Electronic Components in the Design and Engineering Of Electronic Enabled Drug Delivery Devices

Technological advancements and medical innovations have been paired together throughout the ages. One field of technology that has revolutionized how medical science has treated its patients are electronic enabled drug delivery devices or EEDDs. The market for this booming industry has a projected growth in revenue from 7.8 billion dollars in 2019 to as high as 11.9 billion in the year 2024. The most common EEDDs are electronic infusion pumps, electronic autoinjectors, and electronic inhalers.

The foundations of EEDDs have been around for decades. An autoinfuser device designed to infuse liquids into the bodies of humans and animals was patented on March 7, 1978, by inventors Rainer Haerten and Heinz Kresse[2]. This autoinfuser was later improved upon by James E. Leslie and Everett D. Anderson, who invented the ambulatory infusion pump with programmable settings[3]. This groundbreaking electronic delivery device vastly improved how medications were administered.

The largest market for EEDDs is the production of the electronic infusion pumps. Electronic infusion pumps have not only improved the quality of life of the people with certain medical conditions, but they are paramount to their medical care, particularly for the treatment of patients with insulin-dependent diabetes. The wearable electronic infuser grants diabetic patients the ability to efficiently self-administer their insulin, dramatically cutting down issues with patient compliance and error.

Portable infusion pumps are also used for many different medication therapies. Patients with cancer use wearable electronic infusion pumps to treat their side effects from chemotherapy. Electronic infusion pumps are also prescribed to treat severe staph infections with intensive antibiotics post-hospitalization. In cases where children are born with a complex heart condition called persistent pulmonary hypertension, they rely on their continuous medication from their electronic infusion pump to maintain life support.

Electronic inhalers have revolutionized the treatment of patients with respiratory illnesses like asthma and chronic obstructive pulmonary disease, or COPD. Unlike their counterparts, electronic inhalers can monitor the amount of medication the patient breathes in, the quality of their inhalation, and whether there are experiencing any air leaks during administration. The Bluetooth technology can share this data with the patient's doctor. This information allows patients and their doctors to work together to identify and remediate any issues of medication errors and compliance[4].

Electronic autoinjectors is an emerging technology that is not only benefiting its patients but is also having a positive environmental impact as it reduces biowaste. Electronic autoinjectors can adjust a

patient's medication dosage and depth of needle insertion. In some circumstances, this allows for utilizing the full supply of the medication over multiple doses instead of the wasteful one-and-done model that manual dosing offers. This lowers the overall cost of medication administration. The automated dosing cuts down on instances of user errors[5].

Electronic autoinjectors are often used to administer a drug called epinephrine in cases of severe allergic reactions[6]. According to the Asthma and Allergy Foundation of America, as many as 1 and 50 Americans have life-threatening allergies[7]. The most dangerous allergic reaction is a life-threatening condition known as anaphylaxis or anaphylactic shock. People in anaphylaxis require epinephrine emergently as fast as possible.

Having an electronic autoinjector alleviates many of the stressors that accompany an allergic reaction emergency. The automated controlled plunger dramatically reduces instances of medication misfire. This can happen inadvertently with the archaic spring-loaded autoinjector is accidentally triggered and the medicine is wasted before it can be used on the person in crisis. Also opposed to the older spring-loaded autoinjectors, electronic autoinjectors are designed to give their users step-by-step verbal instructions on how to use them in an emergency. These additional directions help to relieve their patient's panic during the event and ensure the proper application of the device. Autoinjectors grant their owners the peace of mind to interact with the world at large.

As an electronics component's supplier, ECS provides the integral equipment to manufacture EEDD's and other specialized equipment. ECS proud to serve our global communities' needs by helping them receive the care that they need. We create the path for our world's tomorrow today.

ECS Inc. has developed new products to help enhance the performance of drug delivery devices. Our products offer the smallest package sizes in the industry. Each part has been performance optimized to add to the overall performance and battery life of the devices that will be used in. They feature small form factor for easy implementation. Low Equivalent Series Resistance (ESR) and Low Load Capacitance (LC) for easy start up and low power consumption.

To ensure your drug delivery devices have the highest quality clocks available. ECS Inc. would highly recement these products for you design.

Part Number	Frequency	Board Layout	Package Size
ECX-1210	32.768 kHz	2 Pad	1.6 x 1.2 mm
ECX-1048	32 - 54 MHz	4 Pad	1.2 x 1.0 mm
ECX-1247	24 - 80 MHz	4 Pad	1.6 x 1.2 mm
ECX-1637	16 - 80 MHz	4 Pad	2.0 x 1.6 mm

Technical Resources:

- ECS Website
- Video Learning
- Technical Guides
- 2020 ECS Catalog
- Reference Designs

[1]Research and Markets

[2]Aktiengesellschaft, S

[3]Cardiac Pacemakers, Inc

[4]Nabeel Farooqui, M. F.

[5]Bjarne Sorenson, J. M.

[6]Mayo Clinic Staff

[7]Asthma and Allergy Foundation of America