

## Department of Electrical and Computer Engineering

### Project Overview

EngineeRing is a wireless mouse in the shape of a ring that allows users to navigate a compatible device and type on a displayed keyboard.

Our goal is to enhance comfort and accessibility for all users—whether they have conditions like arthritis, carpal tunnel, or tendonitis, or simply want a more ergonomic and intuitive way to use their devices for long periods.

EngineeRing has the potential to be used during rehabilitation when paired with therapy apps.

### Team Members



Anna Leonhardt - Electrical Engineer



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### Acknowledgements

Team 4E+C would like to give a special thank you to Dr. Hakan Töreyn for his mentorship throughout the duration of the project and to the Electrical and Computer Engineering Department for sponsoring our project through The Andrew Y.J. Szeto Rehabilitation Engineering & Assistive Technology Endowment Fund.

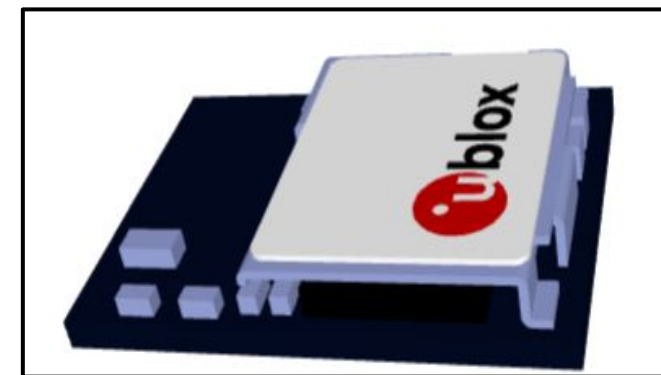
We would also like to thank Dr. Christopher Paolini for advising and aiding in the creation of the EngineeRing.

### Major Components

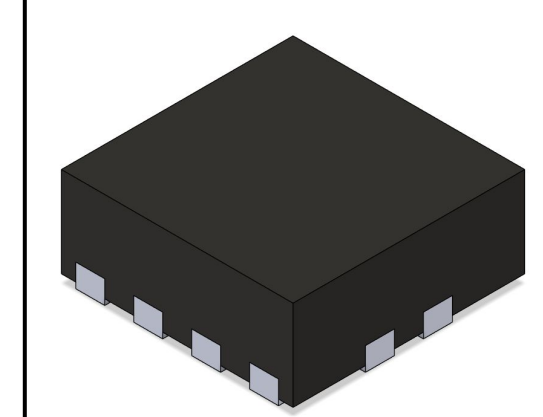
- System-in-Package (SiP) module with an integrated antenna for Bluetooth Low Energy communication.
- nRF52-series microcontroller paired with a low-power inertial measurement unit for compact, energy-efficient sensing.
- Flexible printed circuit board designed for a circular ring form factor.
- Wireless charging circuitry for convenient, cable-free battery charging.

### Hardware

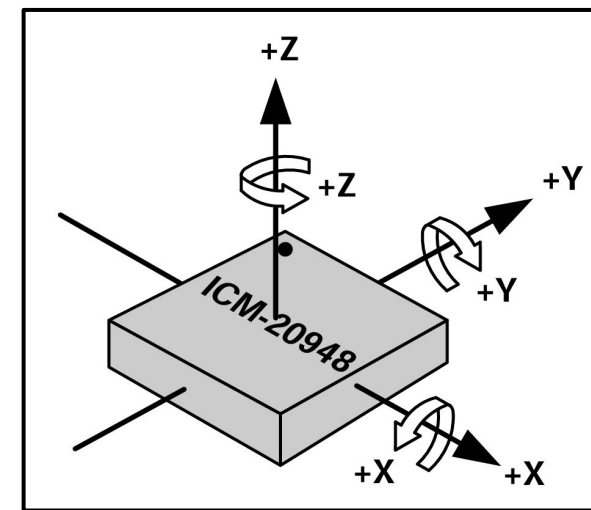
BMD-350-A-R



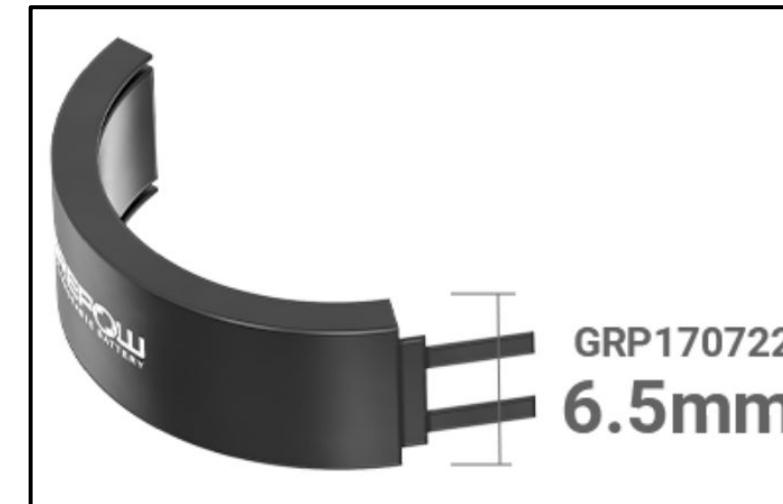
LTC4126EV-10



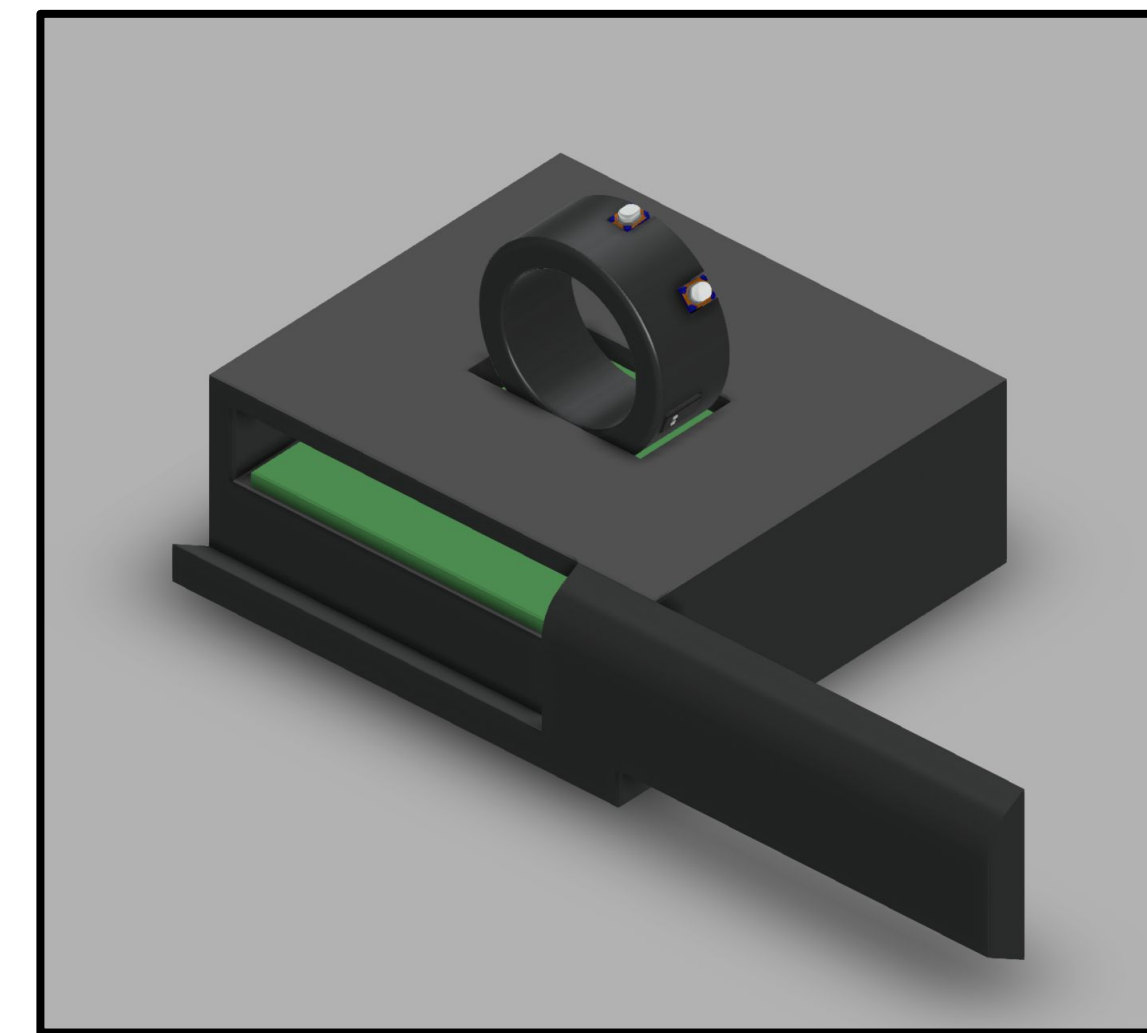
ICM-20948



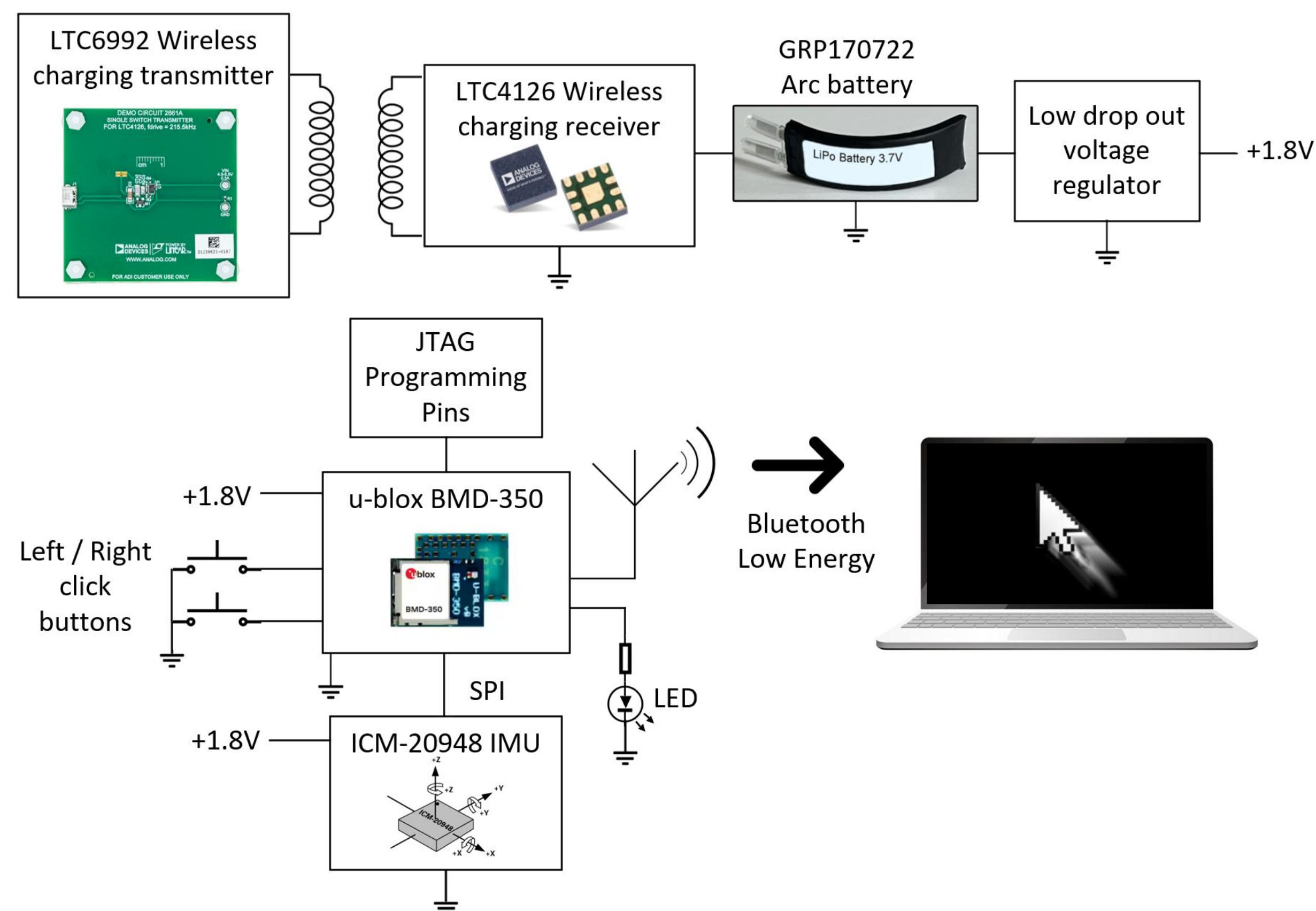
GRP-170722



### CAD Assemblies



### System Diagram



### Test & Analysis

- Confirmed reliable cursor control using push buttons and accelerometer and gyroscope data over Bluetooth Low Energy.
- The antenna design supports stable Bluetooth connectivity at distances exceeding 30 feet.
- The low-power system design enables approximately three hours of continuous battery operation.
- The wireless charging subsystem safely charges the battery at a current of 10 mA.
- The ring works in multiple modes tailored to different use cases, including a Universal Mode, Pointer Mode, Typing Mode (Click-to-Type and Dwell-to-Type) and Presentation Mode (Google Slides and PowerPoint).
- The ring generates metrics that can be shared with a medical professional to assist with rehabilitation assessment, progress monitoring, and therapy treatment adjustment.

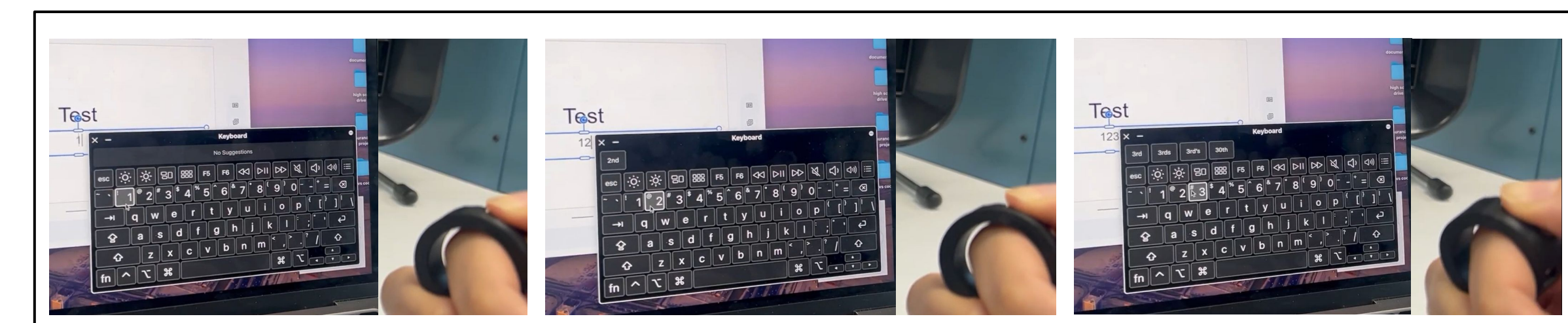
### System Integration

#### Key

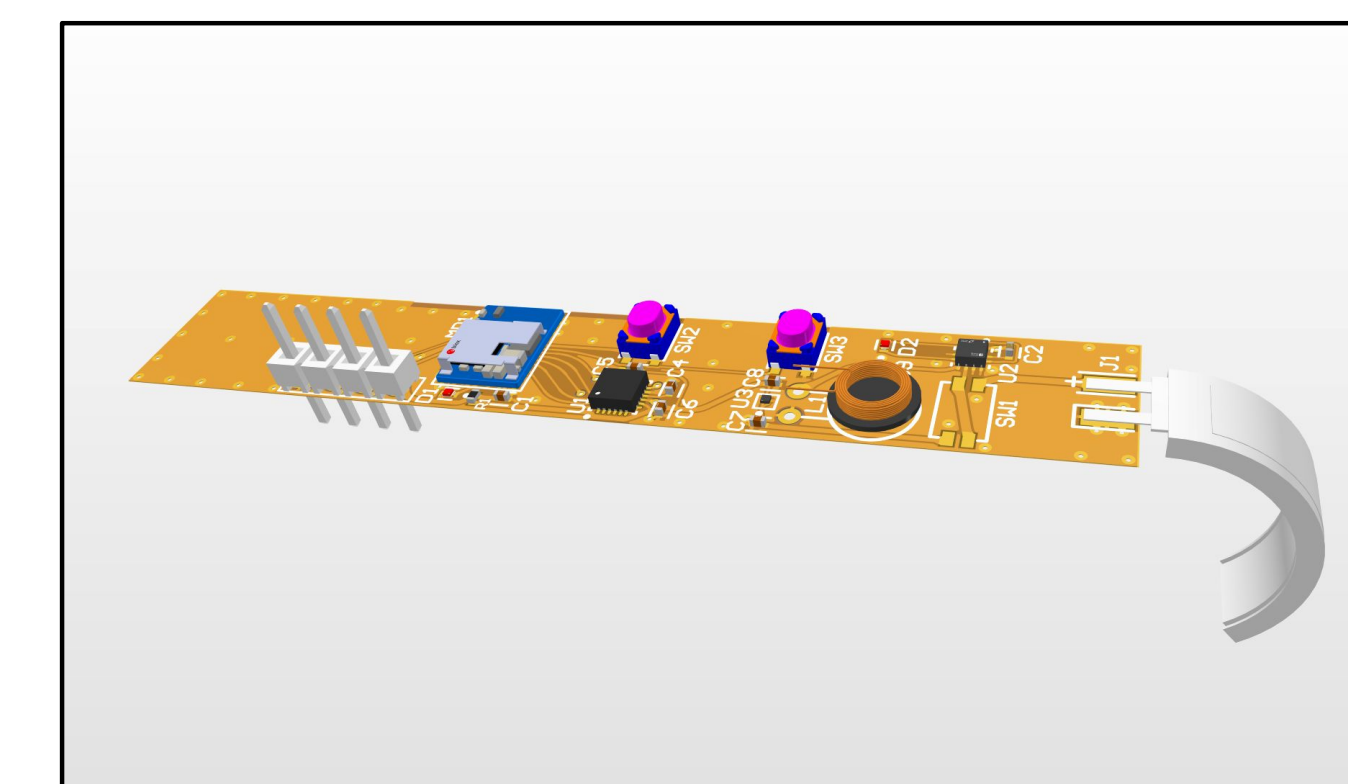
universal
regular mouse mode
keyboard mode
click to type (only)
dwell to type (only)
presentation mode
muscle rehabilitation mode

- Each cursor type has a different purpose that allows the user to operate the ring as a mouse.
- There are 5 different main modes for the ring to be used in with 26 unique gestures.

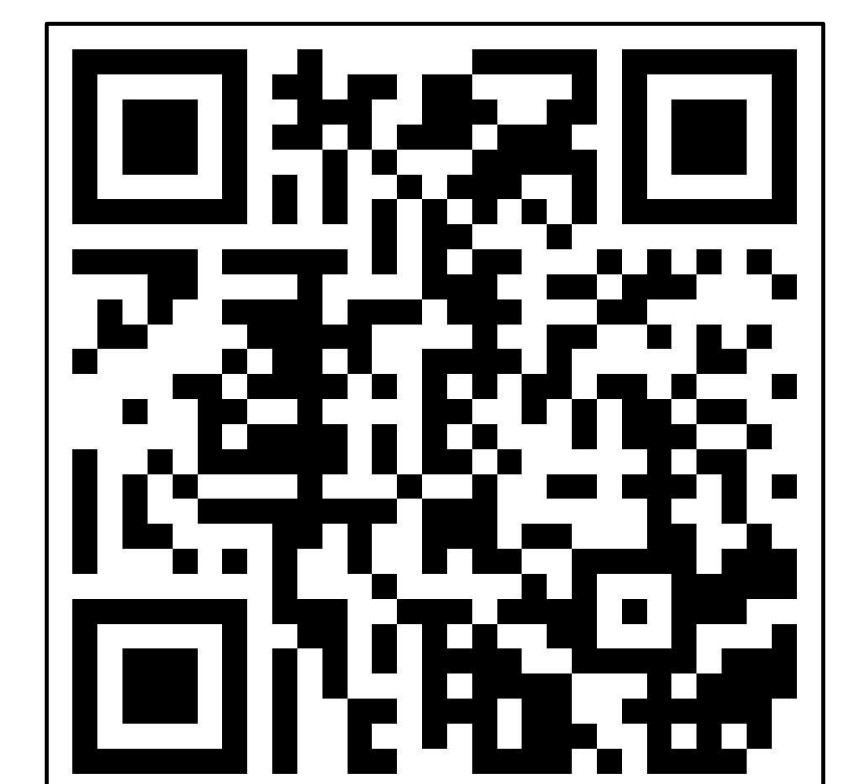
#### Cursor Control



#### On Screen Typing



Combined Flex PCB with Arc Battery Cell



Watch Our Demo!