Rechargeable Solid State Energy Storage: 12µAh, 3.8V

Features
- All Solid State Construction
- SMT Package and Process
- Lead-Free Reflow Tolerant
- Thousands of Recharge Cycles
- Low Self-Discharge
- Eco-friendly, RoHS compliant

Applications
- Standby supply
- Wireless sensors and RFID tags
- Localized power source
- Power Bridging
- Embedded Energy

Part Numbering Example: CCBC012 T- A5

CCBC012	T	D5C	A5
SERIES	**SHIPPING PACKAGE**	**PACKAGE STYLE**	**OPERATING TEMP.**
	T = Tube	D5C = 6 pin DFN	-20°C to 70°C
	Z1 = 1K		
	Z5 = 5K		

Operating Characteristics

<table>
<tr><th colspan="2">Parameter</th><th>Condition</th><th>Min</th><th>Typical</th><th>Max</th><th>Units</th></tr>
<tr><td colspan="2">Discharge Cutoff Voltage</td><td>25°C</td><td>3.0[1]</td><td>-</td><td>-</td><td>V</td></tr>
<tr><td colspan="2">Charge Voltage</td><td>25°C</td><td>4.0[1]</td><td>4.1</td><td>4.3</td><td>V</td></tr>
<tr><td colspan="2">Pulse Discharge Current</td><td>25°C</td><td>100[3]</td><td>-</td><td>-</td><td>µA</td></tr>
<tr><td colspan="2" rowspan="2">Cell Resistance (25°C)</td><td>Charge Cycle 2</td><td>-</td><td>2.8</td><td>4.5</td><td rowspan="2">kΩ</td></tr>
<tr><td>Charge Cycle 1000</td><td>-</td><td>13</td><td>20</td></tr>
<tr><td colspan="2" rowspan="2">Self- Discharge (5-yr Average; 25°C)</td><td>Non- recoverable</td><td>-</td><td>2.5</td><td>-</td><td>% per year</td></tr>
<tr><td>Recoverable</td><td>-</td><td>1.5[4]</td><td>-</td><td>% per year</td></tr>
<tr><td colspan="2">Operating Temperature</td><td>-</td><td>-20</td><td>25</td><td>+70</td><td>°C</td></tr>
<tr><td colspan="2">Storage Temperature</td><td>-</td><td>-40</td><td>-</td><td>+125[5]</td><td>°C</td></tr>
<tr><td rowspan="4">Recharge Cycles (to 80% of rated caapacity; 4.1V charge voltage)</td><td rowspan="2">25°C</td><td>10% depth-of-discharge</td><td>5000</td><td>-</td><td>-</td><td>cycles</td></tr>
<tr><td>50% depth-of-discharge</td><td>1000</td><td>-</td><td>-</td><td>cycles</td></tr>
<tr><td rowspan="2">40°C</td><td>10% depth-of-discharge</td><td>2500</td><td>-</td><td>-</td><td>cycles</td></tr>
<tr><td>50% depth-of-discharge</td><td>500</td><td>-</td><td>-</td><td>cycles</td></tr>
<tr><td colspan="2" rowspan="2">Recharge Time (to 80% of rated capacity; 4.1V charge voltage)</td><td>Charge cycle 2</td><td>-</td><td>10</td><td>22</td><td rowspan="2">minutes</td></tr>
<tr><td>Charge cycle 1000</td><td>-</td><td>45</td><td>70</td></tr>
<tr><td colspan="2">Capacity</td><td>50µA discharge; 25°C</td><td>12</td><td>-</td><td>-</td><td>µAh</td></tr>
</table>

1. Failure to cutoff the discharge voltage at 3.0V will result in EnerChip™ performance degradation

2. Charging at 4.0V will charge the cell to approximately 70% of its rated capacity

3. Typical pulse duration = 20 milliseconds.

4. First month recoverable self-discharge is 4% average.

5. Storage temperature is for uncharged EnerChip™.

Note: All specifications contained within this document are subject to change without notice

Electrical Properties

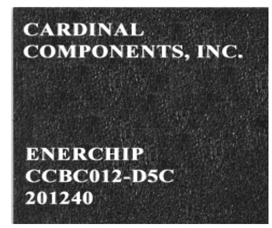
Output voltage (nominal):	3.8V
Capacity (nominal):	12µAh
Charging source:	4.00V to 4.15V
Recharge time to 80%:	10 minutes
Charge/discharge cycles:	>5000 to 10% DOD

Physical Properties

Package size (DFN):	5 mm x 5 mm x 0.9 mm
Operating temperature:	-20°C to 70°C
Storage temperature:	-40°C to 125°C

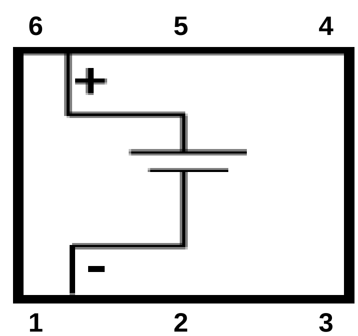
Pin Number(s)	Description
1	V-
2,3,4,5	NIC
6	V+
Note: NIC = No Internal Connection	

The EnerChip™ CCBC012 is a surface-mount, solid state, thin film, rechargeable energy storage device rated for 12µAh at 3.8V. It is ideal as a localized on-board power source for SRAMs, real-time clocks and microcontrollers which require standby power to retain time or data. It is also suitable for RFID tags, smart sensors, and remote applications which require a miniature, low-cost, and rugged power source. For many applications, the CCBC012 is a superior alternative to button cell batteries and super-capacitors.



5mm x 5mm
DFN SMT
Package

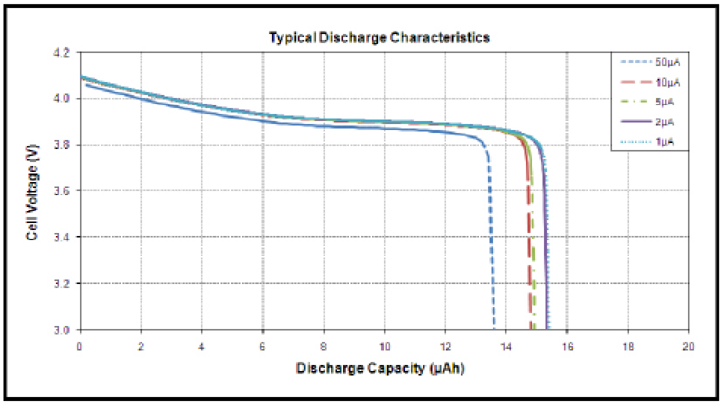
Because of their solid state design, EnerChip™ storage devices are able to withstand solder reflow temperatures and can be processed in high-volume manufacturing lines similar to conventional semiconductor devices. There are no harmful gases, liquids or special handling procedures, in contrast to traditional rechargeable batteries.

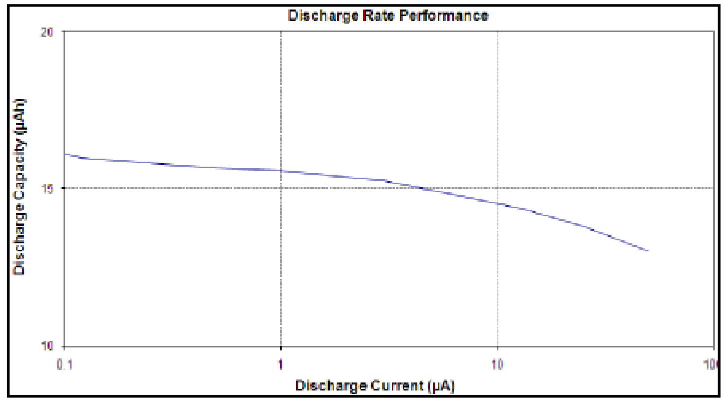


CCBC012 Schematic Representation Top View

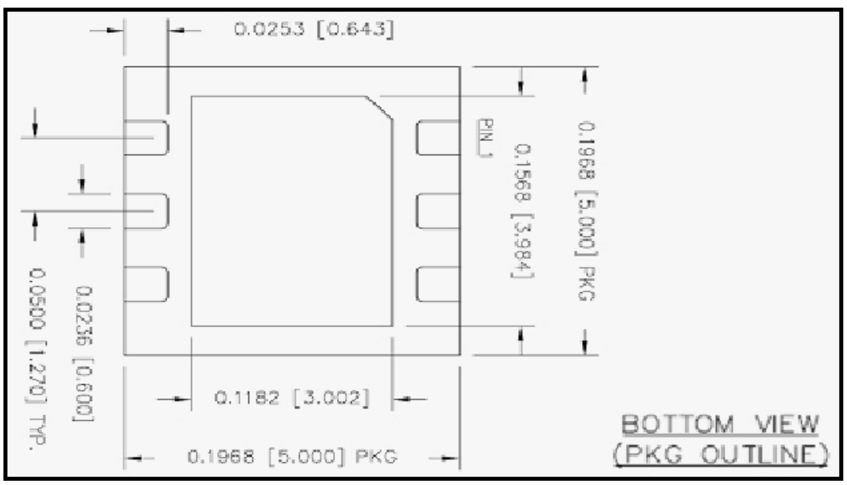
The CCBC012 is based on a patented, all solid state, rechargeable energy cell with a nominal 3.8V output. Recharge is fast and simple, with a direct connection to a 4.1V voltage source and no current limiting components. Recharge time is 10 minutes to 80% capacity. Robust design offers thousands of charge/discharge cycles. The CCBC012 is packaged in a 5 mm x 5 mm 6-pin DFN package. It is shipped in tubes and tape-and-reel.

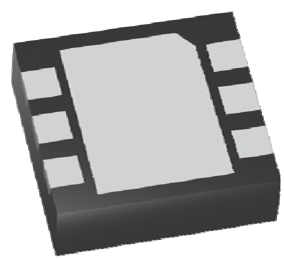
EnerChip™ Discharge Characteristics





Package Dimensions - 6-pin DFN (package code D5)





Notes:

1. All linear dimensions are in millimeters.

2. Drawings is subject to change without notice.

Pin Number(s)	Description
1	V-
2,3,4,5	NIC
6	V+
Note: NIC = No Internal Connection	

Printed Circuit Board (PCB) Layout Guidelines and Recommendations

Electrical resistance of solder flux residue on PCBs can be low enough to partially or fully discharge the backup energy cell and in some cases can be comparable to the load typically imposed on the cell when delivering power to an integrated circuit in low power mode. Therefore, solder flux must be thoroughly washed from the board following soldering.

The PCB layout can make this problem worse if the cell's positive and negative terminals are routed near each other and under the package, where it is difficult to wash the flux residue away. An undesirable example is shown in Figure 1. The negative connection on the EnerChip™ is routed from the negative pad to a via placed under the package near the positive pad. In this scenario, solder flux residue can wick from the positive solder pad, covering both the positive pad and the via. This results in a high resistance current path between the EnerChip™ terminals. This current path will make the cell appear to be defective or make the application circuit appear to be drawing too much current.

To avoid this situation, make sure positive and negative traces are routed outside of the package footprint, as shown in Figure 2, to ensure that flux residue will not cause a discharge path between the positive and negative pads.

Similarly, a leakage current path can exist from the package lead solder pads to the exposed die pad on the underside of the package as well as any solder pad on the PCB that would be connected to that exposed die pad during the reflow solder process. Therefore, it is strongly recommended that the PCB layout not include a solder pad in the region where the exposed die pad of the package will land. It is sufficient to place PCB solder pads only where the package leads will be. That region of the PCB where the exposed die pad will land must not have any solder pads, traces, or vias.

When placing a silk screen on the PCB around the perimeter of the package, place the silk screen outside of the package and all metal pads. Failure to observe this precaution can result in package cracking during solder reflow due to the silk screen material interfering with the solder solidification process during cooling.

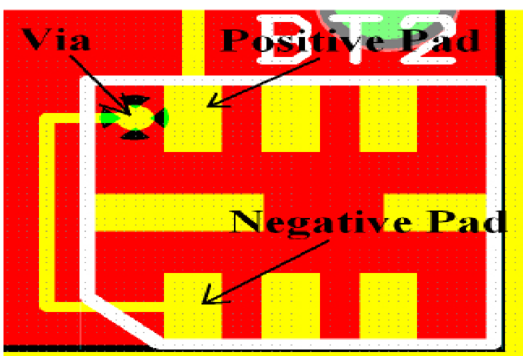


Figure 1: Improper PCB traces resulting in an undesirable parasitic leakage path.

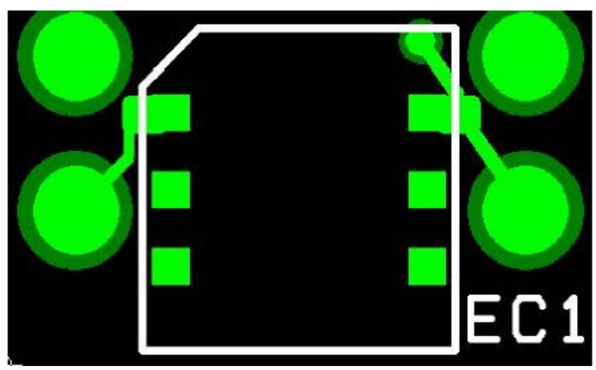


Figure 2: Proper PCB traces, precluding the formation of a parasitic leakage path.

For the CCBC012-D5C the PCB layout of Figure 3 is recommended. Note that there should not be a center pad on the PCB that could contact the exposed die pad on the D5C package. Again, this is to reduce the possible number and severity of leakage paths between the EnerChip™ terminals.

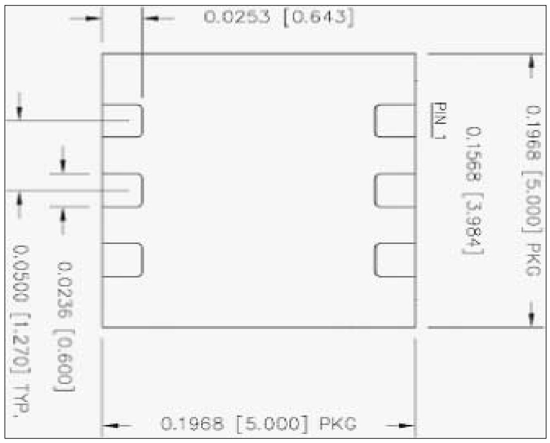


Figure 3: Recommended PCB layout to accommodate CCBC012 package

Soldering, Rework, and Electrical Test

Refer to Cardinal Components, Inc.

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