

# BUILDING PIEZO HAPTIC TRACKPADS FOR WINDOWS 11



# MICROSOFT IS EMBRACING HAPTIC TRACKPADS WITH WINDOWS 11

As mentioned before, Microsoft unveiled on September 22nd their new lineup of Surface devices and had one big surprise for future PCs. For the first time, Microsoft is using a haptic trackpad in their flagship Surface book line! To help PC OEMs embrace the new technology, Windows 11 will support any new haptic trackpad technology and allow the user to control the haptic feedback intensity via a simple slider.

The main reason behind this shift? Microsoft wants PC OEMs to build thinner and lighter devices with better trackpads. Just like they did in 2013 with the Precision Touchpad Program (PTP), Microsoft is taking the lead to create a new industry standard for haptic trackpads.

Now that Microsoft has officially opened the gate for better trackpads, how can PC OEMs accelerate their trackpad development and capture a significant market share? Look no further; Boréas Technologies' piezo haptic trackpad technology is ready for the next generation of PC HMI.

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## Piezo haptics is the future of trackpads

The biggest motivation for computer OEMs to pursue haptic trackpads is their thinness. Mechanical trackpads typically measure more than 3 mm thick. Haptic trackpads can measure below 3 mm. However, only piezo haptics enable the thinnest designs.

LRA (Linear Resonant Actuator) module designs usually are around 3 mm thick. The thickest part of the module is the LRA itself. While you may find and use thinner LRA, you will do it at the expense of a considerable trade-off in haptic feedback quality. Bad haptic feedback will result in weak and unrefined (soft) clicks and annoy the user. As a result, the trackpad will feel odd and weird. Since the end goal is to have the best user experience, you should be very careful when selecting your actuator. To have good haptics, you will need to use a bigger LRA. Usually, LRA needs to be at least 3 mm thick to reach an acceptable performance level in trackpad modules.

On the other hand, piezo actuators have different form factors, are thin, and have an excellent haptic response. You can use various piezo actuators to build your trackpad module and go as thin as 2.4 mm! Plus, piezo actuators can be used as sensors and actuators, thanks to the reversible piezoelectric effect. The BOS1901 piezo driver, with built-in sensing, enables a reliable and straightforward piezo trackpad module design.

## Piezo Trackpads Need to Be Cost-Effective for Mass Adoption

New technology needs to trickle down to lower-cost solutions to reach mass adoption, and trackpads are no different. Of course, not all piezo trackpad designs are equal, but the Boréas team built their reference designs to enable mass adoption. Our piezo haptic trackpad reference designs leverage our core piezo driver CapDrive architecture and use simpler electronics, a more straightforward and reliable design than the competition, and fewer actuators. Boréas' reference designs help lower the trackpad module's total BOM cost and hit a more competitive price target for flagship and mid-end devices.



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## Boréas Integrates to Your Current Supply Chain

PC OEMs are already working with proven trackpad module suppliers. Boréas Technologies wants to accelerate piezo trackpads adoption and ease the architecture transition for PC OEMs. Therefore, we partner with your current trackpad module suppliers to add our proprietary piezo haptic technology to their trackpad modules. This approach adds value to your existing supply chain and makes it easier for PC OEMs to adopt piezo haptic trackpads.

## How to Build the Perfect Piezo Haptic Trackpad

To create a perfect trackpad, you need to consider two crucial things.

Firstly, there is no study, now a day, that gives us the parameters of a perfect click. The ideal click feeling is highly subjective. One may prefer a more powerful click, while another will prefer a softer click. Producing an industry-wide standard click isn't an easy task. Therefore, we work closely with OEMs to tailor the trackpad module according to their preferred click feeling.

Secondly, there are several specifications and factors to consider when creating a click. Each of these factors influences how we feel. For example, two trackpads with the same specifications can feel different if they use different hardware.

## What Are the Metrics to Consider?

Boréas' piezo trackpad modules allow your team to modify four specific variables: the variation of force, the shape of the waveform, the mechanical integration, and the trackpad's noise.

### The Force Variation

The human brain needs to detect a jolt at the level of the finger to feel a click. This jolt is produced by a sudden variation of force on the trackpad. For example, on a particular button prototype, we defined that a force variation of 1,2 newtons in a certain amount of time gives the brain excellent confirmation that the command has been executed. This is called the haptic sensation. The amplitude of the force we are going to feel is not that important. What influences this variation the most is the waveform which includes the electrical parameters and the mechanical integration (e.g.: choice of piezos). For example, we created multiple trackpads designs with different levels of force, but the better feeling designs were not necessarily the ones with the highest force outputs.

### The Waveform

The waveform signal is the graphical representation of the piezo driver voltage output over time. There are multiple types of waveform shapes (sine, square, triangle, etc.) and they all impact the force variation differently. Piezo actuators will create a jolt by deforming correspondingly to the piezo driver's waveform signal. For example, a square waveform has much more abrupt variation and will make a sharper click haptic effect than a sine wave.

## The Mechanical Integration

Mechanical integration encompasses everything that is not electrical, i.e., the type of piezo drivers, the rigidity and mass of the trackpad, and the attachment to the laptop.

The type of piezo actuators will directly influence the desired force variation when a current (the waveform) will excite it. The way it is fixed and supported in the system and the position can significantly influence the haptic effect (sensing and clicking) negatively. For example, poor quality of uniformity across the trackpad's surface will be a direct consequence of an inadequate mechanical integration. There is an infinity of solutions depending on the type of piezo actuators and the desired result. We might have to cushion a piezo that is too powerful if we want to give it, for example, a softer feeling.

## Sound

Sound is an essential part of haptics, but it needs to be optimized appropriately. Otherwise, it can break the user experience. Sound helps our brain understand that the click has taken place. However, the sound level needs to be aligned with the

trackpad haptic effect's force. Our engineering team can help you design the ideal sound level for your trackpad requirements.

## How to Choose the Right Piezo Actuator for your Trackpad

As discussed previously in the mechanical integration section, the piezo actuator choice will be crucial to reach the desired click haptic effect. You have four main options available: single and multi-layers piezo discs and piezo benders. They all feel different and require different mechanical integrations. In addition, price varies for every type of actuator and can influence your decision.

We have tested all types of actuators, and so far, we have not been able to identify the "best" one to use. Even with all the same specifications, all three piezo actuators make different click feelings. Boréas' BOS1901 piezo driver supports all three actuator types, so the OEM's required click will define the "best" piezo actuator. We also have partnerships with multiple piezo actuator manufacturers. So, if you need a custom actuator for your trackpad, we can do it for you.



## We Work Closely With OEMs to Tailor the Perfect Trackpad

On one side, piezo haptic trackpads have many variables that can be adjusted to create a different haptic click effect. On the other side, we have millions of human beings with varying preferences of click effects. So how do you create the perfect click? We believe that every OEM will have its custom piezo haptic trackpad. Windows 11 will allow each user to adjust the trackpad to their desire which will significantly help us achieve the perfect click.

### HOW THE CHIP SHORTAGE AFFECTS PIEZO TRACKPADS

The current chip shortage situation makes it more challenging for manufacturers to meet market needs. While some suppliers have longer lead times, Boréas production capabilities aren't affected. Let's see how the actual situation affects Boréas and why PC OEMs don't have to put their business at risk.

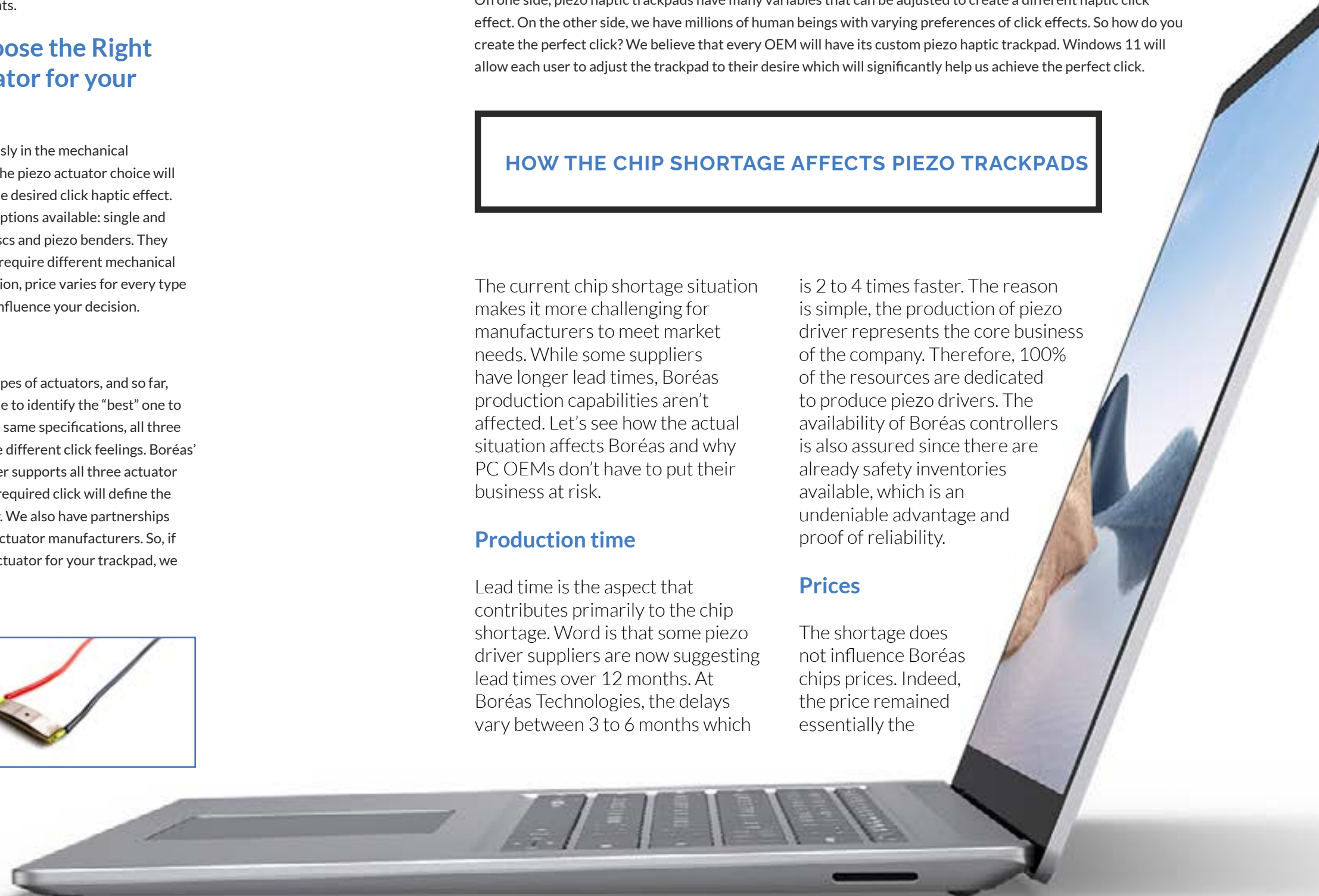
### Production time

Lead time is the aspect that contributes primarily to the chip shortage. Word is that some piezo driver suppliers are now suggesting lead times over 12 months. At Boréas Technologies, the delays vary between 3 to 6 months which

is 2 to 4 times faster. The reason is simple, the production of piezo driver represents the core business of the company. Therefore, 100% of the resources are dedicated to produce piezo drivers. The availability of Boréas controllers is also assured since there are already safety inventories available, which is an undeniable advantage and proof of reliability.

### Prices

The shortage does not influence Boréas chips prices. Indeed, the price remained essentially the



same compared to those of competitors, which in some cases increased by 10 to 20%. The reason remains the same; Boréas Technologies is a reliable company entirely dedicated to producing piezoelectric chips, which allows them to ensure stability in the selling price of their products.

### Volume

Another point that allows Boréas chips to stand out in the market is the company's capacity in terms of volume of production. With a production capacity that has not yet reached its full potential, Boréas Technologies can accommodate up to 20 million units yearly. Currently, it is difficult to provide the same quantity as before the Covid pandemic in the industry. As a result, suppliers can no longer ensure the same business agreements as before, unlike Boréas, a trustworthy and profitable option.

Production times, chip prices, and production volume are the three elements that explain the chip shortage and why it is difficult to meet market demands. All these elements are directly linked together and negatively impact the economic performance of companies. However, they are also the same three elements that allow Boréas Technologies to ensure that future customers get an exceptional quality of service with a superior quality product. Reliability is the essence of Boréas.

“ **WITH A PRODUCTION CAPACITY THAT HAS NOT YET REACHED ITS FULL POTENTIAL, BORÉAS TECHNOLOGIES CAN ACCOMMODATE UP TO 20 MILLION UNITS YEARLY.** ”



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## WHY BORÉAS BUILDS THE BEST TRACKPADS

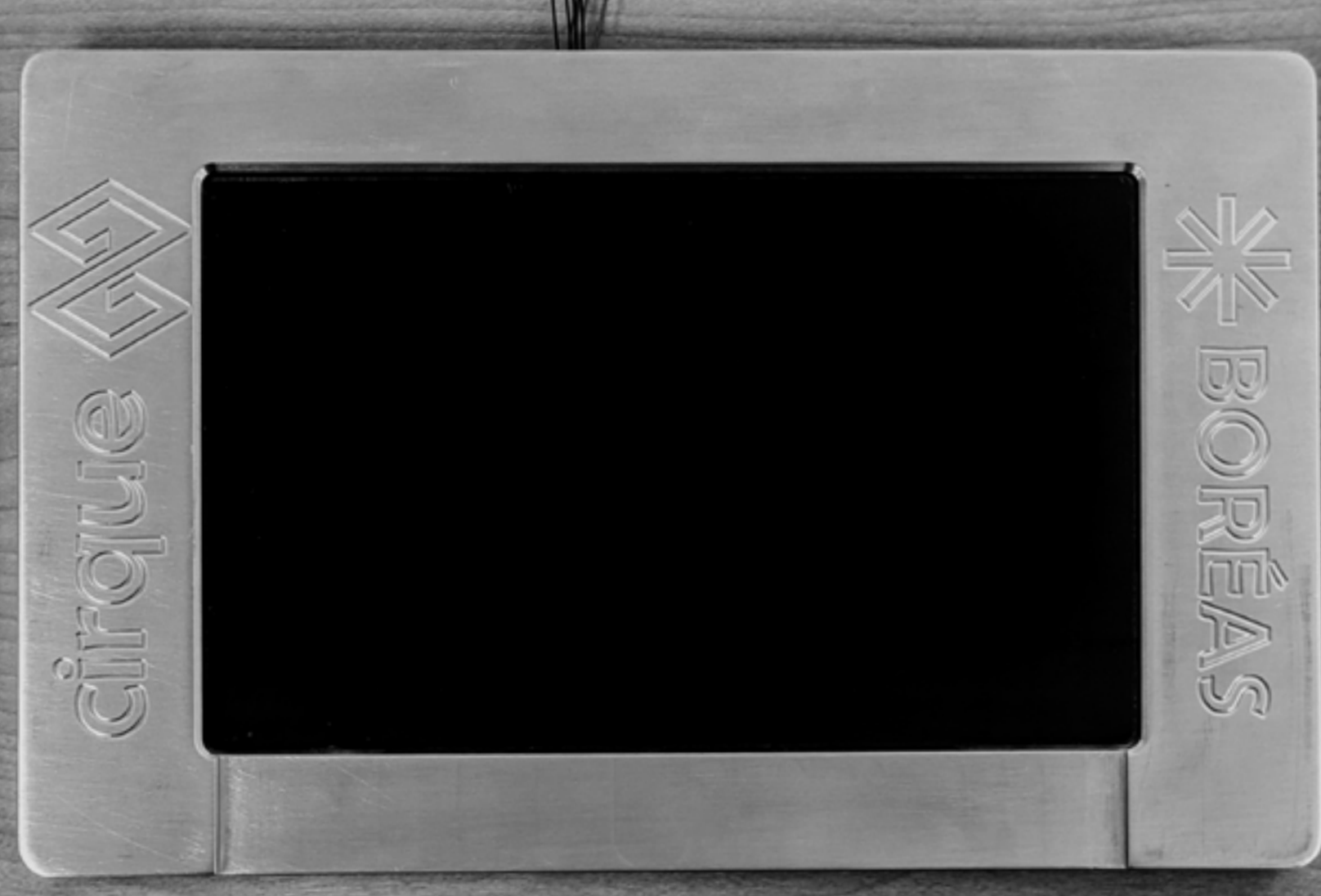
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Boréas Technologies is at heart a fabless semiconductor company designing the most power-efficient piezo haptic drivers. While we believe our piezo drivers were the missing piece for piezo haptics mass adoption, we also understand that our expertise needs to be multidisciplinary to support our customers' design, engineering, and software teams. Therefore, we have in-house expert mechanical, electrical, and software engineering teams to support your business.

For the trackpad market, we partner with establish touchpad suppliers, like Cirque Corporation, to ensure that the piezo haptic trackpad module aligns with your manufacturing requirements. It also makes the whole supply chain easier to manage for PC OEMs.

### **BOS1901: The Technology Behind The Best Piezo Trackpads**

The piezo haptic layer used in our trackpads is thin. It uses a simple mechanical design that



**THE BOS1901 CAN BE UP TO 10X MORE EFFICIENT THAN THE COMPETITION THAT USES NON-EFFICIENT ARCHITECTURES.**

**Boréas Technologies' Piezo Haptic Trackpads Are Ready For Your Next Computer Design.**

Our technology is ready for mass production. Windows 11 is ready to support haptic trackpads. It's now up to PC OEMs to differentiate their products with better trackpads. Boréas Technologies can accelerate your projects and help you grow your business.

Reach out to [info@boreas.ca](mailto:info@boreas.ca) to try our latest trackpad demos and start working on your next piezo haptic trackpad.

translates into trackpads that can be as thin as 2.3 mm with better manufacturing yield, long-term reliability, and lower costs. It's also the only piezo haptic module that can easily scale to large trackpad sizes without adding additional actuators. Our simple design is enabled by our BOS1901 piezo driver exclusive patented CapDrive architecture.

CapDrive technology is our patented piezo driver architecture that enables low power consumption. The BOS1901 can be up to 10 times more efficient than the competition that uses non-efficient architectures. This gives more battery autonomy for the end-user and eliminates heat management problems.

The BOS1901 piezo driver is the only driver on the market that can both drive and sense from

the same piezo actuators without additional hardware. Therefore, the haptic and sensing mechanisms in our trackpad use the same hardware. This dramatically simplifies the whole piezo haptic trackpad module and reduces cost. Our piezo driver also supports multiple types of piezo actuators. We built three different piezo haptic trackpad reference designs using single and multilayers piezo disc and piezo benders. The BOS1901 offers a lot of design flexibility and helps achieve the perfect click and overall cost.

Finally, the BOS1901 is available in both QFN and WLCSP formats and only requires seven discrete components. This considerably reduces the total necessary area for the electronics and reduces the overall BOM.





Contact Us For More Information  
About Haptic Trackpads

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