UcHybrid 3.3V

Ultra Capacitor Conditioner board for LifePO4 battery cell

By Ian May 31, 2020 Ver. 0.9b

A. Introduction

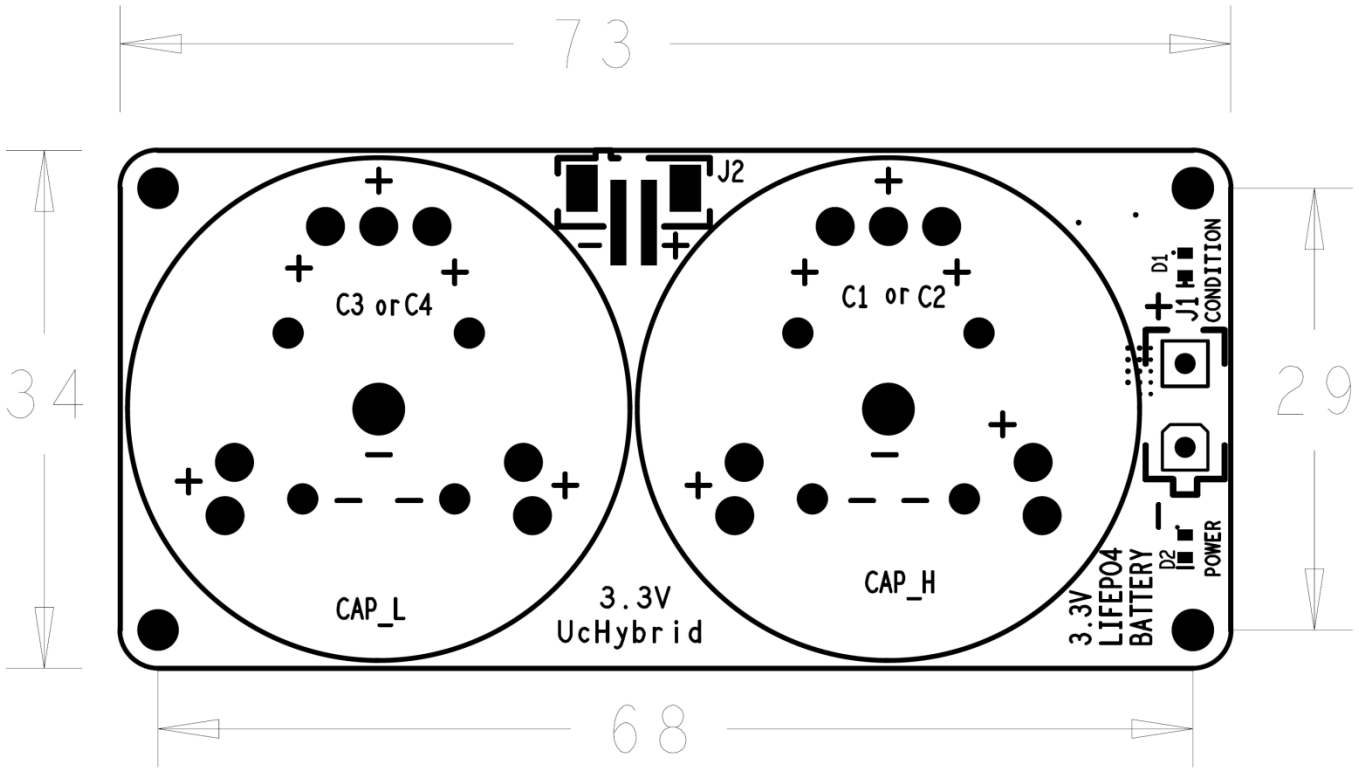
UcHybrid 3.3V is an ultra capacitor conditioner board that was specially designed working with single LifePO4 battery cell. UcMateConditioner can improve the LifePO4 battery power supply quality even more by reducing both internal ESR and the noise levels, as well as increasing the stability and the maximal deliver current.

UcHybrid can be used to upgrade the LifePO4 MkIII and MkII power supply directly. Once upgraded, it will become an ultra capacitor/LifePO4 battery hybrid power supply with the super performance that has never been achieved before.

B. Highlighted Features and Specifications

- Fully ultra low resistance MOS FET architecture.
- Built-in automatic per-charge/charge circuits with current limitation.
- Directly works with any single LifePO4 battery cell without needing of pre-charge.
- LED indications for power and conditioning.
- Double thickness 2oz PCB copper layers especially designed for high current and ultra low ESR applications.
- MOS FETs are controlled by optical isolators to eliminate any possible leakage current.
- Can be mounted directly to the UcAdapter PCB and then whole assembly on top of LifePO4 power supply.
- Output is 100% following the input without any delay.
- DIY friendly, plug and play, very easy to use, no software is required.

C. Layout and Dimensions (in mm)



D. Getting start

1. Solder two ultra capacitors to the positions of CAP_L and CAP_H.

   Ultra capacitor P/N can be:

   BCAP0325 P270 S17, or

   BCAP0350 E270 T11.

   Lower ESR capacitors are performed.

   Please make sure using solder iron with **80W or higher** power for durable connections of this high current conditioner board.

   (Optional) If it is possible, mount the UcHybrid to a UcAdapterPCB by the supplied screws. And then, mount the whole assembly on top of a LifePO4 power supply.

2. Make sure your LifePO4 power supply is turned off.

   For LifePO4 MkIII, please connect the supplied power cable between J1 and the same type Molex power connector on LifePO4 power supply PCB right beside the battery cell to attach to. If it is necessary, solder the supplied Molex power connector to the corresponding position on the LifePO4 power supply PCB in before.

   Or, if you have LifePO4 MkII, connect one side of the supplied power cable to J1. And then, solder the two wires on the other side to both terminals of the LifePO4 battery cell to attach to. Have to be + (RED) to

positive and – (BLACK) to negative. In this case, the positive wire (RED) may needs to be extended before soldering. Please use wire AWG18 or bigger for the extension to keep the high current and low ESR performance.

Safety tips:

A. Keep in mind never short circuit during soldering job if the battery cell is already installed.

B. Reversed connection can damage the board.

3. Make sure all battery cells are installed properly.
4. Now the power LED should light up. For the first time, it may take up to 20 minutes charging the ultra capacitor package full to 3.3V. After that, the condition LED will light up and the conditioning service is ready.
5. Turn on the LifePO4 power supply. Now you can enjoy the improvement that the UcHybrid makes to the 3.3V output.

E. Connectors

J1: 3.3V DC power connector

1- 3.3V positive
2- 3.3V negative

This connector must be connected the both positive and negative terminals of the corresponding LifePO4 battery cell.

Connector P/N: 39-28-1023, Molex Mini-Fit Jr 2pin.

J1: Ultra capacitor package testing/monitoring connector in 2-pin PH2.0

1: V- of ultra capacitor package
2: V+ of ultra capacitor package

F. LED indicators

D2: POWER indicator. Indicating that the DC voltage is applying to the DC power connector J1 when lit.

D1: CONDUTION indicator. Indicating that the UcHybrid board is in conditioning state when lit.

G. Application notes

1. UcHybrid works for 3.3V LifePO4 battery cell only. It doesn't work for any other kind of power supply.

2. It will be very hard to remove if the ultra capacitors had soldered to the UcHybrid PCB. So, please make sure everything is OK before you start to solder them.

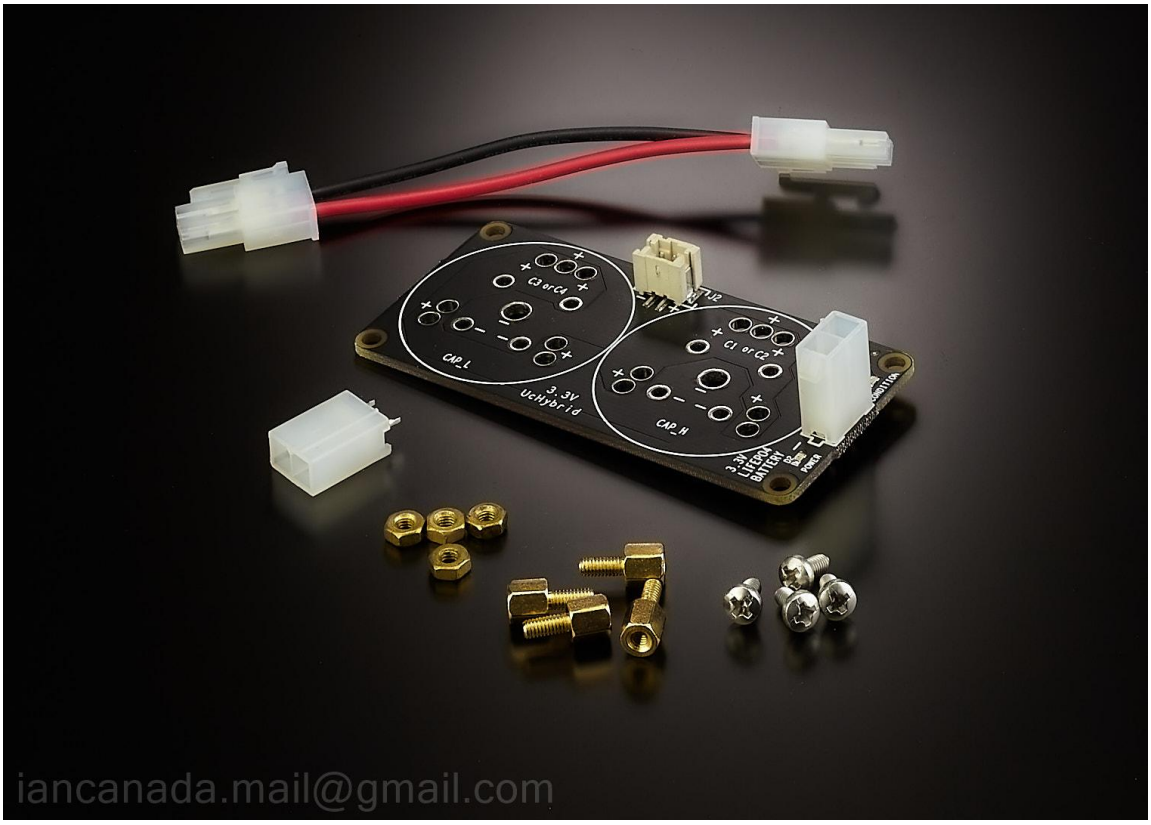
3. Unless both ultra capacitors are fully empty, UcHybrid will always have energy stored inside even if it's disconnected from the circuit. Please be very careful about that, not to short circuit in any way and at any time.

4. Please disconnect the power cable if you don't use it for long time to avoid exhaust the battery cell.

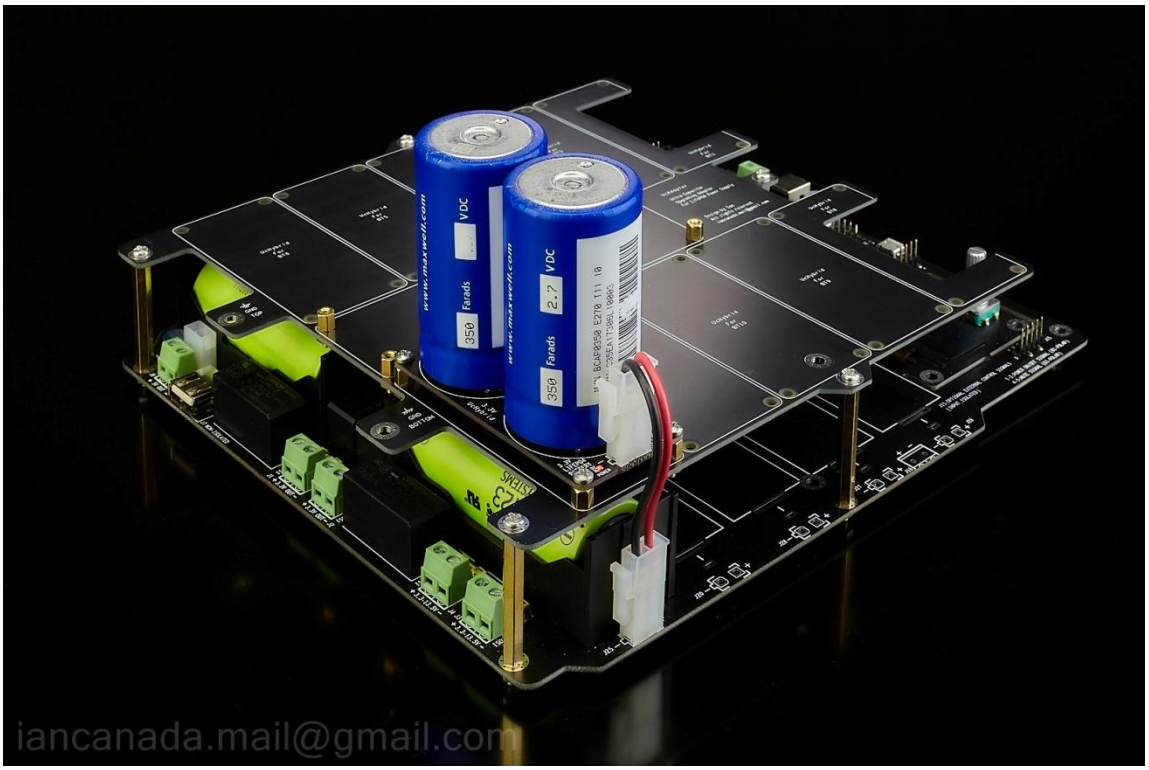
5. UcConditioner 3.3V may cover the function of UcHybrid. But for better integration, UcHybrid will be your first choice if use LifePO4 power supply.

H. Pictures of UcHybrid

1. UcHybrid as shipped



2. UcHybrid integrated with LifePO4 MkIII through UcAdapter PCB



I. History of revising

May 31, 2020 V0.9b released