UcMateConditioner 5V

Ultra Capacitor Conditioner board

By Ian Jin Apr.18, 2021 Ver. 1.0

A. Introduction

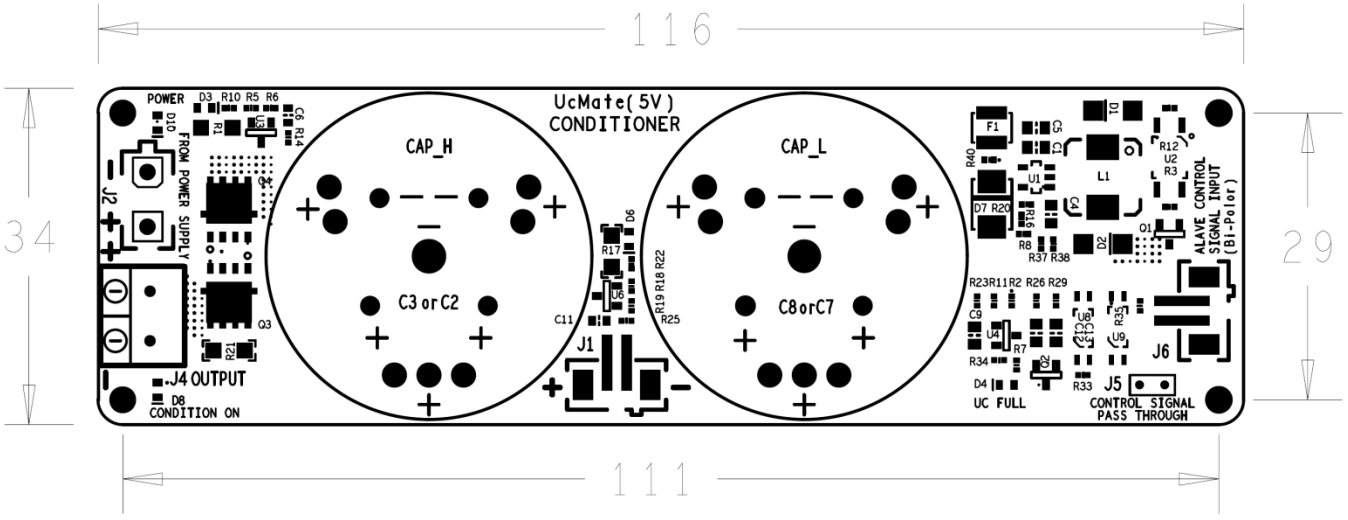
UcMateConditioner 5V is an ultra capacitor conditioner board that was specially designed for LifePO4 MkII or MkIII power supply. UcMateConditioner will significantly improve the DC 5V power supply quality by reducing both internal ESR and the noise levels, as well as increasing the stability and the maximal deliver current.

For audiophiles, upgrading the LifePO4 power supply with UcMateConditioner could be a one of the best solution to achieve better sound quality.

B. Highlighted Features and Specifications

- Fully ultra low resistance MOS FET architecture.
- Built-in automatic per-charge/charge circuits with current limitation.
- Enable/disable conditioning is performed by monitoring ultra capacitors and DC input status.
- All logics are running automatically at background by following ON/OFF control signal from LifePO4 power supply.
- On-board active balancers for ultra capacitor protection.
- LED indications for power on, ultra capacitor full 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.

   If it is possible, mount the UcMateConditioner to a UcAdapterPCB by the supplied screws. An then, mount the whole assembly on top of a LifePO4 power supply.

2. If you have LifePO4 MkIII, connect the 5V power input J2 directly to the 5V output J30 at the power supply through the supplied power cable.

   Or, if you have LifePO4 MkII, connect the 5V power input J2 to the 5V DC output terminal J8 on the power supply through the supplied power cable. In this case, please cut the connector at one end of the power cable. Keep in mind that the connection has to be + (red) to +, - (black) to-. **Reversed connection can damage the board.**

3. Connect the supplied control cable between J6 and J29 at LifePO4 MkIII power supply,

   Or, use another supplied control cable, between J6 and pin1/pin2 of J16 at LifePO4 MkII power supply.

The control signal is non-polarity. (The next you can go to either step4 or step6)

4. Turn on the LifePO4 power supply, the power LED will be lit. And then the 5V output voltage will be applied to the output J4.
5. For the first time power up, it will take up to 10 minutes charging the ultra capacitors full to 5V. After that, both conditioning LED and UC FULL LED will light up. Then turn off the LifePO4 power supply.
6. Connect UcMateConditioner output J4 to the device that needs to be powered. **To avoid any damaging, please be very careful not to reverse the connection.**
7. Turn on the LifePO4 power supply. All of the above 3 LEDs will be lit up shortly indicating it's in the conditioning state. Now you can enjoy the improvement that the UcMateConditioner makes to the 5V output rail.

E. Connectors

J2: 5V DC input connector

1- 5V positive
2- 5V negative

This connector must be connected the DC 5V output of a LifePO4 power supply.
Connector P/N: 39-28-1023, Molex Mini-Fit Jr 2pin.

J4: UcMateConditioner 5V output in 2-pin 5.0mm terminal

This connector will have ultra capacitor conditioned 5V output when conditioning LED is lit, otherwise it will be connected to 5V input.
Under the control signal, this UcMateConditioner output will be turned on or off at same time as the LifePO4 power supply it attached to.
This output can deliver maximal current higher than 100A, so has to be very careful not to short circuit.

J6: UcMateConditioner on/off control signal input connector

This connector must be connected to the on/off control output signal of a LifePO4 power supply to function.
This connector internally is optical isolated and non-polarity.

J5: Control signal pass through (Not assembled by default)

Connected to J6 internally. Isolated from UcMateConditioner.

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

D10: POWER indicator. Indicating that the DC input voltage is applied when lit. The output of UcMateConditioner will be valid at same time.

D4: UC FULL indicator. Indicating that the ultra capacitor package is full when lit.

D8: CONDUTION ON indicator. Indicating that the UcMateConditioner output is in conditioning state when lit.

D3, D6: Ultra capacitor over voltage alarm indicator. Indicating the charging voltage of CAP_H or CAP_L is higher than 2.7V.

G. Application notes

1. UcMateConditioner is kind of passive power supply. Please use wires as big and short as possible to the output to get the best possible performance.

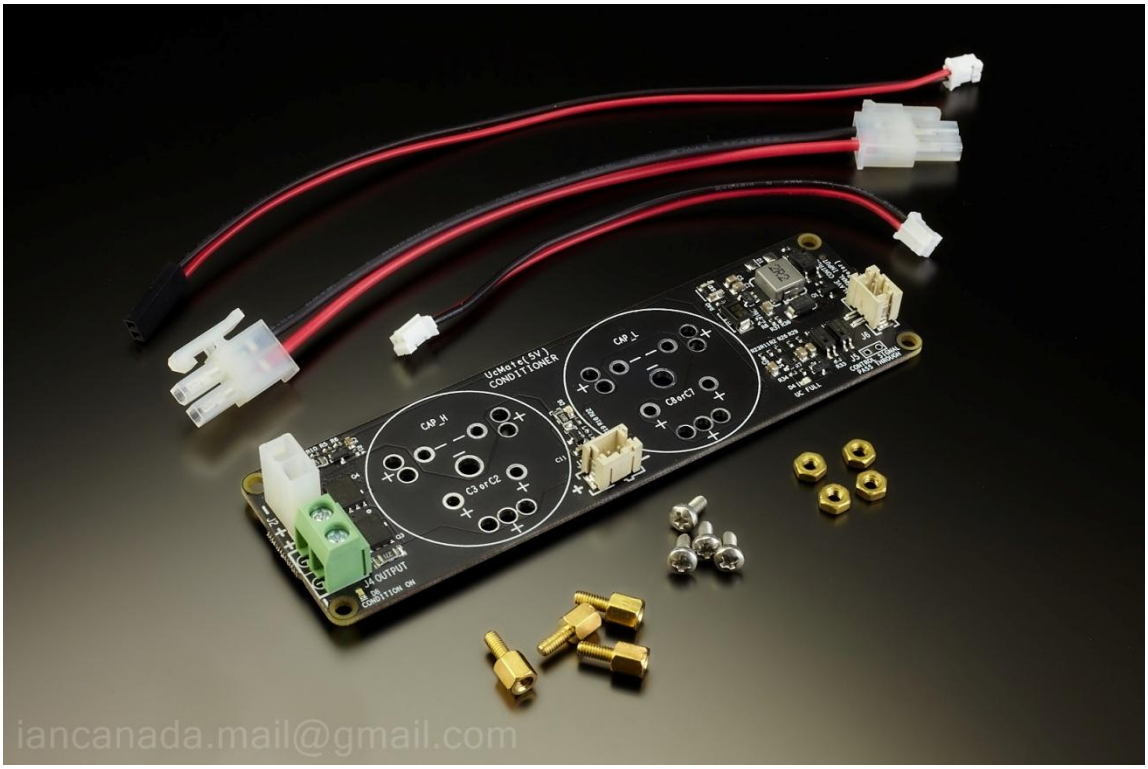
2. UcMateConditioner doesn't regulate the voltage. The output voltage will be as same as the input voltage. So, the input voltage must be within range of 4.9V to 5.3V. If it is lower, the UcMateConditioner will not go to conditioning state. If it is higher, the ultra capacitors can get damaged or reduced the life time.

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

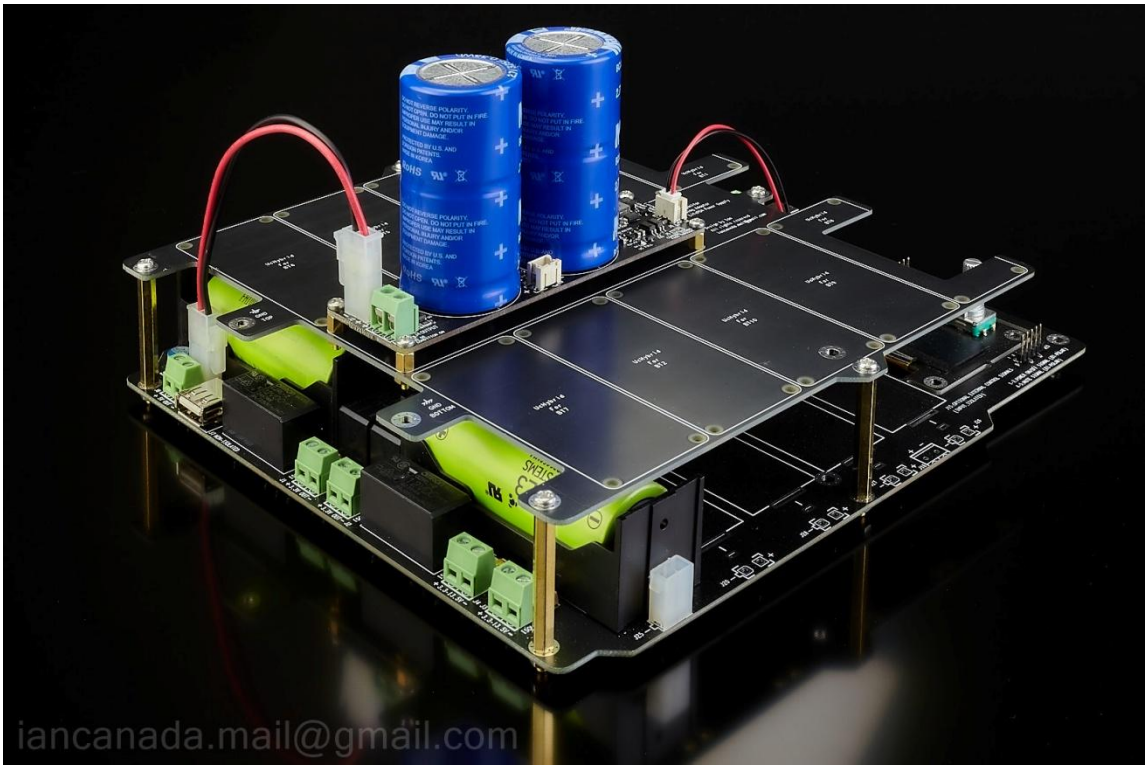
4. UcMateConditioner and UcConditioner are the same in both function and performance. But for better integration, UcMateConditioner will be your first choice if use LifePO4 power supply.

H. Pictures of UcMateConditioner

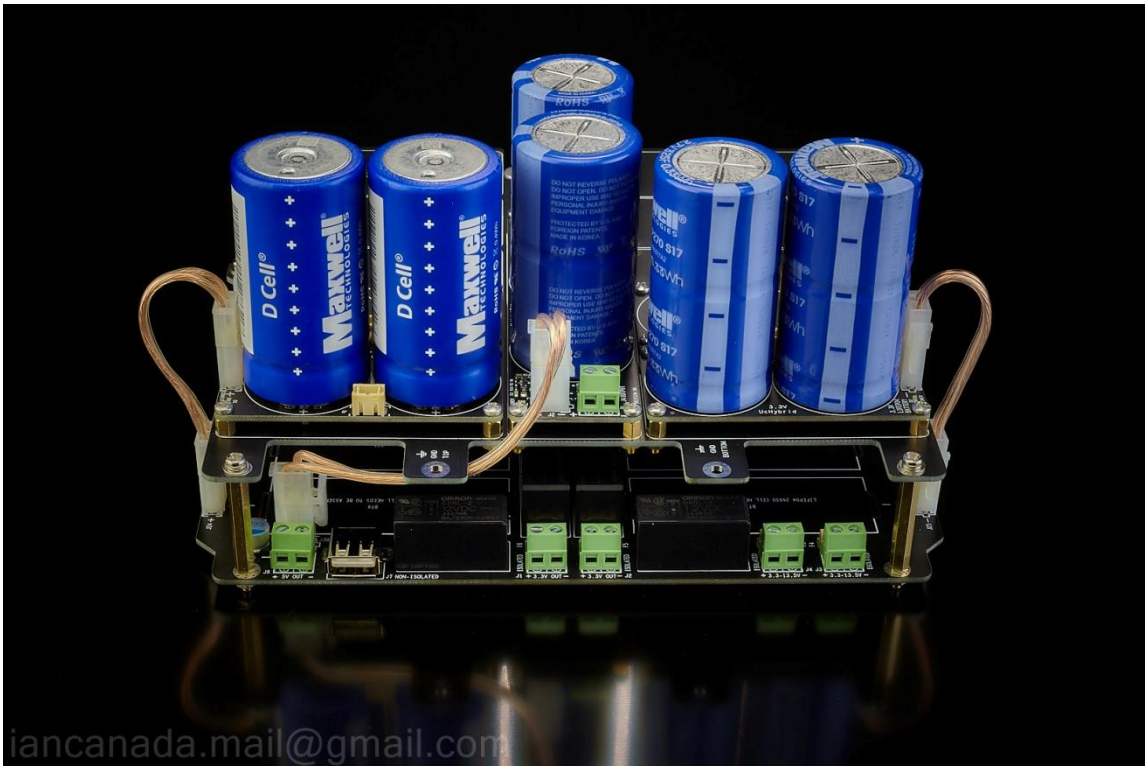
1. UcMateConditioner as shipped



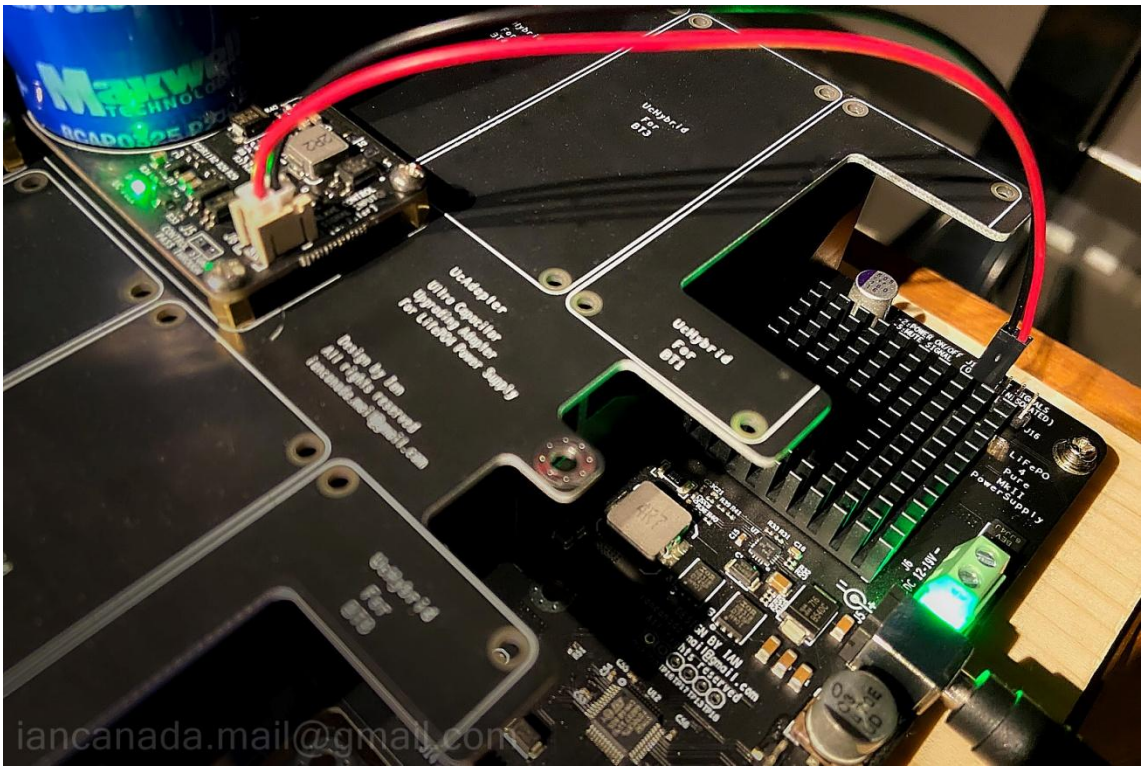
2. UcMateConditioner integrated with LifePO4 MkIII through UcAdapter PCB



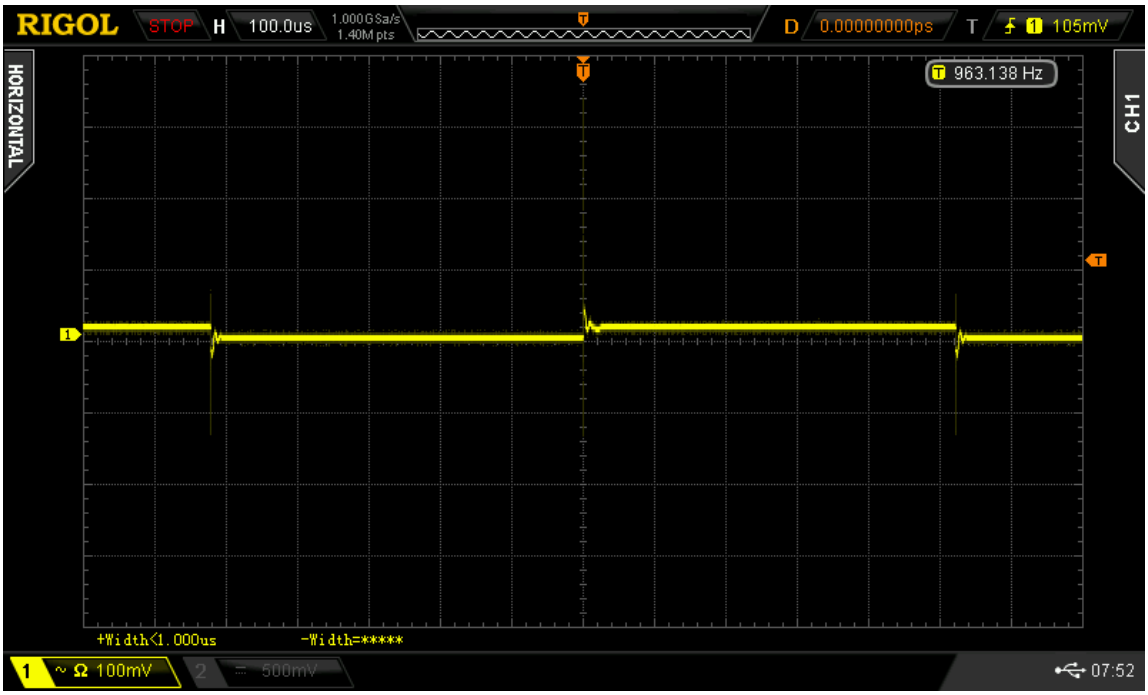
3. LifePO4 MkIII power supply fully upgraded with UcMateConditioner, UcHybrid and UcAdapter



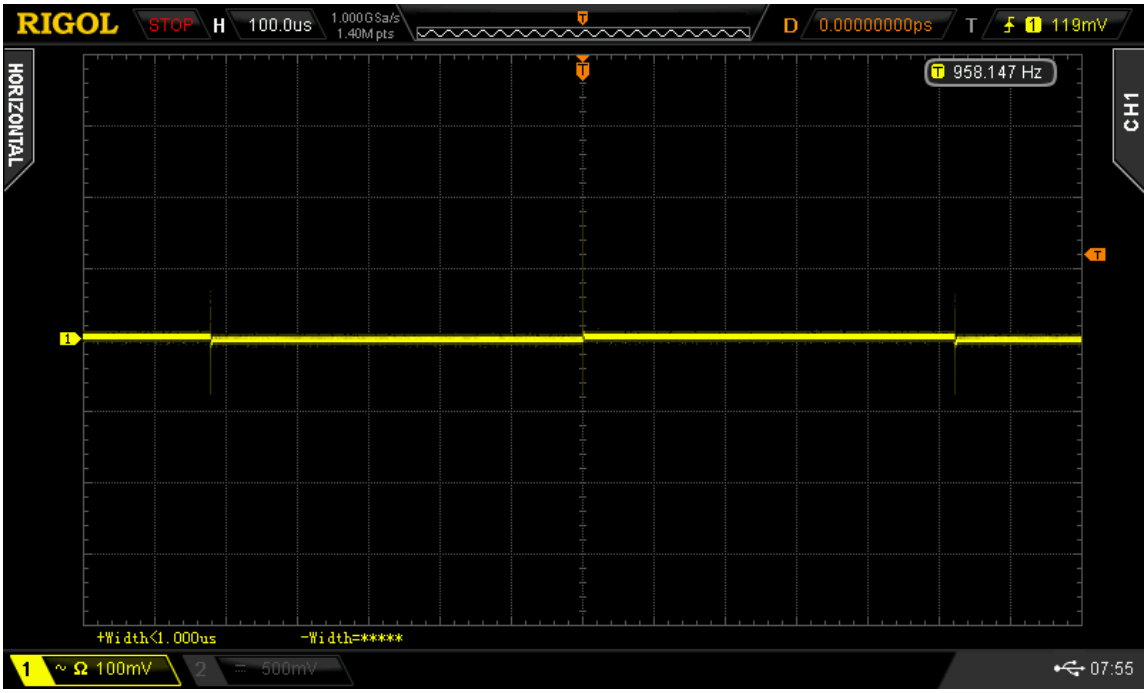
4. How to connect the ON/OFF control signal from LifePO4 MkII power supply



5. Dynamic 500mA load transient response of the DC 5V output of a LifePO4 power supply



6. Dynamic 500mA load transient response of the same power supply with UcMateConditioner attached



I. History of revising

May 31, 2020 V0.9b released