

TAIYO YUDEN

Use Case

TAIYO YUDEN Supercapacitors Provide Reliable Power in Energy Harvesting Applications

As climate change remains at the center of many conversations globally, many countries are looking to renewable energy sources to reduce the volume of emissions produced annually. Moreover, with the rapid deployment of sensors into electronic devices with shrinking geometries, installing and replacing batteries can be challenging or impractical. Although the technology is still evolving, energy harvesting can provide an eco-friendly and sustainable alternative to battery power.

A Host of Energy Harvesting Options

Energy harvesting devices capture and transform energy from external sources or nature into electric power. These devices consist of a transducer (part of the device that transforms energy from one form into another), an interface circuit, and a load. For example, photovoltaic (PV) cells capture and convert energy from the sun, piezoelectric transducers convert vibrations, and thermoelectric generators (TEGs) convert thermal (heat) energy into electric power. The main benefit is to minimize the use of batteries, which are bulky, unreliable, and often contain toxic materials. However, energy harvesting devices currently provide a limited amount of electricity suitable for low-voltage applications.

Benefits of EDLCs over Batteries

Energy storage devices like batteries or supercapacitors can store power generated from energy harvesting systems. However, batteries are unreliable under very low-temperature conditions and prone to damage at high temperatures with a risk of thermal runaway or explosion. Electric double-layer capacitors (EDLCs) or



supercapacitors can provide higher density power than conventional capacitors and perform reliably over a wide range of operating temperatures. EDLCs offer up to 1000 times greater capacitance than traditional capacitors due to a much larger capacitive surface area. Unlike batteries, EDLCs exhibit only minimal degradation over thousands of charge-discharge cycles with no thermal runaway issues.

TAIYO YUDEN EDLC Solutions for Energy Harvesting

TAIYO YUDEN LP Series EDLCs provide peak and backup power in many types of energy harvesting applications. They can be utilized as the sole energy storage or combined with batteries to reduce the cell count and improve load balancing. LP EDLCs offer 2.4 to 20 F of capacitance with a maximum working voltage of 2.7 V and operating temperatures from -40 °C up to +85 °C. These UL-certified products comprise the highest-grade materials and come in small packages for optimum board space savings.

TAIYO YUDEN's LP EDLCs supply power to sensors (such as temperature and humidity sensors in farming assistance systems) to stabilize output (source balancing) when used alongside renewables such as solar panels since they charge up very quickly (typically within a few seconds). With a longer lifespan and maintenance-free operation, the LP EDLCs can lower overall costs. Other uses include LED lighting and wireless communication modules for central heating TEG systems.