

## EnerChip™ CC CBC3105, CBC3112 & CBC3150 Eval Kit

### Overview

The EnerChip™ CC EVAL-05B Evaluation Kit is used to demonstrate the capabilities of EnerChip Solid State Batteries and the EnerChip CC with Integrated Battery Management capabilities. The kit can be used to demonstrate: 1 ) EnerChip battery standalone , 2) either EnerChip CC device or 3 ) the EnerChip CC in parallel with the another EnerChip battery.

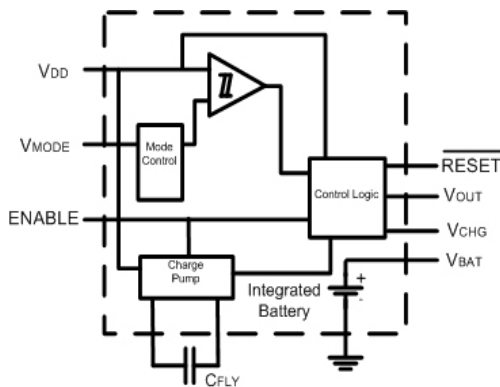


Figure 1: EnerChip CC Block Diagram

### EnerChip CC 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 back-up power to system during exchange of main batteries.
- **Consumer appliances** that have real-time clocks; provides switchover power from main supply to backup battery.
- **Business and industrial systems** such as: network routers, point-of-sale terminals, single-board computers, test equipment, multi-function printers, industrial controllers, and utility meters
- **Energy Harvesting** by coupling the EnerChip with energy transducers such as solar panels.

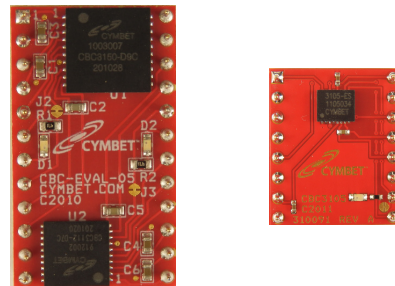


Figure 2: EVAL-05B Boards - CBC3150/CBC3112 board on left and the CBC3105-EVAL-05 board on the right

### CBC-EVAL-05B EVAL Kit

The EnerChip CC is the world's first smart rechargeable Solid State Battery. It is an integrated solution that provides battery backup and power management for systems requiring power backup and/or rechargeable energy storage. A single EnerChip CC can charge up to 10 additional EnerChips connected in parallel.

There are 2 boards in the EVAL-05B kit as shown in Figure 2 above: The first board has a CBC3112 and a CBC3150. This evaluation board utilizes a 24-pin DIP format. The second board has a CBC3105. The CBC3105-EVAL-05 evaluation board utilizes a 16-pin DIP format. Both boards have standard 0.6 inch pin width with 100mil center pin spacing. Either EVAL-05B board can be inserted into a solderless breadboard or 24-pin socket for easy experimentation.

During normal operation, the EnerChip CC charges itself with a controlled voltage using an internal charge pump that operates from 2.5V to 5.5V. An ENABLE pin allows the designer to activate and deactivate the charge pump using an external control line in order to minimize current consumption and take advantage of the fast recharge time of the EnerChip. A power fail detect indication is available via RESET pin.

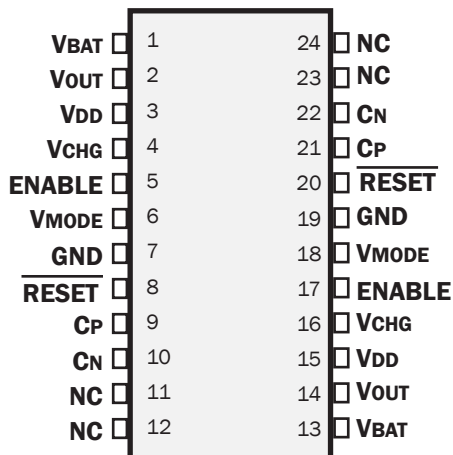
The CBC3105, CBC3112 and CBC3150 data sheets contain complete specifications and application circuits for each EnerChip CC device.

# EnerChip CBC-EVAL-05B

## Input/Ouput Descriptions and Pin-outs for CBC3112/CBC3150 board

| Pin Number | Label  | Description  |
|------------|--------|--|
| 1          | VBAT   | Positive Battery Terminal - Tie to Pin 4 <sup>(1)</sup>            |
| 2          | VOUT   | System Voltage   |
| 3          | VDD    | Input Voltage  |
| 4          | VCHG   | Battery Charge Voltage - Tie to Pin 1 and/or Optional EnerChip(s)  |
| 5          | ENABLE | Charge Pump Enable   |
| 6          | VMODE  | Mode Select for Battery Switchover Threshold                       |
| 7          | GND    | System Ground  |
| 8          | RESET  | Reset Signal (Active Low)  |
| 9          | CP     | Flying Capacitor Positive  |
| 10         | CN     | Flying Capacitor Negative  |
| 11         | NC     | No Connection  |
| 12         | NC     | No Connection  |
| 13         | VBAT   | Positive Battery Terminal - Tie to Pin 16 <sup>(1)</sup>           |
| 14         | VOUT   | System Voltage   |
| 15         | VDD    | Input Voltage  |
| 16         | VCHG   | Battery Charge Voltage - Tie to Pin 13 and/or Optional EnerChip(s) |
| 17         | ENABLE | Charge Pump Enable   |
| 18         | VMODE  | Mode Select for Battery Switchover Threshold                       |
| 19         | GND    | System Ground  |
| 20         | RESET  | Reset Signal (Active Low)  |
| 21         | CP     | Flying Capacitor Positive  |
| 22         | CN     | Flying Capacitor Negative  |
| 23         | NC     | No Connection  |
| 24         | NC     | No Connection  |

<sup>(1)</sup> See EVAL-05 Operational Modes on page 6 for optional connections to V<sub>BAT</sub>.



24-Pin DIP Module

| CBC-EVAL-05 Dimensions |                  |
|------------------------|------------------|
| Attribute              | Size             |
| width                  | 0.7 in [17.18mm] |
| length                 | 1.2in [30.48mm]  |
| height                 | 0.9in [5.00mm]   |



The EVAL05 module is sensitive to electrostatic discharge (ESD) and must be handled accordingly. In cases where the EVAL-05 module is removed from its original packaging, it is a requirement to maintain the same type of anti-static, non-conductive packaging to prevent discharge of the on-board EnerChips. Do not store the EVAL-05 in conductive black foam, as it will discharge and destroy the EnerChips on the module.

## EVAL-05 Evaluation Board Schematic

The CBC-EVAL-05 board is configured symmetrically so that a single external circuit can be used to evaluate the CBC3150 when the board is plugged into the DIP socket in the pin 1 to pin 1 orientation, and the CBC3112 when the board is rotated 180 degrees. Pins 1-12 pertain to the CBC3150. Pins 13-24 pertain to the CBC3112. A circuit schematic of CBC-EVAL-05 is shown in Figure 3. Figure 4 is a typical application circuit.

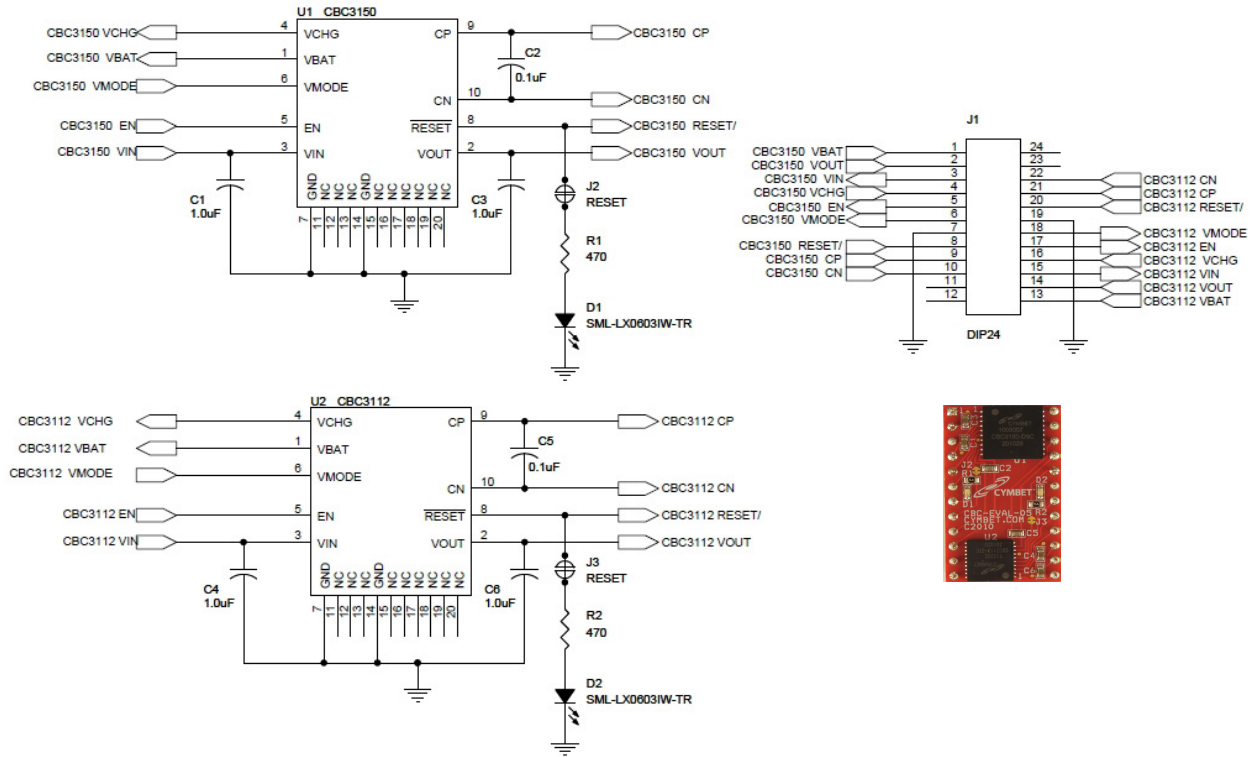


Figure 3: CBC-EVAL-05 Circuit Schematic

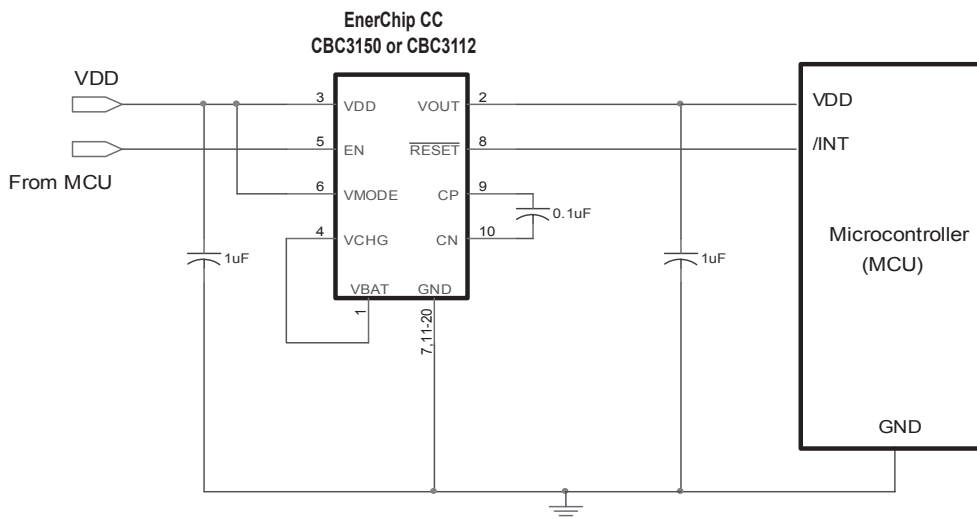


Figure 4: Typical EnerChip CC Application Circuit

## EVAL-05 Operational Modes

The CBC-EVAL-05 board can be used in seven different ways:

1. CBC3150 only - Connect to pins 1-12.
2. CBC3112 only - Connect to pins 13-24 or rotate the EVAL-05 so that pin 13 is inserted into socket pin 1 and connect to pins 1-12 on EVAL-05.
3. CBC050 only - the EnerChip 50  $\mu$ Ah battery is tested alone. Do not connect pins 1 and 4 together; pin 1 is the positive EnerChip terminal and can be charged and discharged independently of the integrated battery management circuitry. See the CBC050 data sheet for EnerChip operating and use conditions.
4. CBC012 only - the Enerchip 12  $\mu$ Ah battery is tested alone. Do not connect pins 13 and 16 together; pin 13 is the positive EnerChip terminal and can be charged and discharged independently of the integrated battery management circuitry. See the CBC012 data sheet for EnerChip operating and use conditions.
5. CBC3150 controlling the CBC012 - The CBC3150 can be used to control external EnerChips, including the CBC012 embedded in the CBC3112 package on board the EVAL-05. This is accomplished by connecting pin 4 (VCHG) to pin 13 (VBAT).
6. CBC3112 controlling the CBC050 - The CBC3112 can be used to control external EnerChips, including the CBC050 embedded in the CBC3150 package on board the EVAL-05. This is accomplished by connecting pin 16 (VCHG) to pin 1 (VBAT).
7. CBC3112 and CBC3150 simultaneously - Connect the two VBAT pins (1 and 13) together and tie them to EITHER VCHG pin (not both). Leave the other VCHG disconnected from the circuit.

## Using the EVAL-05 board

- Place the 24-pin EVAL-05 module into solderless breadboard or socket with pin 1 in pin 1.
- Note that if only one EnerChip CC is to be evaluated at a time, only pins 1 to 12 need to be connected on the test board. With board pin 1 in socket pin 1, the CBC3150 is accessible. To access the CBC3112, turn the EVAL-05 180 degrees and place EVAL-05 pin 13 in socket pin 1.
- Tie VBAT to VCHG on the test board.
- When operating under main power, LED D1 (CBC3150) or D2 (CBC3112) will be illuminated. When operating in battery backup mode, LED D1 (CBC3150) and D2 (CBC3112) will not be illuminated.
- Tie VMODE to VDD or GND depending the system voltage and the desired switchover voltage. Optionally, use a resistor divider. See the CBC3112 or CBC3150 datasheets for switchover voltage details.
- Tie the ENABLE pin to VDD.
- Tie VOUT to VDD of a microcontroller or any device requiring power backup.
- Tie the  $\overline{\text{RESET}}$  pin to the interrupt pin of a microcontroller if desired. When operation is under battery backup mode, the LED will not be illuminated.
- Allow the EnerChip CC to charge for at least 30 minutes before attempting to use backup power.
- Monitor VBAT for battery voltage and monitor Vout for output voltage to the system.
- Place current meter between VBAT and VCHG to monitor battery charging current if desired.
- Disconnect VDD and the RESET pin will go low and system will switchover to battery backup mode.

## Adding the CBC3105-EVAL-05 Evaluation Board to the CBC-EVAL-05

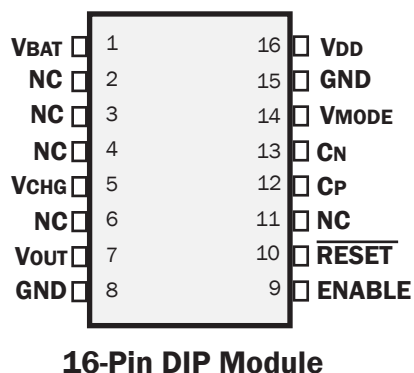
The CBC-EVAL-05B kit combines the existing CBC-EVAL-05 24-pin DIP board with the new CBC3105-EVAL-05 16-pin DIP board and is intended to test the EnerChip CC CBC3105 in standalone mode.

# EnerChip CBC-EVAL-05B

## Input/Ouput Descriptions and Pin-outs for CBC3105-EVAL-05 board

| Pin Number | Label  | Description  |
|------------|--------|--|
| 1          | VBAT   | Positive Battery Terminal  |
| 2          | NC     | No Connection  |
| 3          | NC     | No Connection  |
| 4          | NC     | No Connection  |
| 5          | VCHG   | Battery Charge Voltage - Tie to Pin 1 and /or Optional EnerChip(s) |
| 6          | NC     | No Connection  |
| 7          | VOUT   | System Voltage   |
| 8          | GND    | System Ground  |
| 9          | ENABLE | Charge Pump Enable   |
| 10         | RESET  | Reset Signal (Active Low)  |
| 11         | NC     | No Connection  |
| 12         | CP     | Flying Capacitor Positive  |
| 13         | CN     | Flying Capacitor Negative  |
| 14         | VMODE  | Mode Select for Battery Switchover Threshold                       |
| 15         | GND    | System Ground  |
| 16         | VDD    | Input Voltage  |

<sup>(4)</sup> See CBC3105-EVAL-05 Operational Modes on page 5 for optional connections to VBAT.



| CBC3105-EVAL-05 Dimensions |                  |
|----------------------------|------------------|
| Attribute                  | Size             |
| width                      | 0.7 in [17.18mm] |
| length                     | 0.8 in [20.00mm] |
| height                     | 0.9in [5.00mm]   |



The CBC3105-EVAL-05 module is sensitive to electrostatic discharge (ESD) and must be handled accordingly. In cases where the CBC3105-EVAL-05 module is removed from its original packaging, it is a requirement to maintain the same type of anti-static, non-conductive packaging to prevent discharge of the on-board EnerChips. Do not store the CBC3105-EVAL-05 in conductive black foam, as it will discharge and destroy the EnerChip on the module.

## CBC3105-EVAL-05 Evaluation Board Schematic

The CBC3105-EVAL-05 board is configured in the same pin-out fashion as the CBC51100 on the EVAL-09 Kit board and is intended to test the CBC3105 in standalone mode or as the EnerChip charge control circuit for an optionally attached EnerChip CBC012 or CBC050.

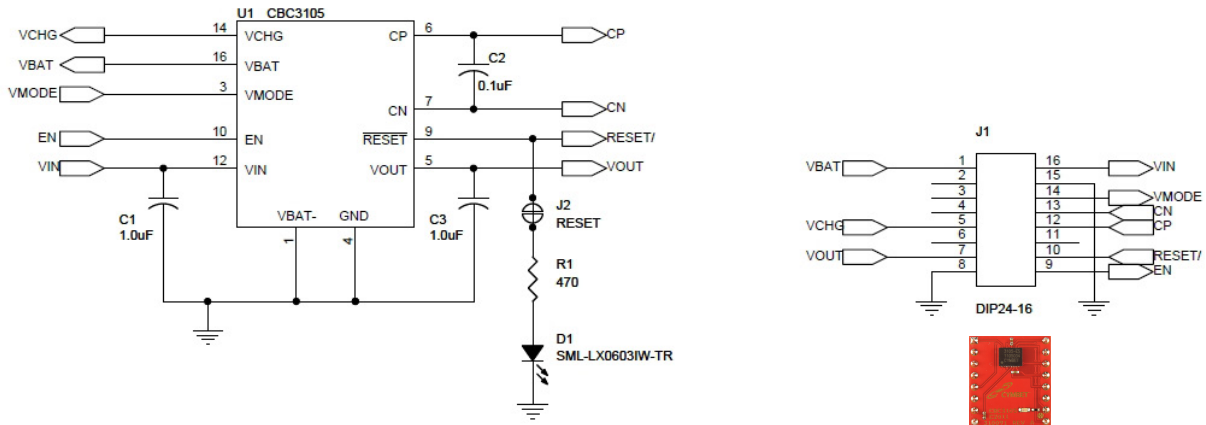


Figure 5: CBC3105 -EVAL-05 Circuit Schematic

## CBC3105 Application Circuit

The CBC3105 can be used for secondary power backup for Real Time Clocks and Microcontrollers (MCUs).

**Note:** that the pin-out of the CBC3105 is different than the CBC3112 and CBC3150 and should be taken into consideration when designing products with the CBC3105.

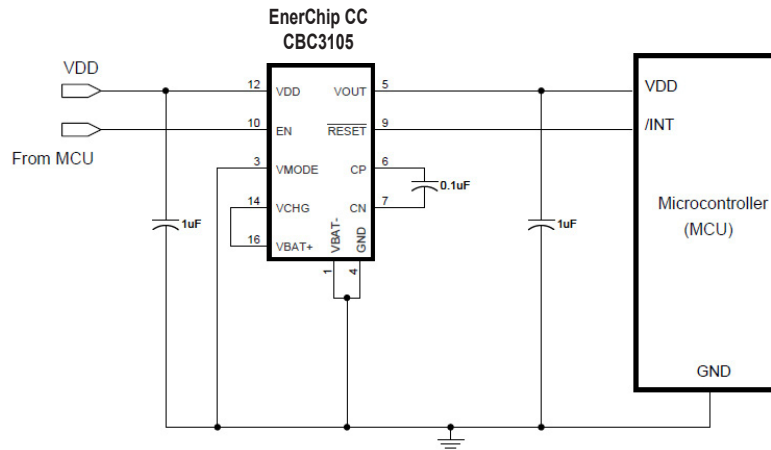


Figure 6: Typical EnerChip CC CBC3105 Application Circuit

## Using the CBC3105-EVAL-05 board

- Place the 16-pin CBC3105-EVAL-05 module into solderless breadboard or socket with pin 1 in pin 1.
- Tie VBAT to VCHG on the test board.
- When operating under main power, LED D1 (CBC3105) will be illuminated. When operating in battery backup mode, LED D1 (CBC3105) will not be illuminated.
- Tie VMODE to VDD or GND depending the system voltage and the desired switchover voltage. Optionally, use a resistor divider. See the CBC3105 datasheet for switchover voltage details.
- Tie the ENABLE pin to VDD.
- Tie VOUT to VDD of an RTC, microcontroller or any device requiring power backup.
- Tie the RESET pin to the interrupt pin of a microcontroller if desired. When operation is under battery backup mode, the LED will not be illuminated.
- Allow the EnerChip CC to charge for at least 30 minutes before attempting to use backup power.
- Monitor VBAT for battery voltage and monitor VOUT for output voltage to the system.
- Place current meter between VBAT and VCHG to monitor battery charging current if desired.
- Disconnect VDD and the RESET pin will go low and system will switchover to battery backup mode.

## Ordering Information

| Cymbet Part Number | Description                | Notes               |
|--------------------|----------------------------|---------------------|
| CBC-EVAL-05B       | EnerChip CC Evaluation Kit | Includes two boards |

U.S. Patent No. 8,044,508. Additional U.S. and Foreign Patents Pending

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