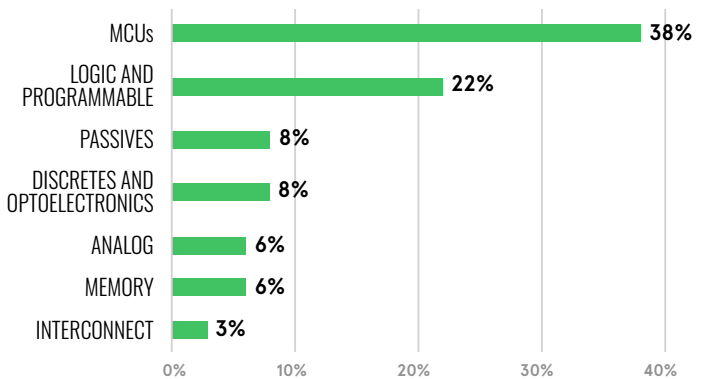
While the shortage is a challenge across all product categories, respondents said they are most concerned about the availability of MCUs. Logic and programmable logic parts came in second in terms of concern.

What is the significance of an MCU shortage? Notably, their widespread use. MCUs can be found in just about every type of electronic product today and they are critical to some of the fastest-growing industries, including medical devices and automotive.

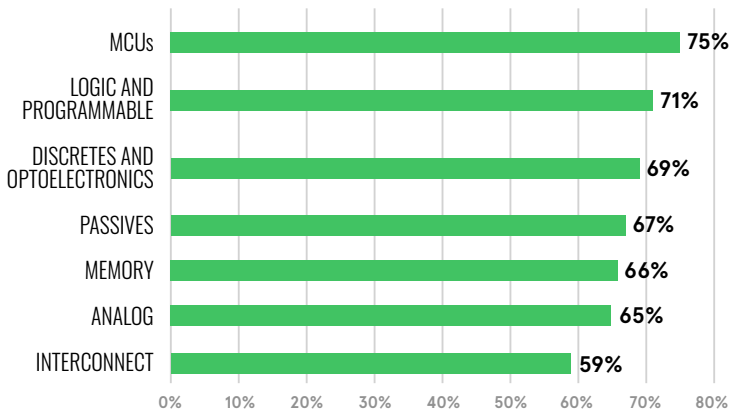
The challenge with MCUs is that unless a drop-in replacement is available, changes in not only the hardware but also the software and firmware are necessary. In many cases, these modifications may be extensive enough that a redesign is likely to be easier and quicker.

With engineers everywhere chasing the parts they need, lead times for many MCUs have stretched to 50 weeks or more. And the limited supply has led in some cases to dramatic price increases.

MCUs most significantly impacted (% respondents)



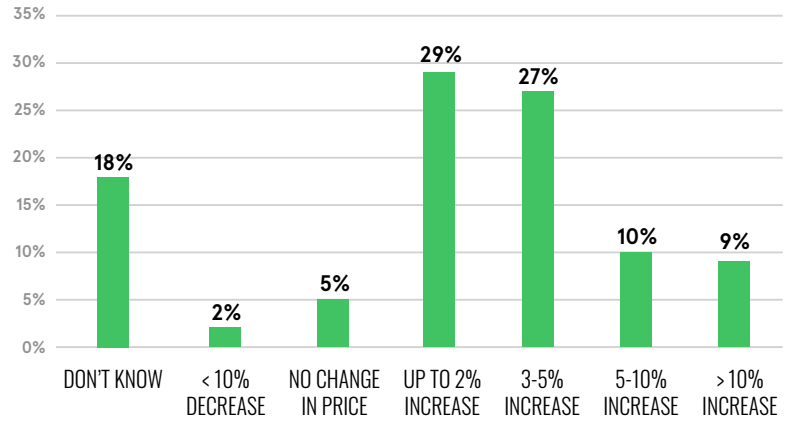
Prices rising for all part categories (% respondents)



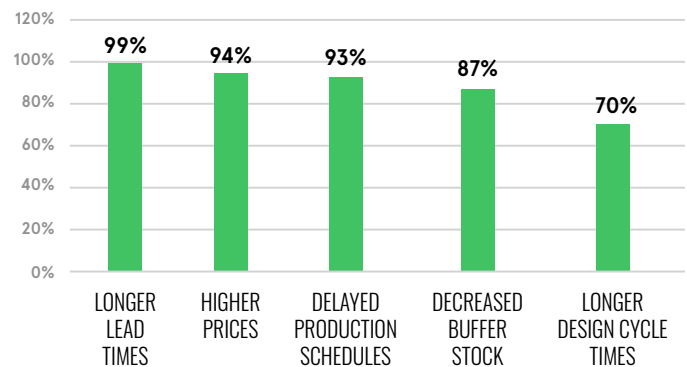
Survey respondents say that MCUs have seen the biggest markup of all component types, with some reporting increases of more than 10 and even 20 times that of pre-pandemic pricing. Worse yet, more than 80% of respondents expect prices to go up even more in the next 18 months.

As lead times grow, many respondents say they are drawing from buffer supplies to meet immediate production needs, with 87% reporting that dwindling inventory on hand is a challenge. Even so, delays in production have not been entirely avoidable, with three-fourths of respondents reporting slippages of up to six months due to lack of parts. Some report pushing schedules out by over a year.

### How MCU prices changed (% respondents)



### Chip shortage ripple effects (% respondents)



**“FOR THE MOST PART, WE’VE BEEN ABLE TO GET THROUGH. BUT NOW WE’RE LOOKING AT THE PROSPECT OF HAVING TO DO BOARD REDESIGNS BECAUSE WE CAN’T GET THE EXACT PARTS WE NEED.”**

**— SENIOR HARDWARE ENGINEER FOR LUXURY EV MANUFACTURER**

# / THE SEARCH FOR PARTS

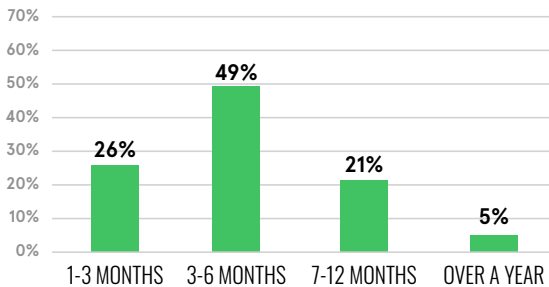
## SCRAMBLING FOR PARTS, ENGINEERS BECOME RESOURCEFUL

Parts selection is one of the most critical steps in product design. To optimize their designs, engineers consider trade-offs in performance, cost and other key attributes. But with parts in short supply and long lead times, two-thirds of engineers (64%) say they are now creating new designs based on the availability of components rather than preference.

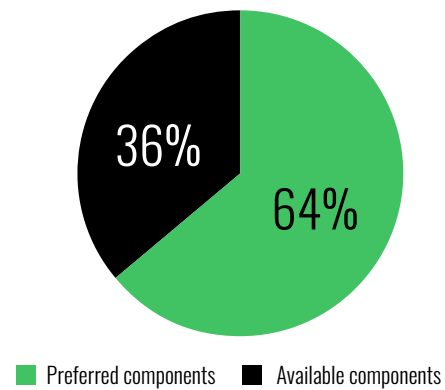
When a needed part can't be found, the first and best course of action is to find a drop-in replacement with the same functionality and better availability.

Unfortunately, although supply varies by part, the market remains extraordinarily constrained and often engineers are not able to find a direct replacement for an out-of-stock part.

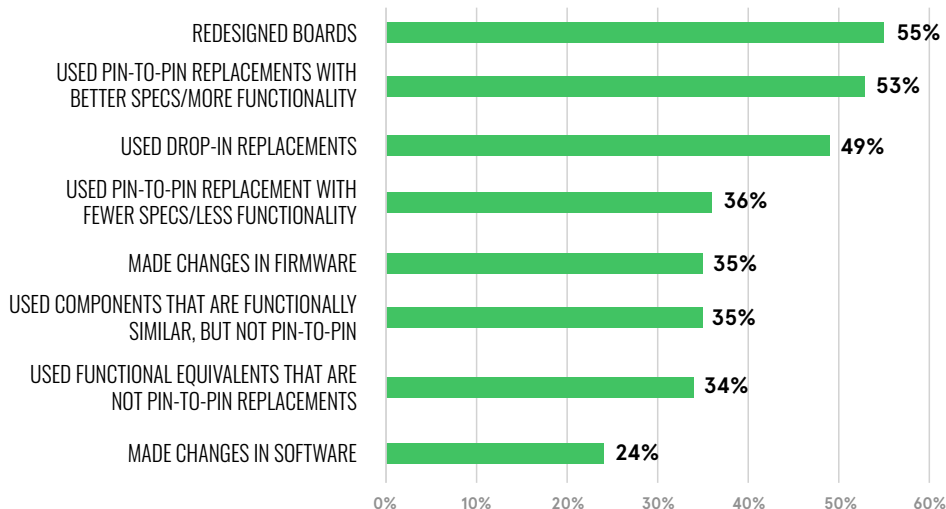
### Production schedules pushed out (% respondents)



### Engineers pivot to use of available rather than preferred parts (% respondents)



### How engineers adapted when preferred parts weren't available (% respondents)





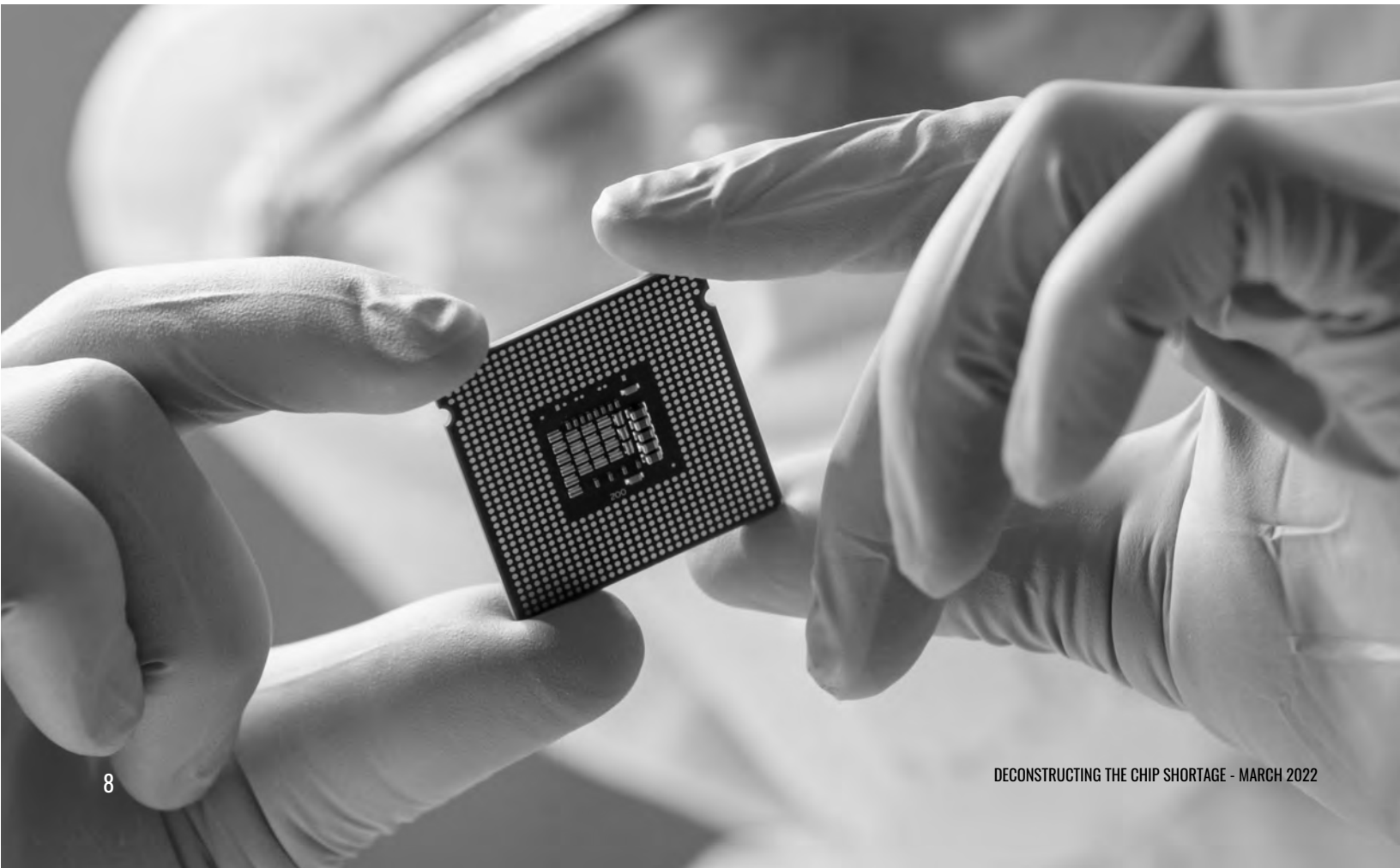
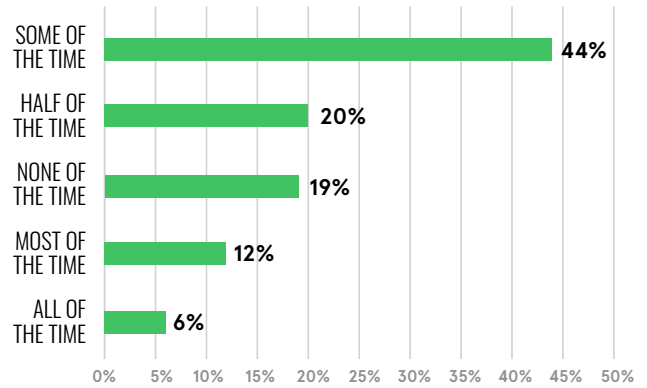
When that is the case, over half of respondents (53%) say they are considering parts with better availability, more functionality and better specs; 35% are considering parts with less functionality and fewer specs.

Switching to a different part means more work. Over half of respondents (55%) say they are currently redesigning boards. They also report making firmware (35%) and software (25%) changes. The additional work is having an impact on design cycles, with 91% reporting at least a slight impact on design cycles; 40% report a major impact.

In the case of critical or strategic components, significant resources may also be required to conduct testing, approvals and certifications. This extra engineering time impacts the product development cycle, ultimately delaying time to market.

The use of substitute parts is also having an impact on the final product, with 81% of respondents reporting the need to modify the performance and functionality of the final product.

## How often engineers said they modified product performance, functionality due to shortage (% respondents)





# COMBATING COUNTERFEIT PARTS

## ENGINEERS ARE CONCERNED AND TAKING STEPS TO COMBAT COUNTERFEIT PARTS

The upshot is that engineering teams say they are spending more time and energy sourcing parts from multiple channels, taking time away from engineering tasks as they take on more of a procurement role and work to manage strategic relationships. Some companies that traditionally used partners to source parts say they have gotten back into the parts-acquisition business.

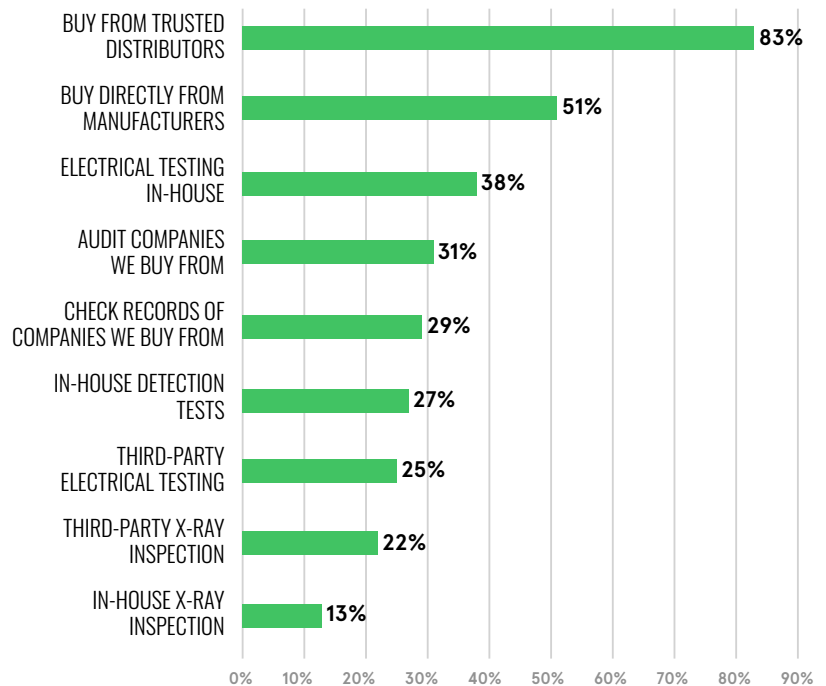
Because our survey focused on Avnet Silica customers, we know that they value distributors. So, it's no surprise that survey respondents say they do a moderate to great amount of business through distributors (95%), while 58% say they are going direct through manufacturers and 52% say they are also using the spot market, or brokers.

Unlike franchised distributors who are authorized by a manufacturer to distribute its products, the spot market is an independent distribution channel that typically specializes in hard-to-find parts and excess inventory. Because the spot market is not authorized by manufacturers to sell their parts, it poses more potential risks for buyers in the way of counterfeit, defective and repackaged products.

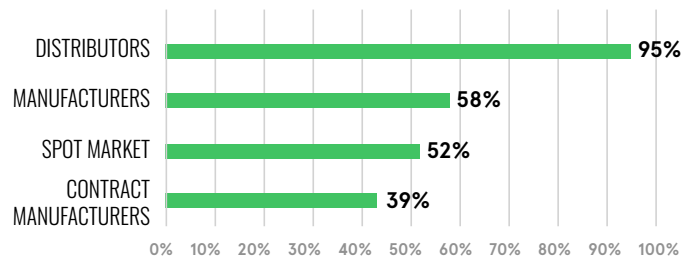
To avoid the risk of counterfeit parts, a majority of respondents say they work through trusted distributors or purchase directly from manufacturers. When they do buy from the spot market, engineers say they are doing due diligence by checking records and performing audits. Others say they work only with brokers they trust.

One-third of respondents (35%) say that the problem of counterfeit components will increase. Close to half (42%) of respondents see a need for additional testing for counterfeit parts, and they are taking active steps by conducting in-house tests such as X-ray detection or hiring a third party to do testing and qualification of the parts.

## How engineers are managing risk of counterfeit parts (% respondents)



## Searching for parts, engineers turning to multiple sources (% using the specific channel a moderate to great deal)



# WHAT THE FUTURE HOLDS

## Engineers anticipate longer lead times and higher prices

Continuously searching for available parts, modifying their designs, taking steps to identify counterfeit parts, and shoring up stock on hand all have become *de rigueur* for engineering teams large and small today.

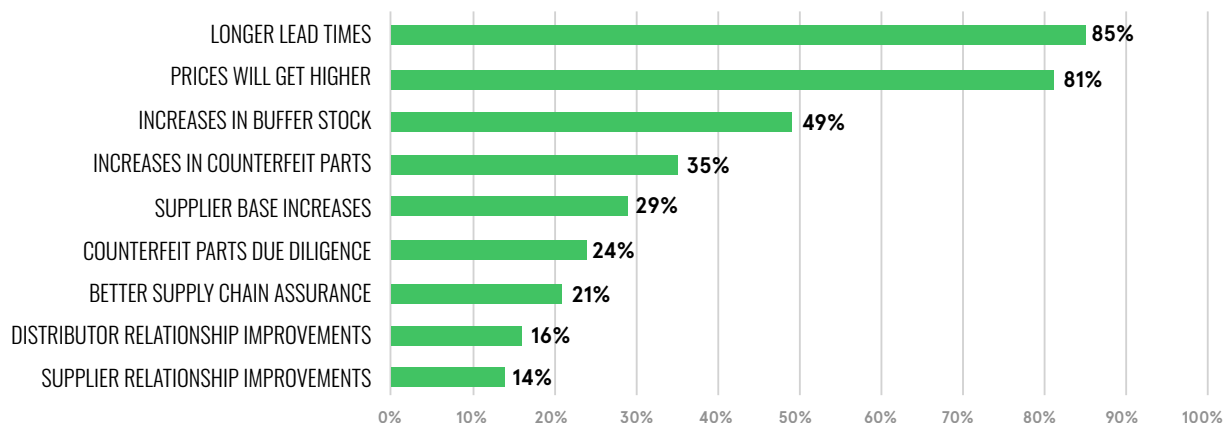
What does the future hold? While there are varying opinions on how long the shortage will continue and how severe it will be, the fact is no one can predict exactly what will happen and what the long-term impact will be. Most respondents, however, do think that lead times will continue to increase (85%) and prices will rise (81%) over the next 18 months.

Engineers are taking several actions to prepare. Whenever possible, they're increasing their levels of buffer stock, widening their supplier base, and changing their design

approaches. They are designing for resiliency – selecting key components with drop-in alternatives that can be sourced from different suppliers. They are testing for counterfeit parts either in-house or contracting with a third party. They also expect to improve relationships with supplier teams and distributors. And in some cases, engineering teams are training in-house staff to take on procurement and testing duties they in the past contracted with partners to conduct.

Engineers expect the steps they are taking to not only get them through this current shortage, but also will provide them with the flexibility and resourcefulness needed to outmaneuver disruptions in the future.

What engineers anticipate in next 18 months  
(% respondents)



“THIS YEAR I’VE SPENT A SIGNIFICANT AMOUNT OF MY TIME IDENTIFYING AND TESTING ALTERNATE SOURCES FOR EXISTING DESIGNS. WE’RE STILL OUT LOOKING FOR DROP-IN REPLACEMENTS AND ARE NOW LAYING OUT A NEW PCB TO ACCOMMODATE POTENTIAL ALTERNATE SOURCE FOOTPRINTS.”

— SENIOR RF HARDWARE ENGINEER

# / SUMMARY

The global semiconductor shortage is upending electronic product design cycles, extending production lead times and raising prices.

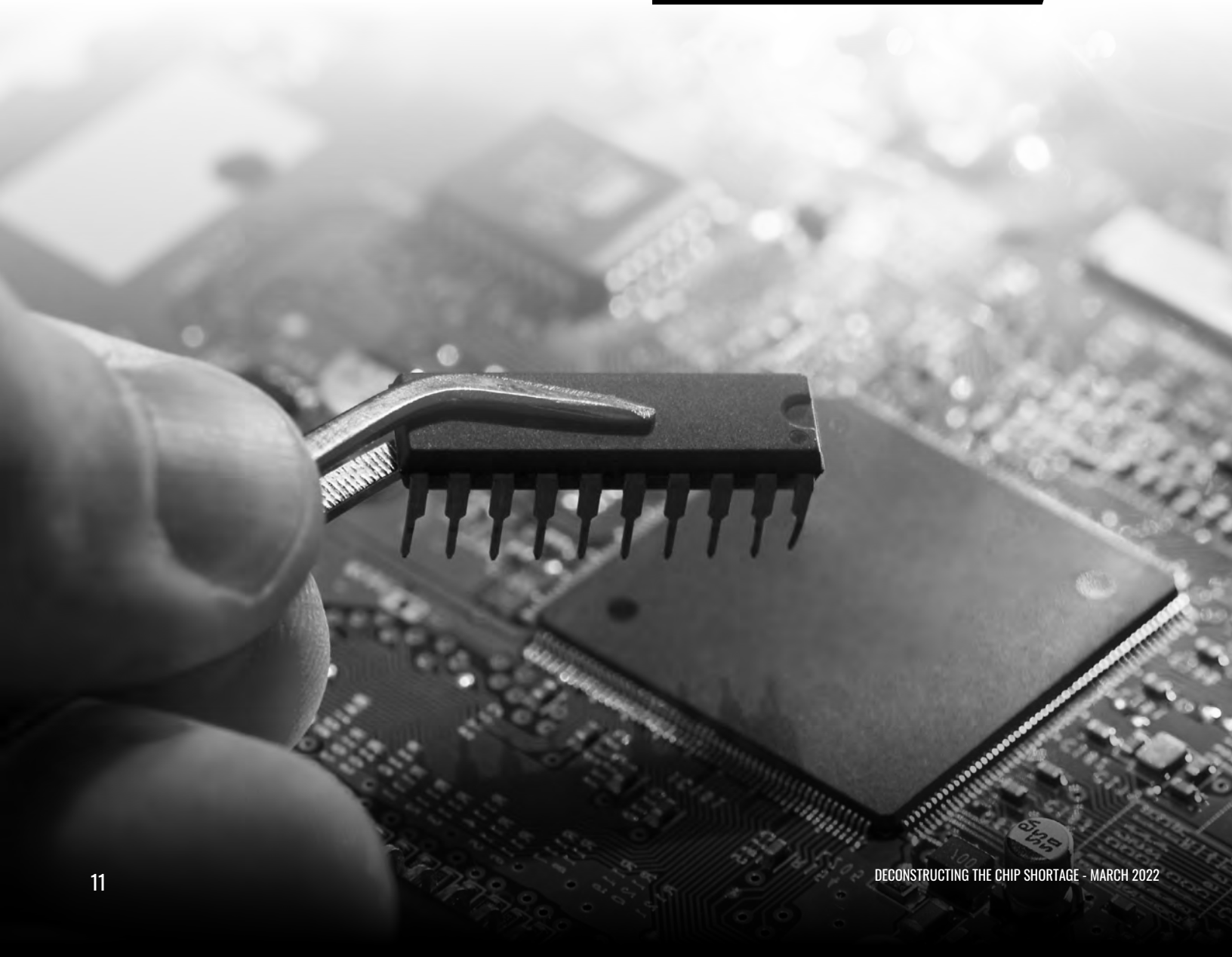
To combat the parts shortages, design engineers have unleashed their problem-solving skills and resourcefulness to find the parts they need to get the job done. They are working new angles to procure parts, prioritizing the use of available chips and making modifications to their designs. Many are now selecting components for new designs with a wider set of alternative sources.

Our survey shows that whether they be franchised distributors, suppliers or independent distributors or brokers, the companies that can ensure reliable continuity and supply of components to their customers will have true, high-value market differentiation.

Working with a distributor like Avnet Silica during these challenging times can prove invaluable for getting access to component lead times, insight into dates for new product launches, and mitigating supply chain risk.

## FOR MORE INFORMATION

[DESIGN SUPPORT AND ADVICE](#)



## ABOUT AVNET SILICA

Whether you're developing a complete edge to cloud concept, working on a new design or facing complex supply chain issues, Avnet Silica is the partner that fully anticipates your challenges and requirements. Solving your problems is what we do best. With decades of experience in hardware components and supply chain, deep knowledge of edge devices and investments into IoT platforms, we bring the solutions that drive your success. And we're supported by most of the world's-leading suppliers of electronic components, embedded modules, and software solutions. From product design and build, to custom IoT solutions, and supply chain management, we can help you design and innovate faster, with the insight and visibility to stay at the top of your game.

Learn more at [www.avnet-silica.com](http://www.avnet-silica.com)