

UcConditioner Pro 3.3V (#26C)
UcConditioner MkII 3.3V (#26B)
Ultracapacitor Conditioner Board

IanCanada Mar 08, 2024 Ver. 3.0

iancanada.ca



A. Introduction

UcConditioner works with any 3.3V power supply as a super filter to promote the performance. UcConditioner can significantly improve the power supply quality by reducing both internal ESR and EMI noise. It will make a big difference to the dynamic performance of the power supply, as well as the noise levels.

For audiophiles, upgrading power supply with UcConditioner could be a one of the best and easiest solutions to achieve better sound quality.

B. Highlighted Features and Specifications

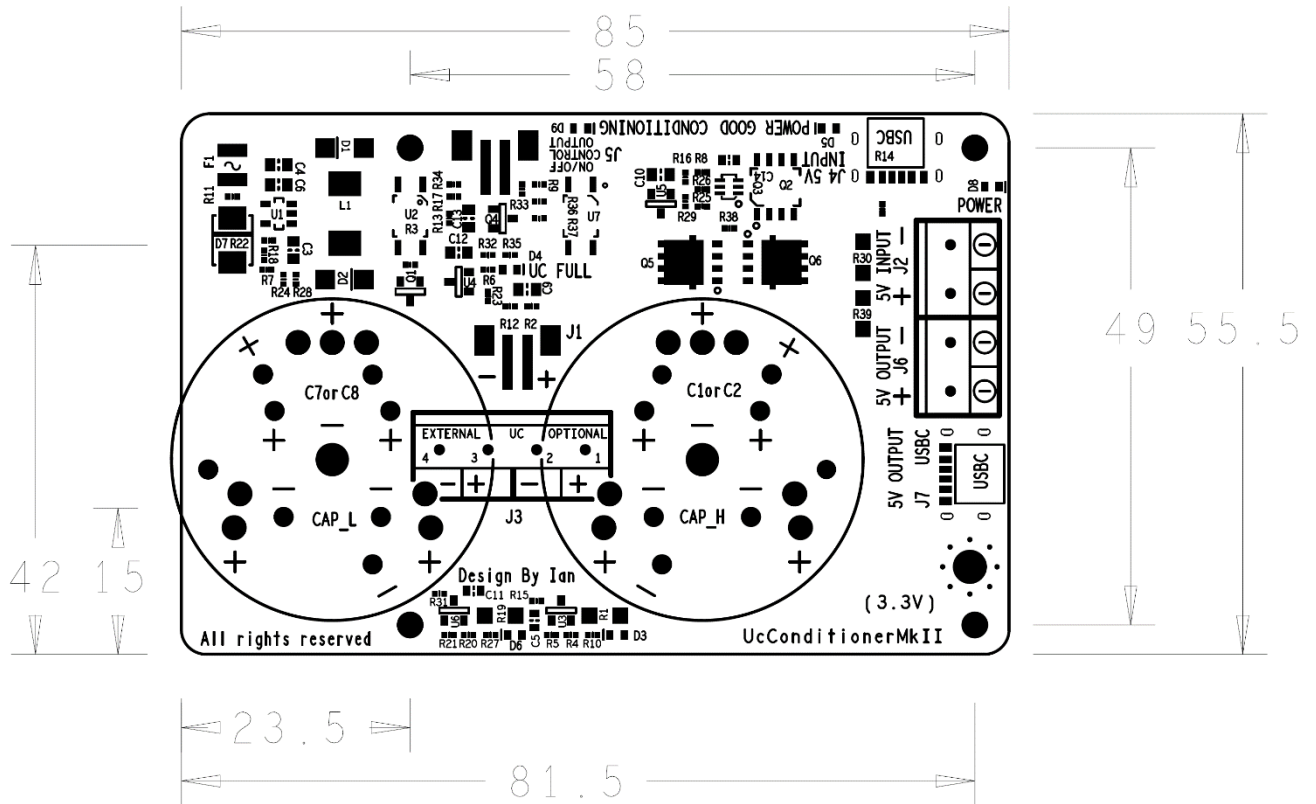
- Fully ultra-low resistance MOS FET architecture
- Built-in automatic per-charge/charge circuits with current limitation.
- Enable/disable conditioning is performed by monitoring ultra capacitors and DC input status.
- All control logics are running automatically at background, no need any external control signal.
- On-board active balancers for ultra capacitor protection.
- LED indications for power on, power good, ultra capacitor full and conditioning.
- Double thickness PCB copper layers for high current and ultra-low ESR applications.
- Optical isolators for internal control
- 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. UcConditioner Pro new features

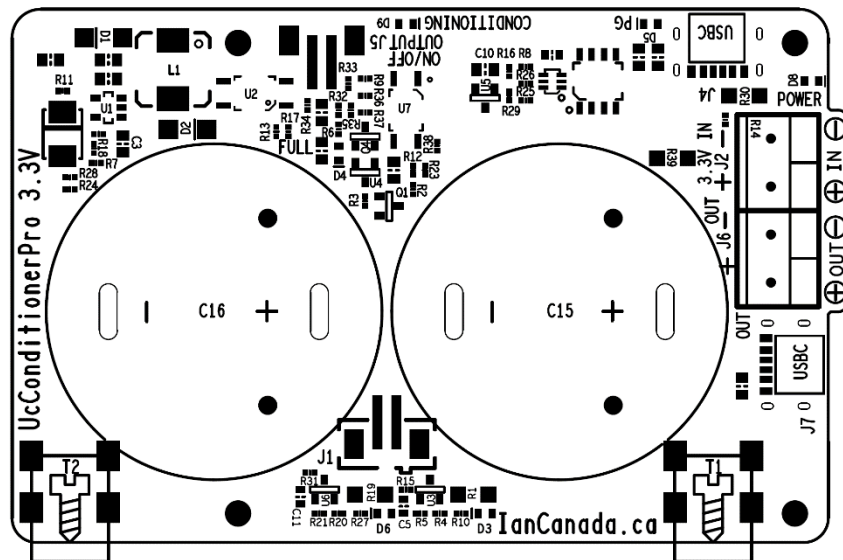
- High quality low ESR ultracapacitors are pre-assembled. Plug and play. No need for any soldering job.
- Overall ESR is 30% lower than the previous versions
- New high efficiency power management solution to reduce the peak charging current, speed up the charging time and make the overall EMI noise even lower
- Optimized PCB layout for better performance
- Equipped with vertical mounting brackets
- Better manufacturing quality

D. Layout and Dimensions (in mm)

UcConditioner MkII 3.3V layout



UcConditioner Pro 3.3V layout



You can also download the dxf file at:

<https://github.com/iancanada/DocumentDownload/tree/master/UltraCapacitorPowerSupply/UcConditioner>

E. Getting start

1. Solder two ultra capacitors to the positions of CAP_L and CAP_H (This step No need for UcConditioner Pro).

Recommended ultracapacitor P/Ns are:

BCAP0325 P270 S19, BCAP0450 P270 S18, DSF407Q3R0, BCAP0350 P270 S18, XV3560-2R7407-R,

Lower ESR capacitors are always preferred.

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.
3. Turn on the 3.3V power supply, both power LED D8 and power good LED D5 will be lit.
4. For the first time power up, it will take up to 10 minutes charging the ultracapacitors to 3.3V. When they are fully charged, both full LED D4 and Conditioning LED D9 will light up.
5. After that, turn off the 3.3V input power supply. 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.

Note: It can take up to 72 hours for new ultracapacitors to reach the best performance. Please take serious listening only after that time.

F. 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 MkII 3.3V PCB might be mistakenly marked J2 as 5V

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

This is the ultracapacitor conditioned 3.3V output when conditioning LED is lit, otherwise it will be connected directly 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 MkII 3.3V PCB might be mistakenly marked J6 as 5V

J8: Additional 3.3V DC power input connector (UcConditioner Pro only, PH2.0)

J9: Additional 5V output connector (UcConditioner Pro only, PH2.0)

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, UcConditioner only)

- 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.

G. 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 (C15) or CAP_L (C16) is higher than 2.7V.

H. Application notes

1. It will be very hard to remove if the ultracapacitors 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 ultracapacitors 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.
6. If the power LED D8 is lit up, but the PG LED D5 keeps off, that means that the input voltage is lower than 3.2V. There could be two possible reasons:
 - A. The 3.3V input power supply is not qualified.
 - B. The input power cable is too long or the resistance is not low enough

I. Typical Application examples

1. Upgrade LinearPi 3.3V or other linear power supply



2. Upgrade a LifePO4 Mini 3.3V with a UcConditioner 3.3V

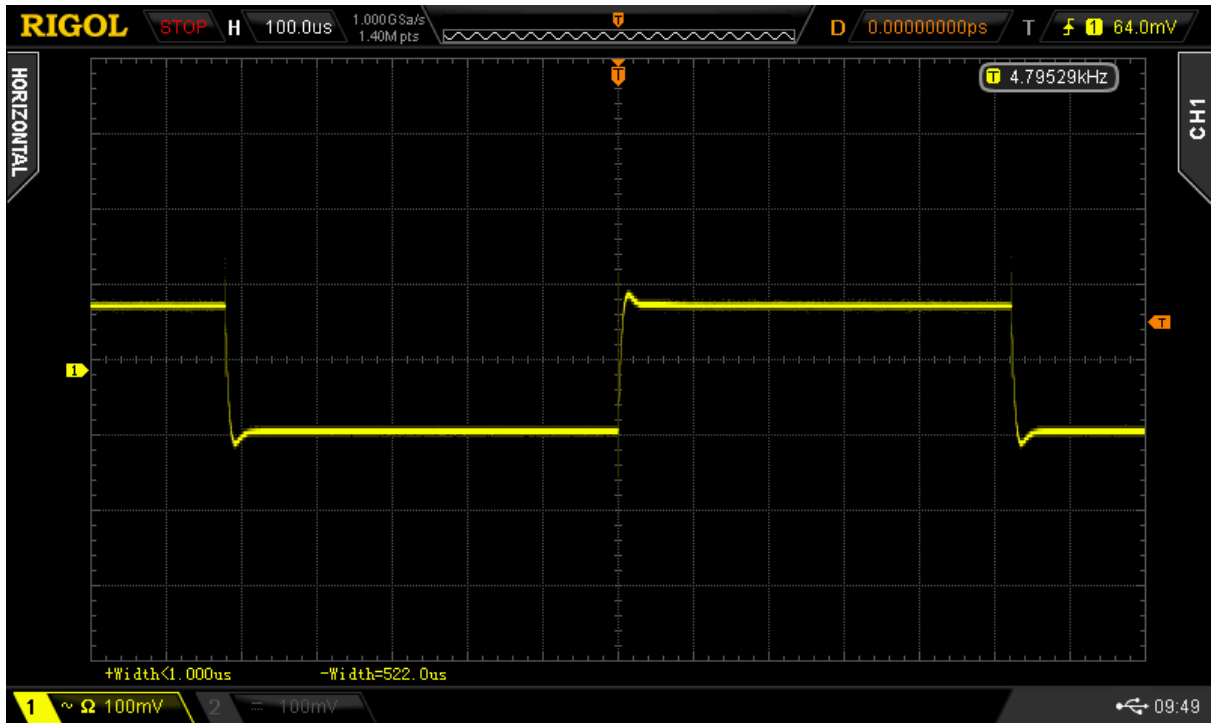


3. Upgrade a PurePi with a UcConditioner 3.3V

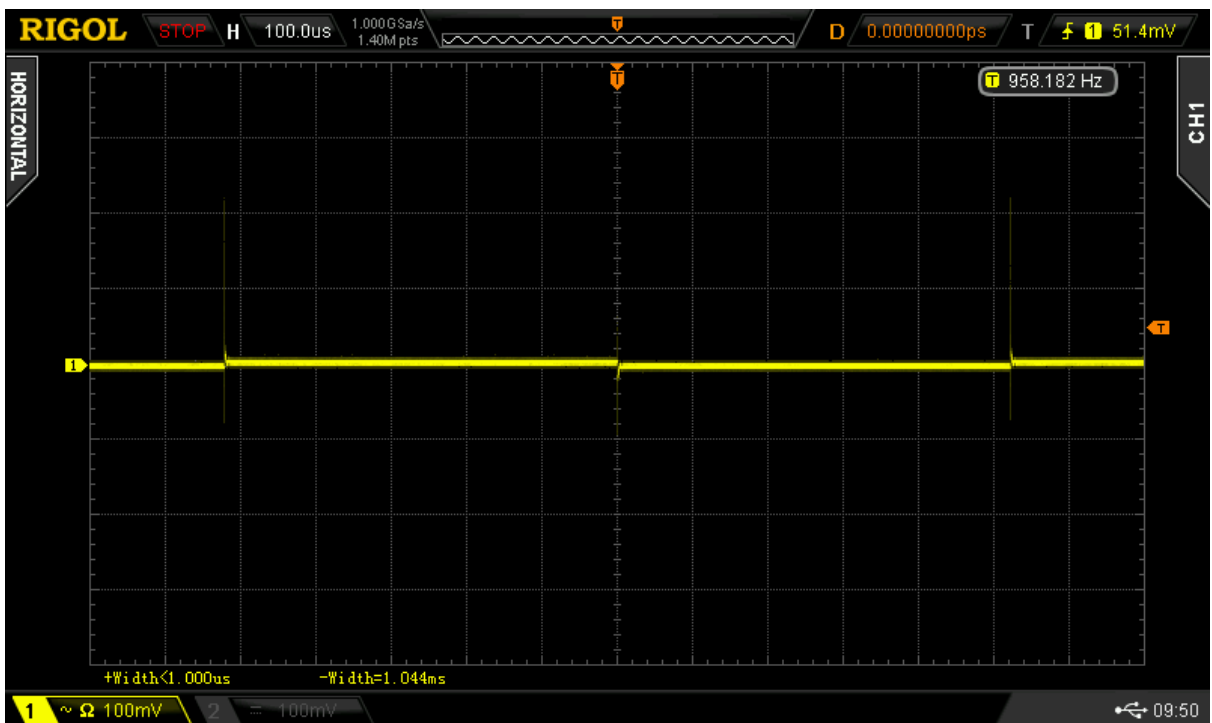


4. UcConditioner dynamic performance measurements

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



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



5. History of revising

June 20, 2020 Ver. 1.0b released

Aug 23, 2020 Ver. 1.01b released

June 23, 2023 Ver. 2.0 released

Mar 8, 2024 Ver. 3.0 released for UcConditioner Pro 3.3V

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