

Case Study: TZUKURI



Genesys delivers ultra-miniaturised PCB solution for Tzukuri unlosable glasses.

Tzukuri is on a mission to ensure you never lose a pair of glasses again, with their unlosable glasses.

Sealed inside every pair of Tzukuri's lightweight, stylishly designed glasses, is a tiny little Bluetooth beacon, connected to the Tzukuri App. If you leave your glasses behind, perhaps at a bar, the app will notify you. When you go out of the range of connection (15m), the app switches on and saves the last place you left them.

The Challenge

According to Tzukuri, 76% of people reported to have lost a pair of glasses or sunglasses in the past year, costing \$18B and contributing 90,000 tonnes of plastic and metal waste into the environment. For many people - losing a pair of glasses isn't just a mild inconvenience - the process to replace a pair of prescription glasses they need to see, is not usually a simple one.

For Tzukuri Founder Allen Liao, these numbers just aren't acceptable. To help solve this, he took on the challenge of designing a pair of glasses that are virtually unlosable, without compromising on quality or style.

“ Adding a Bluetooth WiFi antenna to such a tiny circuit board was a major challenge - to make this work Genesys designed and integrated what at the time was the smallest ever Bluetooth IC.

“The design, comfort and quality of the glasses took precedence, with the hardware being designed around these goals,” explained Allen. “The hardware criteria were driven by size, battery life and safety.”

Tzukuri approached Genesys Electronics Design to create an ultra-miniature PCB that would work with their chosen microcontroller and battery, and stringent size restrictions.

The Solution

Jonathan Forrest, Senior Design Engineer at Genesys Electronics Design, was tasked with designing the circuit board.

“The solution for making the PCB as small as possible, was to put as few components as possible on the actual circuit board itself, and use the smallest possible option for each necessary component,” explained Jonathan.

To do this, Genesys designed a solution that put as much of the battery charging hardware as possible into the charger. “The more standard option is to have a 5V output from the charger and keep the charging hardware inside the device itself. By moving this technology into the charger, we were able to drastically reduce the size of the PCB,” said Jonathan.



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Another step taken to reduce the size of the circuit board was to build the programming port for the microcontroller into the PCB panel. Although this meant programming the board once out of the panel was very difficult, it again reduced the size of the actual device.

A Bluetooth WiFi antenna was required to provide connectivity with the Tzukuri app. Most small bluetooth WiFi antennas rely on the circuit board's ground plane to work, and with very little ground plane, tuning the device proved very difficult. To make this work, Genesys designed and integrated what at the time was the smallest ever Bluetooth IC (integrated circuit).

An off-the-shelf through-hole component soldered on as a surface mount was used to connect the glasses to the battery charger. This provided a nice solution that kept the size and visibility of the charging connection to a minimum.

Silver-Zinc battery technology was chosen to power the glasses, due to its improved safety compared to standard lithium polymer batteries. Power consumption was then carefully designed for every element of the device, to achieve the targeted 30-day battery life from a single charge of the tiny 20mAh, 1.8-volt battery.

Results

Genesys' ingenuity in reducing the size and weight of every component, without compromising on quality, has enabled Tzukuri to produce a stylish, lightweight and reliable product.

Jon Eggins, COO at Genesys Electronics Design described the project as a futuristic technology challenge.

"The Tzukuri glasses were a unique, almost sci-fi-like, challenge. The electronics are ultra-miniaturised, and battery-powered; in fact, the electronics were so small that being able to connect a production programming jig to them was a major design challenge."

Overall, Allen Liao was impressed with Genesys Electronics Design's professionalism and quality.

"Jonathan was an excellent engineer, who is easy to communicate with and always honest about any issues that were occurring," stated Allen.

Tzukuri glasses were launched in early 2017 and are now available for sale in Tzukuri's Sydney-based store and online.

