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

5.7 mm x 6.1 mm
Bare Die

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:	-20°C to 70°C
Storage temperature:	-40°C to 125°C

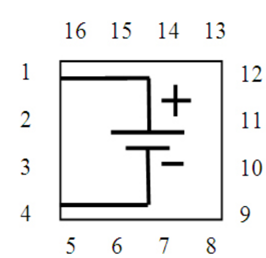
Applications
- **Standby supply** for non-volatile SRAM, real-time clocks, controllers, supply supervisors, and other system-critical components.
- **Wireless sensors and RFID tags** and other powered, low duty cycle applications.
- **Localized power source** to keep microcontrollers and other devices 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.

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

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.



CBC050 Schematic - Top View

Operating Characteristics

Parameter	Condition	Min	Typical	Max	Units
Discharge Cutoff Voltage	25°C	3.0(1)	-	-	V
Charge Voltage	25°C	4.0(2)	4.1	4.3	V
Pulse Discharge Current	25°C	300(3)	-	-	µA
Cell Resistance (25°C)	Charge cycle 2	-	750	2000	Ω
	Charge cycle 1000	-	4200	7000	
Self-Discharge (5yr average; 25°C)	Non-recoverable	-	2.5	-	% per year
	Recoverable	-	1.5(4)	-	% per year
Operating Temperature	-	-20	25	+70	°C
Storage Temperature	-	-40	-	125(5)	°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)	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.*

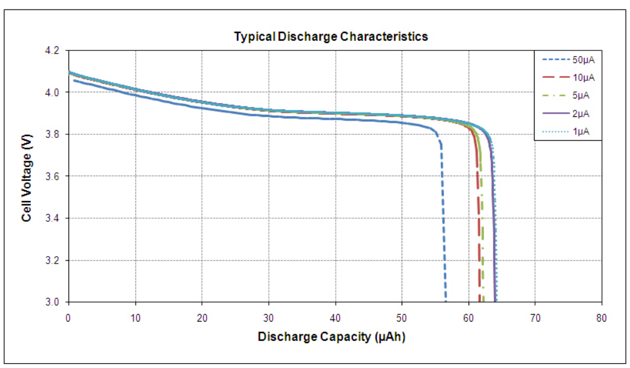
(3) *Typical pulse duration = 20 milliseconds.*

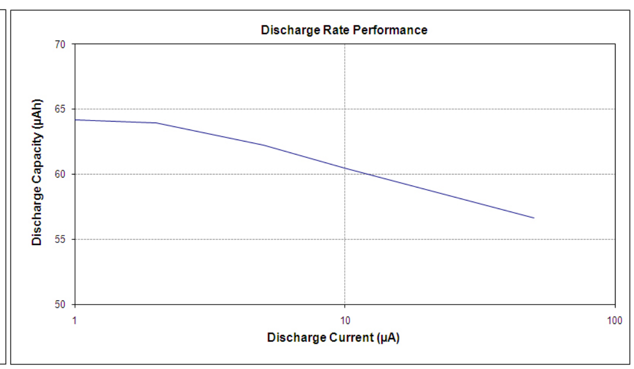
(4) *First month recoverable self-discharge is 5% average.*

(5) *Storage temperature is for uncharged EnerChip.*

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

EnerChip Discharge Characteristics

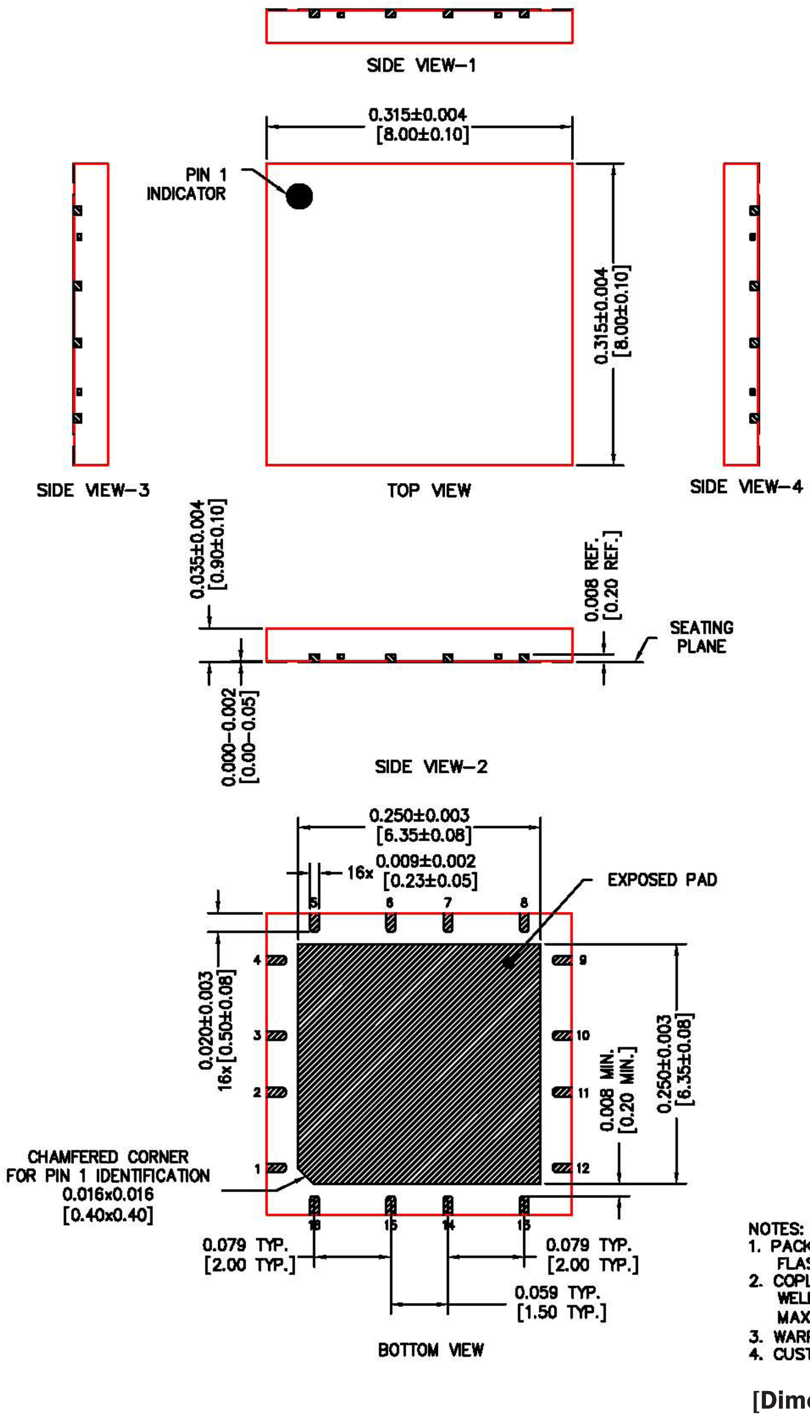




Ordering Information

EnerChip Part Number	Description	Notes
CBC050-M8C	50µAh in 16-pin M8 QFN Package	tube
CBC050-M8C-TR1	50µAh in 16-pin M8 QFN Package	tape & reel 1000 pcs
CBC050-M8C-TR5	50µAh in 16-pin M8 QFN Package	tape & reel 5000 pcs
CBC050-M8C-WP	50µAh in 16-pin M8 QFN Package	waffle pack
CBC050-BDC-WP	50µAh Bare Die	Contact Cymbet
CBC050-BUC-WP	50µAh Bumped Bare Die	Contact Cymbet

Package Dimensions - 16-pin QFN (package code M8)



NOTES:
1. PACKAGE DIMENSION DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS, BURRS OR METAL SMEARING.
2. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE EXPOSED TERMINALS. MAXIMUM COPLANARITY SHALL BE 0.003 [0.08].
3. WARPAGE SHALL NOT EXCEED 0.004 [0.10].
4. CUSTOM PACKAGE.

[Dimensions in inches [mm]

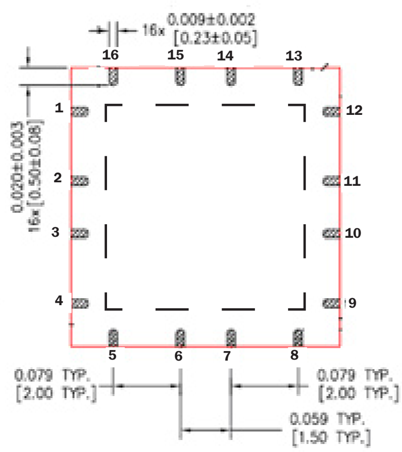
Printed Circuit Board (PCB) Layout Guidelines and Recommendations

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.



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.

Soldering, Rework, and Electrical Test

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