

# EnerChip™ CBC050

## Rechargeable Solid State Energy Storage: 50μAh, 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



8 mm x 8 mm  
QFN SMT Package

### Electrical Properties

Output voltage:	3.8V
Capacity (typical):	50μAh
Charging source:	4.00V to 4.15V
Recharge time to 80%:	20 minutes
Charge/Discharge cycles:	>5000 to 10% DOD

### Physical Properties

Package size:	8 mm x 8 mm
Operating temperature:	-40 °C to 70 °C
Storage temperature:	-40 °C to 125 °C

### Applications

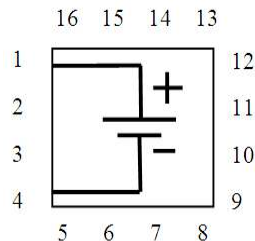
- **Standby supply** for non-volatile SRAM, real-time clocks, controllers, supply supervisors, and other system-critical components.
- **Wireless sensors and RFID tags** and other powered, low duty cycle applications.
- **Localized power source** to keep microcontrollers and other devices alert in standby mode.
- **Power bridging** to provide backup power to system during exchange of main batteries.
- **Energy Harvesting** by coupling the EnerChip with energy transducers such as solar panels.
- **Embedded Energy** where bare die can be embedded into modules or co-packaged with other ICs.

The EnerChip™ CBC050 is a surface-mount, solid state, rechargeable energy storage device rated for 50μAh 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 CBC050 is a superior alternative to coin cell batteries and supercapacitors.

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.

The EnerChip recharge is fast and simple, with a direct connection to a 4.1V voltage source and no current limiting components. Recharge time is 20 minutes to 80% capacity. Robust design offers thousands of charge/discharge cycles. The CBC050 is packaged in an 8 mm x 8 mm quad flat package. It is available in reels for use with automatic insertion equipment.

Pin Number(s)	Description
1	V+
4	V-
2,3	NIC
5-16	NIC
<b>Note: NIC = No Internal Connection</b>	



CBC050 Schematic - Top View

# EnerChip™ CBC050 Solid State Battery

## Operating Characteristics

Parameter	Condition	Min	Typical	Max	Units	
Discharge Cutoff Voltage	25 °C	3.0 <sup>(1)</sup>	-	-	V	
Charge Voltage	25 °C	4.0 <sup>(2)</sup>	4.1	4.3	V	
Pulse Discharge Current	25 °C	300 <sup>(3)</sup>	-	-	μA	
Cell Resistance (25 °C)	Charge cycle 2	-	500	1250	Ω	
	Charge cycle 1000	-	2250	5000		
Self-Discharge (5-yr. average; 25 °C)	Non-recoverable	-	2.5	-	% per year	
	Recoverable	-	1.5 <sup>(4)</sup>	-	% per year	
Operating Temperature	-	-40	25	+70	°C	
Storage Temperature	-	-40	-	125 <sup>(5)</sup>	°C	
Recharge Cycles (to 80% of rated capacity; 4.1V charge voltage)	25 °C	10% depth-of-discharge	5000	-	-	cycles
		50% depth-of-discharge	1000	-	-	cycles
	40 °C	10% depth-of-discharge	2500	-	-	cycles
		50% depth-of-discharge	500	-	-	cycles
Recharge Time (to 80% of rated capacity; 4.1V charge voltage) <sup>(6)</sup>	Charge cycle 2	-	20	35	minutes	
	Charge cycle 1000	-	60	95		
Capacity	100μA discharge; 25 °C	50	-	-	μAh	

(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.

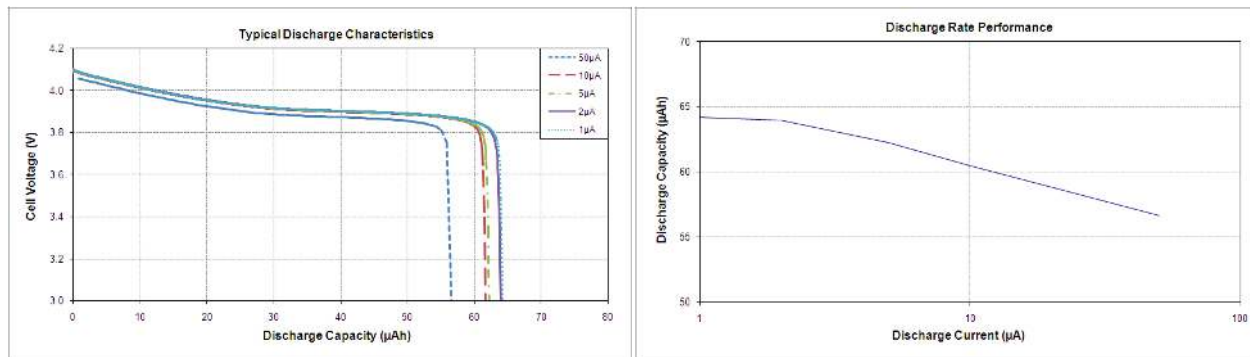
(3) At a pulse duration = 20 milliseconds.

(4) First month recoverable self-discharge is 5% average.

(5) Storage temperature is for uncharged EnerChip.

(6) EnerChip charging time and cell resistance increase approximately 2x per 10°C decrease in temperature.

## EnerChip Discharge Characteristics



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



# EnerChip™ CBC050 Solid State Battery

## Printed Circuit Board (PCB) Layout Guidelines and Recommendations

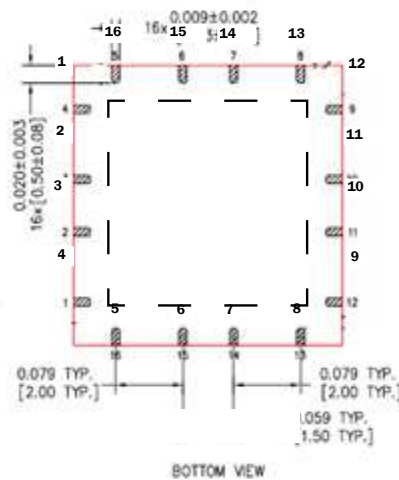
Electrical resistance of solder flux residue on PCBs can be low enough to partially or fully discharge the backup energy cell and in some cases can be comparable to the load typically imposed on the cell when delivering power to an integrated circuit in low power mode. Therefore, solder flux must be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

To avoid this situation, make sure positive and negative traces are routed outside of the package footprint 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.

A recommended CBC050 PCB layout is shown in Figure 1 below. Notice that there should not be a center pad on the PCB to mate with the exposed die pad on the CBC050 package. Again, this is to reduce the possible number and severity of leakage paths between the EnerChip terminals.

Add soldering, ESD warnings.



Dimensions in inches [mm]

Figure 1: Recommended PCB layout for the CBC050 package. Do not route signal traces under the EnerChip as they could become shorted to the die pad (as shown by the dotted lines) on the package underside.

## Handling EnerChips as MSL 3 Devices

EnerChip CBC050 devices are rated Moisture Sensitivity Level 3 and must be mounted and reflowed within 168 hours of being removed from the moisture barrier antistatic bag.

## Soldering, Rework, and Electrical Test

Refer to the Cymbet User Manual AN-1026 for soldering, rework, and replacement of the EnerChip on printed circuit boards, and for instructions on in-circuit electrical testing of the EnerChip.

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# EnerChip™ CBC050 Solid State Battery

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## HAND SOLDERING TECHNIQUES

When soldering the EnerChip using by hand at a soldering station, adhere to the following guidelines:

- Observe the ESD precautions outlined in this document.
- Never solder an EnerChip that has been partially or fully charged, even if the EnerChip is in a discharged state. This includes wave soldering and reflow soldering.
- Minimize the amount of time that heat is applied to the EnerChip. Using a tweezer-type soldering iron tip that applies heat to two opposite sides or the entire perimeter of the device simultaneously will result in more uniform heating of the package and for a shorter period of time than when soldering one pin or package edge at a time.
- If possible, apply solder paste to the solder pads on the PCB prior to placing the EnerChip on the board; this will promote wetting of the solder and reduce the amount of time the soldering iron is applied to the component and solder pads.
- Place the EnerChip onto the PCB by hand and solder in place rather than grabbing the EnerChip with a heated tweezer-type tip and placing the EnerChip on the board with the iron. This will minimize the amount of time the EnerChip is exposed to heat.
- Most surface mount packages have metal leadframe tie points that do not extend to the bottom surface of the package but are exposed on two more of the package sidewalls. When soldering, ensure that solder does not cover these tie points, as this situation could result in package pins being shorted to one another through the metal leadframe.

## ENERCHIP ASSEMBLY REPAIR TECHNIQUES

Should the need arise to replace an EnerChip that has already been soldered to a circuit board, due to battery failure, improper package placement, or other circumstances, it is recommended that the EnerChip being replaced be discarded and replaced with a new EnerChip. When removing the EnerChip from the board, use a tweezer-type soldering iron tip that heats opposite sides of the package simultaneously and lift the package from the board. When applying the new EnerChip to the board, follow the hand soldering guidelines in the previous section.

For QFN-style packages, use a hot air rework station to remove a defective or misplaced EnerChip package. If there are other EnerChips in the vicinity of the EnerChip being replaced, use proper heat shielding to protect the adjacent EnerChip package from the heat source and turn off any heat source that would otherwise be used to heat the bottom of the board during removal of the EnerChip. This will prevent the adjacent EnerChip(s) from being damaged during the rework procedure.

If it is not possible to replace the EnerChip with a new EnerChip, use extreme care when removing the EnerChip from the board to minimize the amount of time heat is applied to the package during removal and re-soldering. Follow the guidelines in the previous section pertaining to hand soldering. Under no circumstances should an EnerChip that has been partially or fully charged - even if subsequently discharged - be subjected to reflow, wave, or hand soldering.

Conductive epoxy may also be used as an attachment method. If the cure temperature is above 70 °C, then a new (i.e., never charged) EnerChip must be used.

# EnerChip™ CBC050 Solid State Battery

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## Ordering Information - available for Last Time Buy until September 12, 2014

EnerChip Part Number	Description	Notes
CBC050-M8C	50 $\mu$ Ah in 16-pin M8 QFN Package	tube
CBC050-M8C-TR1	50 $\mu$ Ah in 16-pin M8 QFN Package	tape & reel 1000 pcs
CBC050-M8C-TR5	50 $\mu$ Ah in 16-pin M8 QFN Package	tape & reel 5000 pcs
CBC050-M8C-WP	50 $\mu$ Ah in 16-pin M8 QFN Package	waffle pack

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