

Using Cymbet[™] EnerChip[™] Batteries Instead of Coin Cells and Super Capacitors

Introduction

Primary and secondary (i.e., rechargeable) coin cell batteries, as well as super capacitors, have been in use for years as auxiliary power sources for applications including SRAM, real-time clocks, and microcontrollers. Now, a new type of rechargeable battery is available from Cymbet Corporation, the leader in thin film rechargeable micro-batteries.

Cymbet[™] EnerChip[™] thin film, solid state batteries feature all solid state construction, are packaged in standard integrated circuit packages, and can be reflow soldered for high volume PCB assembly. They are ideal as rechargeable backup power sources for clocks, memories, microcontrollers and other low-power circuits where data or timing information must be retained in the absence of primary power. These new energy storage devices present significant advantages over conventional coin-type batteries and super capacitors in applications requiring backup power.

Features:

- Solid state reliability
- Low profile surface mount packaging
- Simple charge control
- Very high charge/discharge cycle life
- High temperature solder reflow tolerant
- Component class

Benefits:

- Reduced size
- Fewer parts
- Lower overall cost
- Higher reliability

Applications:

- Utility meters
- Digital video recorders
- Set-top decoders
- PABX hubs
- RAID controllers
- Point-of-sale terminals
- Clock radios
- Microwave ovens
- Cellular phones

Benefits of Using Cymbet Enerchips[™] Instead of Coin Cells and Super Capacitors

The high charge/discharge cycle capability makes these rechargeable batteries ideal as backup power sources for low power circuits in cellular phones, pagers, point-of-sale terminals, office equipment, home appliances, and other devices where protecting data or timing information is either essential to the enterprise, or simply gives convenience to the consumer.

Another key advantage to using EnerChips is realized in total energy savings, particularly in battery operated equipment. For example, consider the case where a super capacitor is used to provide backup power for a device operated by a primary coin cell. This could be a home thermostat, a remote sensor, a portable RFID reader, portable medical instruments, or any other device operating from a user-replaceable battery. The coin cell or prismatic battery is used to power the system under normal operating conditions, while the super capacitor provides a short-term supply of energy to maintain memory or real-time clock operation while the main battery is being replaced or recharged. Because of the high self-discharge of many types of super capacitors, and because the capacitor must always be fully or nearly charged so that it will have a ready supply of charge when needed unexpectedly, the main battery must be continuously or regularly charging the capacitor. As shown in Table 1, this results in a significant current drain on the battery, diminishing its service life. A Cymbet EnerChip is a preferred solution, as the self-discharge of these batteries is substantially lower than that of the super capacitor. This results in negligible wasted energy and thus increases the useful life or time between recharge cycles of the main battery. Moreover, the EnerChip provides the backup energy equivalent to or greater than the super capacitor while occupying less volume – an advantage in space-constrained devices.

Table 1. Amount of Wasted Energy in Maintaining Charge on Super Capacitors.

Device	Equivalent Charge (μAh)	Self-Discharge (%/day)	Supplemental Charge Required (μAh)	CR2032 Capacity (mAh)	% of CR2032 Used in Compensating for Self-Discharge
			per 10 years		
CBC012	12	0.1	43.2	225	0.0192
CBC050	50	0.1	180	225	0.08
0.047 F	20	30	21600	225	9.6
0.2 F	80	30	86400	225	38.4

A summary of the key advantages of using EnerChips instead of primary coin cells, rechargeable coin cells, and capacitors, is given in Table 2. It is clear that the Cymbet EnerChip offers the ease of implementation, low cost

assembly, performance advantages and service life necessary to support the backup power requirements of today's electronic systems.

Table 2. Features and Benefits of Cymbet EnerChip Thin-Film Batteries

<i>Feature</i>	<i>Capacitor</i>	<i>Primary Coin Cell</i>	<i>Rechargeable Coin Cell</i>	<i>Cymbet</i>	<i>Cymbet Advantage</i>
<i>Solder reflow tolerance</i>	<i>Select products</i>	<i>No</i>	<i>Select products</i>	<i>Yes</i>	<i>Low cost assembly</i>
<i>Fast recharge</i>	<i>No</i>	<i>N/A</i>	<i>No</i>	<i>Yes</i>	<i>Always ready for use</i>
<i>High cycle life</i>	<i>Yes</i>	<i>N/A</i>	<i>No</i>	<i>Yes</i>	<i>Component class</i>
<i>Charge circuit</i>	<i>Simple</i>	<i>N/A</i>	<i>Simple</i>	<i>Simple</i>	<i>Low cost, small footprint control circuit</i>
<i>Self-discharge</i>	<i>High</i>	<i>Low</i>	<i>Low</i>	<i>Low</i>	<i>Longer back-up time</i>