



Case Study

Freescale and Insulet Partner to Help Improve Diabetes Care

Insulet Corporation develops innovative drug delivery device made possible by Freescale technology

The Cost of Chronic Disease

As medical care improves and people live longer, managing chronic disease becomes a more widespread and expensive challenge. Type 1 diabetes is a chronic condition that can have serious consequences when patients can't monitor and maintain proper blood sugar levels. According to the American Diabetes Association, 23.6 million children and adults in the United States—7.8% of the population—have diabetes. 57 million people are pre-diabetic and 1.6 million new cases of diabetes are diagnosed in people aged 20 years and older each year. In 2007, estimates put the total costs of diagnosed diabetes in the United States at \$174 billion. The World Health Organization estimates that there will not be enough hospital beds worldwide to treat chronic disease sufferers, increasing the need to manage these conditions outside of traditional medical settings.

Insulet and the Revolutionary OmniPod

Insulet Corporation was founded when a father with a diabetic son decided to search for ways to improve the traditional insulin pump. An insulin pump replaces the multiple daily injections that diabetics usually have to give themselves. A pump also helps diabetics maintain steady glucose levels throughout the day. According to Insulet, insulin pump therapy provides superior clinical outcomes, but only approximately one in four Type 1 diabetics use insulin pumps.

Challenge:

Create a wireless, tubing-free insulin pump that's easy to use, helps to increase patient compliance and improves the overall quality of life for people with diabetes.

Solution:

Freescale designed an MCU with integrated wireless technology based on the ultra-low-power S08 core architecture that meets Insulet's market requirement to design a small, incredibly power-efficient insulin management system that helps to free patients from traditional medical tubes.

Benefit:

Insulet's OmniPod insulin pump is discreet, durable, wireless and incredibly easy to use, with just two user-friendly parts that communicate wirelessly.



“When used properly, insulin pumps may contribute to improved clinical outcomes,” said Kevin Schmid, Insulet’s VP of Business Development. “These pumps are generally covered by insurance, and we saw an opportunity to develop a device that would simply make these people’s lives easier and healthier.” Insulet developed a design for the ultra-portable OmniPod pump. Conventional pump therapy includes an insulin pump, reservoir, an infusion set and tubing that connects the insulin pump to the infusion set—keeping the patient tethered to the pump 24/7. “It definitely affects your quality of life, the activities and sports you can do, even the kind of clothes you wear,” said Schmid. “We knew we could do it better.” The revolutionary OmniPod design has only two parts: a wearable pod that delivers the insulin, and a PDA-type device called a personal diabetes manager (PDM). The pod is worn for three days, then thrown away and replaced with another pod. It holds 200 units of rapid-acting insulin, which covers the requirements of 95% of Type 1 diabetes patients.

Finding the Right Technology Partner

When it came time to find a silicon provider for their design, Insulet searched for a partner who could provide a chip capable of achieving the demanding and specific requirements of Insulet’s design. “We saw that Freescale had the right MCUs to control size and cost for the disposable pods, and RF connectivity for the PDM and pod to communicate wirelessly,” said Schmid. Freescale’s MCU design consumes very little power and enables communication between the PDM and the pod using an integrated 433 MHz radio. “Freescale developed a product that meets the cost and reimbursement structure for the marketplace in a disposable, fully featured device,” said Schmid.

Freescale: Medical Expertise for the Long Term

Semiconductor technology plays a critical role in the development of new technologies to assist with patient monitoring, diagnostics, therapy and imaging. Medical device designers need to balance processing requirements with power consumption,

ensure a fast time to market and navigate the regulatory environment. Freescale is a trusted provider of MCUs, MPUs, analog and sensor components, RF amplifiers and wireless technology to meet the unique needs of medical designs. These vital technologies, along with Freescale enablement tools, expertise and partnerships, help enable customers to develop breakthrough medical systems and life-critical applications. Freescale also offers a formal product longevity program for the medical segment, ensuring that a broad range of program devices will be available for a minimum of 15 years.*

More about OmniPod

In the OmniPod system, fully automated catheter insertion takes place in five milliseconds, and is virtually pain-free. The pump starts and primes itself automatically and is watertight to 25 feet for one hour. The PDM is a user-friendly device with a color screen that wirelessly programs and manages insulin delivery profiles and interaction with the pod. The PDM includes a built-in blood glucose monitor—which Freescale also helped integrate—that replaces the traditional finger pricks to test blood glucose levels. A bolus calculator for extra insulin doses, a food library to help manage what you eat, and full data management and download capability complete the features of the PDM.

The OmniPod launched in 2005. To date, the company has produced more than 15 million pods and increases capacity almost daily. The OmniPod system may also be used to infuse other drugs subcutaneously. Schmid noted that “This growth is entirely attributable to our differentiating technology, and we have Freescale to thank for a significant part of that.”

Insulet’s second-generation OmniPod is one-third smaller, one-quarter lighter and much more power efficient. A higher level of printed circuit board integration allows the component count to be significantly reduced. Moving to 433 MHz RF increases the communication range from two to five feet.

Insulet OmniPod Solution

- World’s first tubing-free wireless insulin pump for people with diabetes.



- PDM with built-in glucose monitor featuring Freescale’s i.MX21 multimedia applications processor and an S08QE8 8-bit MCU.



- Disposable, wearable insulin delivery pods contain a Freescale ultra-low-power MCU with integrated wireless and precision analog components.

The new MCU consumes much less power, reducing the battery requirement from four to three. This greater integration helps Insulet to significantly lower their device manufacturing cost, while the reduced size and weight benefit users by making the device even easier to wear.

“We hear one thing from our customers every day: “OmniPod has changed my life.” Parents say that their kids can eat when they want and lead regular, active-kid lives. Athletes can get back to the sports they love,” said Insulet’s Schmid. “Ultimately, our goal is to provide superior treatment options for people with diabetes—and to make diabetes an ever smaller part of life.”

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For more information on Freescale healthcare and medical solutions, visit freescale.com/healthcare

To learn more about the Insulet OmniPod, visit freescale.com/OmniPod