

Piezoelectric haptics gets a boost

Boréas Technologies' CEO, Simon Chaput, talks to **Neil Tyler** about the company's ultra-low-power haptic chip, which delivers realistic haptic feedback but does so without draining the battery

Last month the Canadian company, Boréas Technologies, unveiled an ultra-low-power haptic technology that combined high-definition haptic feedback with low-power, making it suitable for wearables and other battery-powered consumer devices.

Simon Chaput, the company founder and CEO, set up the business after pursuing his Ph.D. at Harvard University where he invented a new technology to enable the use of piezoelectric actuators while using a very small amount of energy.

Chaput has not only managed to attract a very experienced team but has also successfully raised funding to commercialise the technology.

"The BOS1901 has been under evaluation with a group of customers and is now ready to meet the needs of a market in which consumers want realistic touch interfaces but in a way that doesn't drain the device's battery," he explains.

"This is our first product and it has been under development for 18 months, since our first funding round back in March 2017. Over 1000 ICs have been distributed for evaluation and we have been working with a long list of customers.

"The key challenge for device designers is balancing the performance requirements with the hefty power demands associated with haptic technologies," Chaput explains.

"The BOS1901 is capable of delivering 10X power savings over its nearest piezoelectric competitor," according to Chaput, "as well as providing 4X to 20X power savings over other incumbent technologies."

He does concede that those dramatic improvements are somewhat dependent on conditions, but they are considerable, nonetheless.

"These are certainly dramatic power savings and when combined with the BOS1901's tiny footprint, we believe that it will help to open up HD haptic feedback to even the smallest battery-powered electronics." Chaput continues, "If we're going to see the use of HD haptic feedback spread across a much wider range of devices, we need to not only reduce the hardware footprint but also the power consumption as we look to increase both responsiveness and precision."

According to Chaput, "The BOS1901 will be the lowest power piezoelectric driver IC for high definition (HD) haptic feedback currently on the market."

Boréas Technologies' solution is based on piezoelectric ceramic units but it is not the only solution to have emerged in this space. Other technologies include shape memory alloys that use carefully controlled, miniature nitinol wires; layered electroactive polymer films that can be integrated onto the surface of devices to provide completely localised haptic feedback and electromagnetic actuators, that are able to offer customised and varied sensations.

One of the key problems with actuators is that they need a high driving voltage – in the region of 50-200 volts – which can give rise to issues with efficiency or distortion. These problems can then lead to poor power consumption, noise and other challenges.

"Those issues have meant that actuators haven't been able to penetrate the larger main-stream markets in haptics," says Chaput. "Our device, however, has been designed to operate in the 3-5.5 V range, and that's been achieved by building this device from the ground up. As a result, we've delivered efficiency and a piezoelectric actuator with very low distortion."

Boreas' CapDrive technology platform is a proprietary scalable piezoelectric driver architecture on which its haptic driver ICs are based. It not only provides greater energy efficiency, but both low heat dissipation and rapid response times.

"We're addressing the needs of the haptics market which in the past few years has started to see real growth," Chaput suggests.

It's certainly a sizeable and growing market.

According to BCC Research, the global haptic actuator and driver IC market could be worth upwards of \$26billion by 2022 and Boréas is looking to tap the fastest-growing segment for haptic interface technologies.

Its piezoelectric haptic components are expected to outpace legacy architectures, such as eccentric rotating mass (ERM) motors and linear resonant actuators (LRAs), which have tended to be limited by higher power consumption, large size, and slower response times.

Unlike ERMs and LRAs, piezoelectric haptic components can be



Simon Chaput

Simon Chaput is the founder and CEO of Boréas Technologies. While pursuing his Ph.D. at Harvard University between 2013 to 2017, he invented a new technology to enable the use of piezoelectric actuators while using a very small amount of energy. After realising the commercial potential of the technology, he negotiated a license for the technology from Harvard University and then assembled the key pieces to launch Boréas Technologies. He's now attracted an experienced team and raised the funding required to commercialise the technology.

used for both output (haptic) and input (e.g., button) in a system, helping to reduce the complexity, size and cost of interactive devices.

While the market for haptics has been somewhat 'moribund' over the past few years, there does seem to be growing interest in the technology and a growing number of new players have entered the market, from large OEMs to a host of new start-ups – Boreas being one of them.

While at Harvard University, Chaput worked closely with Gu-Yeon, a professor of electrical engineering and computer science, and his work with actuators, and the establishment of the company, came in response to research he'd been conducting in developing ultra-thin and efficient piezoelectric fans for cooling electronic devices.

"It was when we were looking to commercialise the product, that we then recognised the potential for disruption in the haptics space," Chaput explains.

Having now gained validation from various partners, Boréas

Technologies is now making available development kits for testing, so allowing a wider community to join their alpha test group in experimenting with this technology.

The opportunities for HD haptic feedback are "diverse", according to Chaput.

He points to the use of the technology in consumer goods and in VR/AR gaming, where it will be able to add to audio and video, offering "realistic sensations, for users."

The next step is likely to involve the development of virtual buttons or virtual keyboards. Used on a large display, in a vehicle for example, a driver would be able to feel their way over their screen.

"For Boréas Technologies, replacing mechanical buttons is the next logical step going forward," Chaput concludes.