UcConditioner 3.3V

Ultra Capacitor Conditioner board

By Ian Jin June 20, 2020 Ver. 1.01b

A. Introduction

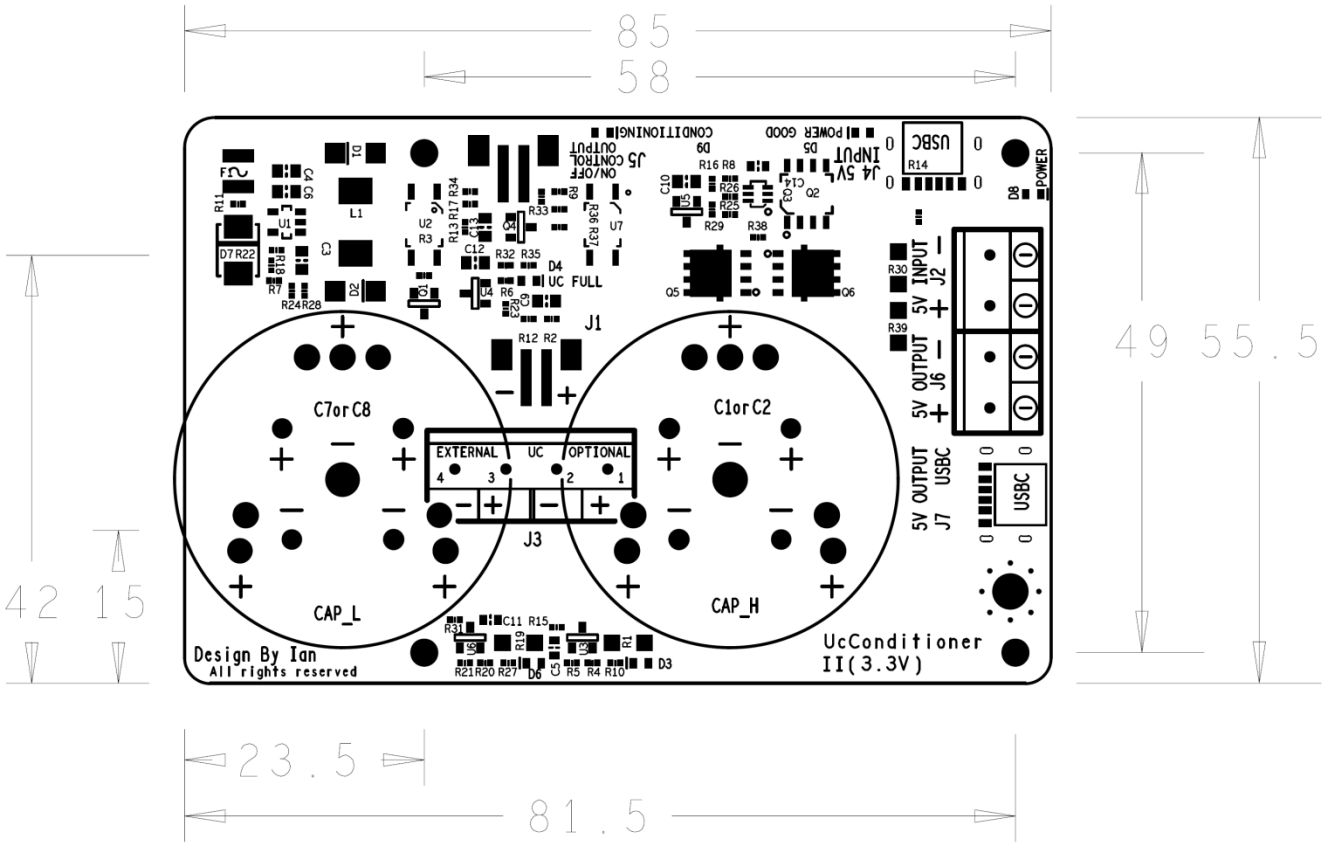
UcConditioner 3.3V is an ultra capacitor conditioner board that works with any existing 3.3V power supply. UcConditioner will significantly improve the power supply quality by reducing both internal ESR and the noise levels, as well as increasing the stability and the maximal deliver current.

For audiophiles, upgrading power supply with UcConditioner 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 control logics are running automatically at background, no need any external control signal.
- Very easy to use. Just input and output.
- On-board active balancers for ultra capacitor protection.
- LED indications for power on, power good, 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.
- External ultra capacitor connectors flexible for evaluation and possible upgrading.
- Output is 100% following the input without any delay.
- With ON/OFF control signal output for possible requirement.
- Special ultra low internal resistance design for 3.3V low voltage.
- DIY friendly, works for any 3.3V power supply, plug and play, 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.

2. Connect a 3.3V power supply to input terminal block J2. (If you power supply is capable of delivering 1.5A current or higher, you can go to step5 directly)

3. Turn on the 3.3V power supply, both power LED and power good LED will be lit.

4. For the first time power up, it will take up to 10 minutes charging the ultra capacitors to 3.3V. When they are fully charged, both full LED and power good LED will light up. After that, turn off the 3.3V power supply.
5. Connect UcConditioner output J6 to the device that needs to be powered.
6. Turn on the 3.3V power supply again. All of the above 4 LEDs will be lit up shortly indicating that the UcConditioner is in conditioning state. Now you can enjoy the improvement that the UcConditioner makes.

E. Connectors

J2: 3.3V DC power input connector

A 3.3V DC power supply that needs to be conditioned must be connected to this (or J4) 2-pin 5.0mm terminal to operate. The voltage range must be within 3.2V to 3.6V. To power Raspberry Pi, rated current 2A or higher linear power supply would be recommended for this input.

Note: UcConditioner 3.3V PCB might be mistakenly marked J2 as 5V

J6: UcConditioner 3.3V output in 2-pin 5.0mm terminal

This is the ultra capacitor conditioned 3.3V output when conditioning LED is lit, otherwise it will be connected to 3.3V input.

UcConditioner output will be turned on or off automatically when 3.3V DC input voltage is applied or removed.

This output can deliver maximal current higher than 100A, so has to be very careful not to short circuit.

Note: UcConditioner 3.3V PCB might be mistakenly marked J6 as 5V

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

1: V- of ultra capacitor package

2: V+ of ultra capacitor package

J3: Optional external ultra capacitor terminal connector (un-installed by default)

1: CAP_H +

2: CAP_H -

3: CAP_L +

4: CAP_L -

J5: ON/OFF control signal output in 2-pin PH2.0

Can be used for the isolated input of other possible device that needs this on/off control signal. No need in normal application. This signal is non-isolated.

J4: 3.3V USB type-C input power connector (Not assembled by default)

Please don’t use this input because of standard USB type-C power supply doesn’t support 3.3V

J7: UcConditioner 3.3V output in USB type-C connector (Not assembled by default)

Please don’t use this input because of standard USB type-C power supply doesn’t support 3.3V

F. LED indicators

D8: Power indicator. Indicating that the DC input voltage is applied when lit. The output of UcConditioner will be valid at same time.

D5: Power good indicator. Indicating that the DC input voltage is higher than 3.1V when lit.

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

D9: Conditioning indicator. Indicating that the UcConditioner 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. It will be very hard to remove if the ultra capacitors are soldered to the UcConditioner PCB. So, if you are new to UcConditioner, I would suggest soldering them first to the option external UC connector J3. And then solder them to PCB only after you make sure everything is good.

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

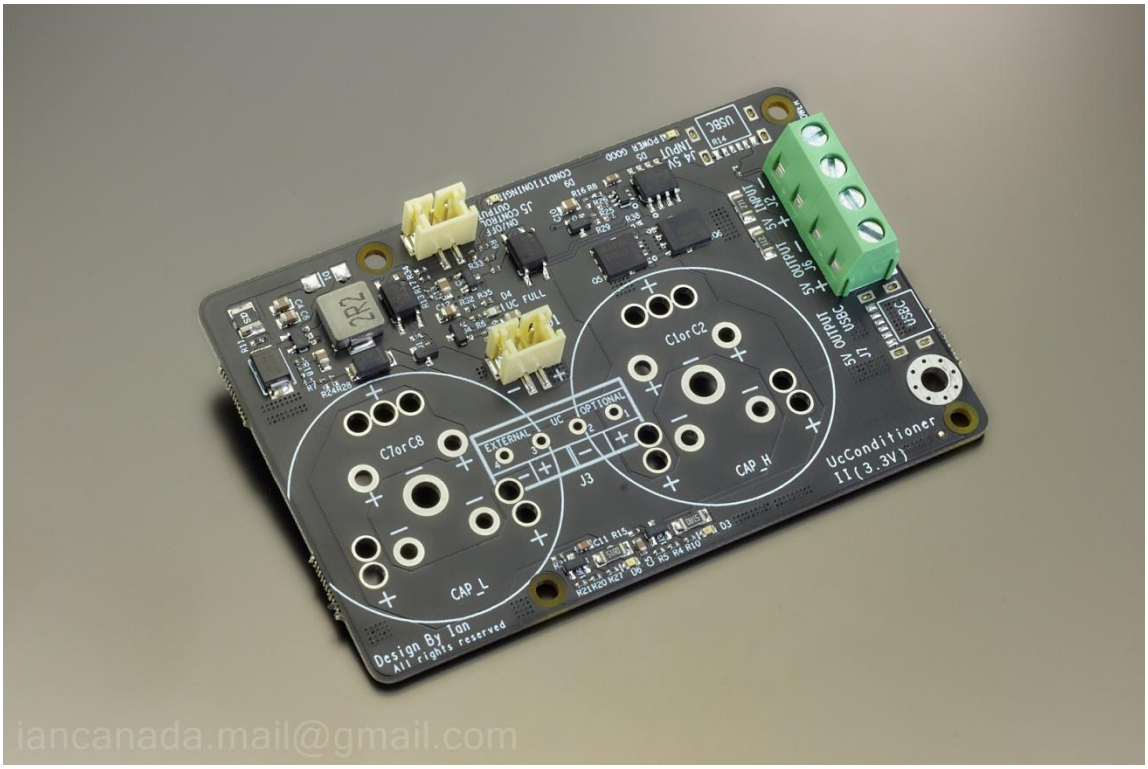
3. UcConditioner doesn't regulate the voltage. The output voltage will be as same as the input voltage. So, the input voltage must be within range of 3.2V to 3.6V. If it is lower, the UcConditioner will not go to conditioning state. If it is higher, the ultra capacitors can get damaged or reduced the life time.

4. The internal charging current limitation is 1A. If the power supply it will attach to has output current less than that, it may take longer time to charge the UcConditioner to 3.3V if it is fully empty. Or you can pre-charge the UcConditioner with another 3.3V power supply at the first time of use. Both the UC FULL LED and CONDITIONING LED will light up when UcConditioner is full.

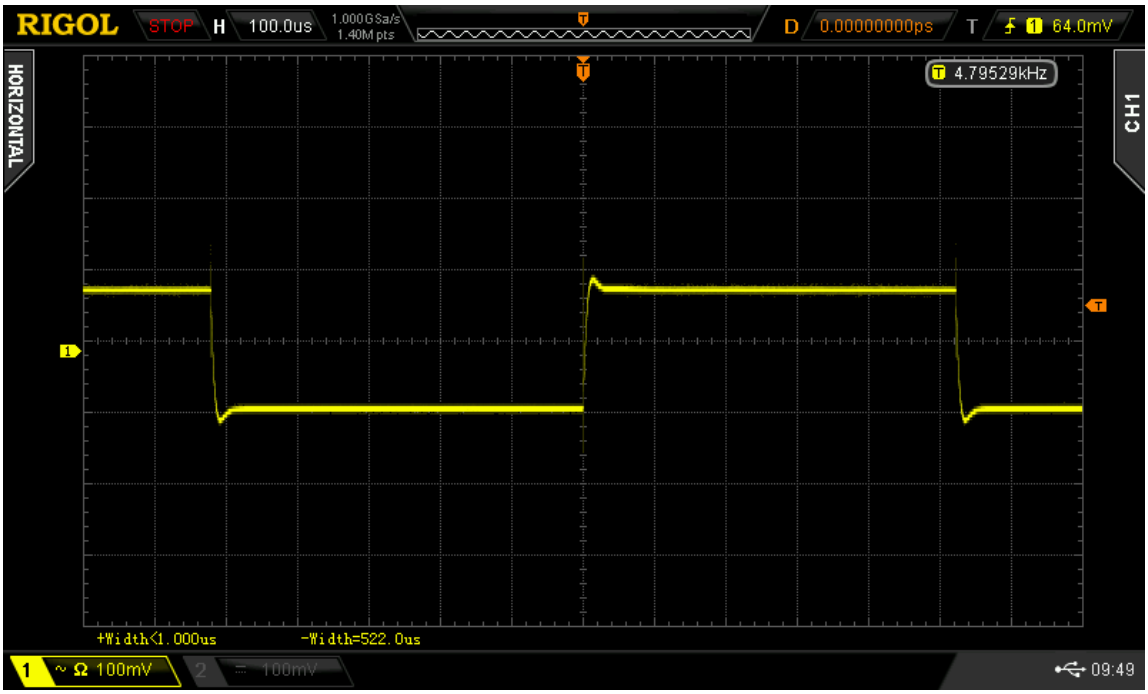
5. The output of UcConditioner will follow the 3.3V DC input voltage without any delay. However, some power supply doesn't remove the output voltage immediately when you turn off the switch. So, in this case, some delay will be expected to the UcConditioner output. This kind of delay is caused by the power supply itself, not the UcConditioner.

H. Pictures of UcConditioner

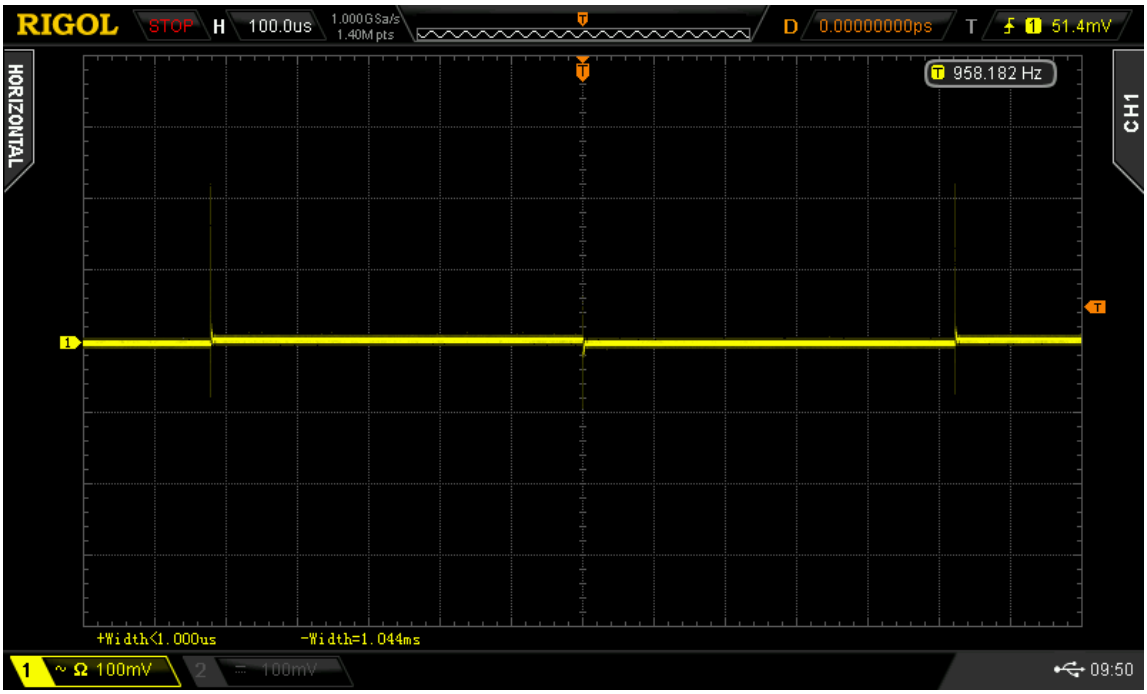
1. UcConditioner 3.3V as shipped



2. Dynamic 500mA load transient response of a typical 3.3V/2A external linear power supply



3. Dynamic 500mA load transient response of the same linear power supply with UcConditioner attached



I. History of revising

June 20, 2020 Ver. 1.0b released

Aug 23, 2020 Ver. 1.01b released