Wireless power transfer (WPT) is turning out as a promising approach to power supply active implantable medical devices (AIMDs) as the population is progressively aging. This project illustrates all the steps required to realize the receiving side of an inductive WPT system resonating at 13.56 MHz ISM band, from its conceptualization to the final realization on a printed circuit board. The design of a custom recharging method based on inductive wireless power transfer was required by two main devices: a nanofluidic drug delivery system and a bidirectional neural interface for neuroprosthetic applications. The system comprises four main blocks: the receiving coil, together with its series capacitor needed to tune the system, the matching network to adapt the load impedance to the voltage source, the signal rectifier made of Schottky diodes to convert the input into a constant voltage and the DC-DC converter to power the system and recharge an LIR 2025 Li-Ion battery. There are multiple constraints that must be faced to make this objective feasible, such as the reduced dimensions allowed by the device, thermal heating, RF working frequency, and proper impedance matching. Through an initial simulation in LTSPICE, all of these aspects were taken into account and resulted in a system-level modeling of the entire circuit. The following simulations led to the optimization of each of the single blocks composing the overall circuit. Moreover, the behavior of the signal rectifier was assessed on a breadboard and both the input, delivered by a signal generator at a given frequency and amplitude, and the output signals released from it were acquired. The final PCB board was also equipped with a current sensing measuring system to perform the testing phase. It specifically consists of the following tests: first of all, current and voltage measurements were performed to evaluate the entity of the leading electrical parameters crossing the device, then a temperature measurement through an NTC thermistor placed in proximity of the receiving coil to precisely measure the temperature and monitor eventual excessive power dissipation and subsequent overheating of the future implantable device. In fact, the future perspectives aim to fully integrate all the components of the device to shrink its size and fit into an implantable device. In order to do so, some strategies were applied in the design of the printed circuit board, mainly concerning the components' selection, the separation between different functional areas of the board, such as the main blocks of the circuit with respect to the sensing acquisition system, the interconnection between the top and the bottom layer and finally the introduction of a thermal resistor to assess the nets along which most of the power goes lost as heat. The primary goal of the project is to assess whether the experimental measurements fit the results obtained from the simulations in terms of voltage, current, and efficiency, as well as verify if any of the circuital components releases excessive heat.