

High Power Supercapacitors Enable New Power Applications... *and Replace Batteries*

The ultimate energy storage device should have high energy density that can be rapidly released. High energy batteries have been developed for single use or rechargeable systems, but they typically require from minutes to hours to discharge, not seconds. High power, standard capacitors are capable of discharging rapidly, but they only have low energy density.

Cooper Bussmann[®] PowerStor[®] Supercapacitors are environmentally-friendly, lead free, RoHS compliant and have no disposal issues at end of life. The European WEEE directive will require companies to recover and recycle the Lithium batteries currently used for back-up. Similar regulations are also being considered in China and Japan.

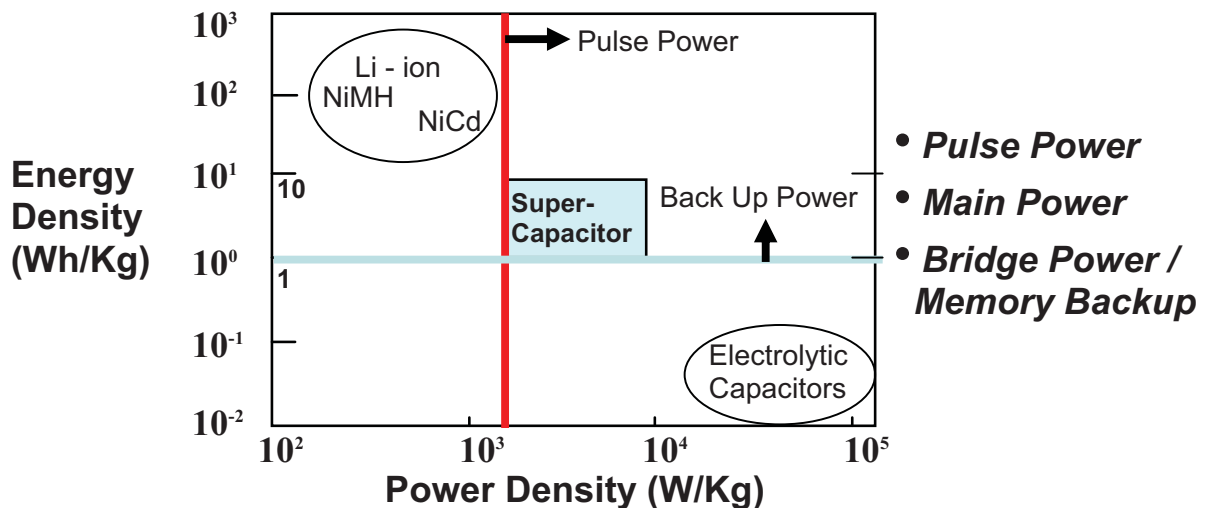
The new PowerStor Supercapacitors incorporate both the *high energy density* of batteries (100 times the energy of electrolytic capacitors) and the *high power* of capacitors (10 to 100 times the power of batteries) as shown below.

Supercapacitors have these advantages over battery solutions:

- Long operating life - do not need replacing.
- Rapid charge - ready to provide back-up in seconds.
- Low ESR - capable of providing higher peak power.
- Environmentally friendly - no heavy metals or disposal issues.
- Customized packaging available.

Supercapacitors have reasonably high energy density compared to rechargeable batteries. In most applications, batteries have far more energy than is required and several drawbacks, including:

- Take too long to charge.
- Do not like to be held fully charged.
- Degrade with shallow discharge - NiCd memory effect.
- Require maintenance or replacement.



The memory effect is too familiar to mobile phone users. With continuous 365 charge/discharge cycles per year, rechargeable batteries require frequent replacement and create environmental issues in addition to increasing lifecycle cost.

Supercapacitors are rapidly being adopted as an ideal main power source for in toys, remote monitoring systems, transmitters, lighting and solar traffic signs.

Here are two examples of using environmentally-friendly PowerStor Supercapacitors to replace traditional rechargeable batteries:

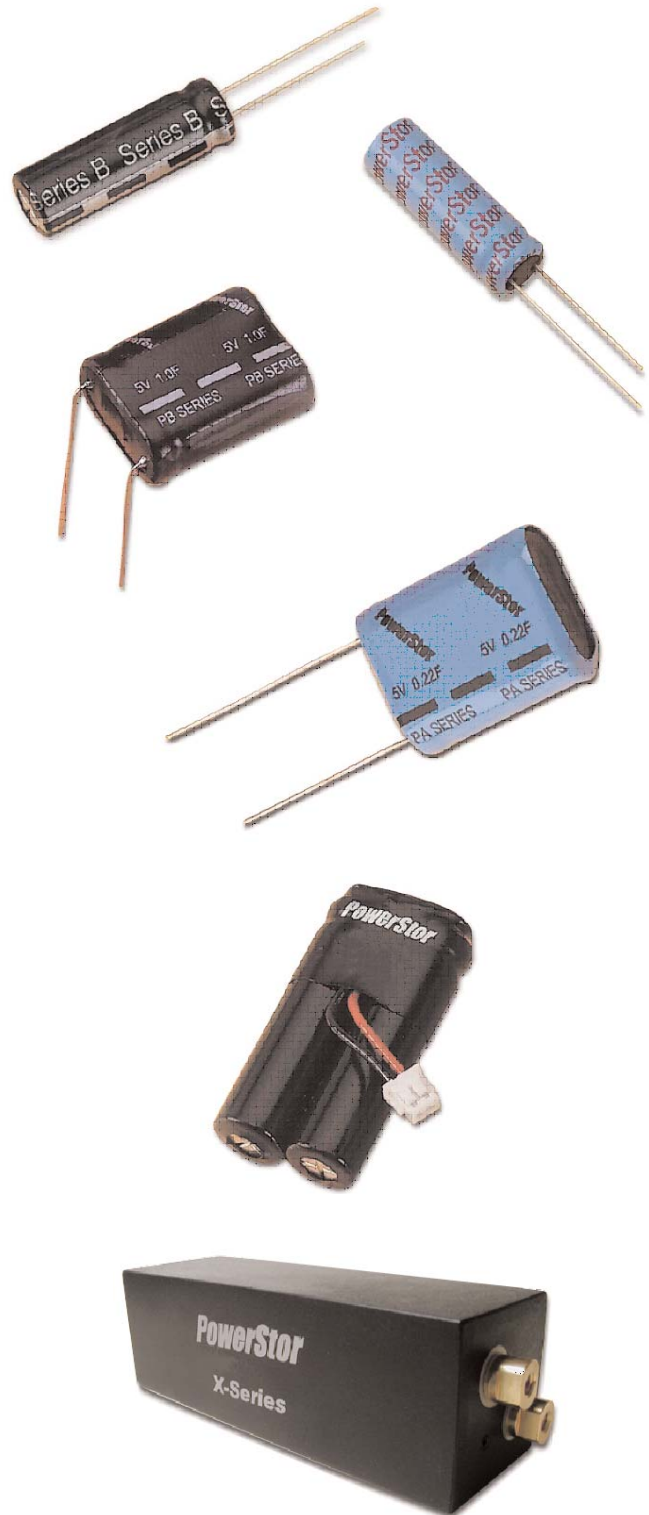
1. Supercapacitors are used in local area or restaurant pagers. The pagers run for two hours while a patron is waiting for a table. After being returned to the host/hostess, the pager only requires a 10 second charge for the next customer. Nickel cadmium batteries perform poorly in shallow depth-of discharge applications due to their "memory" effect (loss of capacity due to continuous shallow discharges). As a result, constant battery replacement is no longer an issue or added cost. Supercapacitors are designed to last the life of the product and are used for main power.
2. RAID data storage systems provide high integrity fast access data storage for network servers. Traditional systems ensured data integrity during mains failure by using expensive Lithium batteries. Supercapacitors offer a green, lower cost alternative that will not require replacing and can be recharged in seconds after a mains failure. Replacing batteries with supercapacitors created a maintenance-free product for the life of system, increasing reliability while eliminating expensive maintenance doors, equipment downtime and reliance on customer adherence to suggested service schedules.

Summary

Supercapacitors offer very cost effective power solutions by:

- Eliminating the need for maintenance provisions.
- Eliminating reliance on customer maintenance procedures.
- Do not require keeping a spare parts inventory (batteries).

While capacitors are most often mounted on the circuit board, the Cooper Bussmann PowerStor line of Supercapacitors also offers customized pack solutions with plug-in connectors. Single cell capacitors are available in values up to 100F in 18mm diameter cylindrical packages.



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