

Powering Toll Tags



Case Study: Customized coin cell holders for automotive toll tags

MPD explores the unique difficulties of designing a battery holder for highway speed RFID toll tags.

Industry

RFID - Toll Tags

Product

Coin Cell Holder

Status

Long-term Study

Challenge

A leading manufacturer of toll tags recently approached MPD looking for a new battery holder to replace soldered-in batteries. The customer had two main problems with their current battery solution. First, coin cell batteries with solderable terminations are expensive, and second, they are not compatible with modern SMT manufacturing.

These problems seem quite common in the industry today. Coin cells with PCB pins are often nearly twice the price of a bare coin cell. In many cases, a bare coin cell along with a battery holder can be less expensive than a coin cell with leads, while still offering an extremely strong battery retention and the added benefit of replaceability. Meanwhile, the



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soldering process of reflow ovens not only reduces batteries' functionality, but sometimes damages cells and can even cause them to explode in extreme cases.

Additionally, toll tags require significantly stronger and more durable battery holders than most products, since they must be able to withstand extreme environmental conditions- both inside and outside of the car. Although most current toll tags are meant for internal windshield mounting, license plate mounted toll tags are starting to become popular as well. In order to keep costs down, the customer requested the same battery holder to be functional for both types of toll tags, which meant designing a more versatile and resilient holder.

The environmental specifications of a toll tag can call for large operating temperature ranges, which is not surprising given that a car parked in the Arizona desert can reach nearly 85°C, while one in a Minnesota blizzard can be around -40°C. Humidity was another large concern, as toll tags are usually not hermetically sealed, so resistance to 95% relative humidity was another factor of consideration. Further areas of design concern were the fretting of the contacts over the expected 10 year lifespan of the toll tag, given the frequent shocks and vibrations a car encounters on the road, and the various ways in which consumers can accidentally damage any product, such as accidentally dropping it onto concrete.

Solution

Our solution was a customized version of our new, award-winning Glider line of battery holders.



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Gliders can have their metal retainers mounted to the PCB in an automated reflow solder process, allowing for reduced labor costs that create additional value for the customer beyond the upfront savings. At any time later, the coin cell battery can be loaded into the matching plastic tray and inserted into the retainer.

The normal Glider design was modified to include a locking feature, so that once the tray is inserted it is permanently locked into the retainer. A more durable plastic with a higher temperature range was also necessary for the tray, to account for the strict environmental specifications of the toll tag. Both the stronger plastic and locking feature will also enhance the lifespan of the customized Glider, and help it to withstand the wear and tear of years on the road.

Current Status

- MPD engineers designed and created prototypes within days
- New holder design meets customer's target price point
- Customized Glider is compatible with SMT manufacturing process
- Custom packaging for automated assembly was made for holder
- Design withstands extreme shocks and vibrations
- Plastic tray functions within operating temperature range
- Battery-loaded tray locks in permanently upon insertion
- MPD is performing additional reliability studies for customer

Memory Protection Devices, Inc. is an ISO 9001 certified manufacturer of battery holders and other electronic components.



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