UcConditioner Pro 2025 5V

UcConditioner Pro 5V

UcConditioner MkII 5V

Ultracapacitor Conditioner Board

iancanada.ca

A. Introduction

UcConditioner works with any 5V power supply as an ultracapacitor filter to promote the performance. UcConditioner can significantly improve the power supply quality by reducing both internal ESR and the 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 a power supply with an UcConditioner could be a one of the best and easiest solutions to achieve better sound quality.

B. Highlighted Features and Specifications

- Ultra-low ESR MOS FET architecture.

- Built-in automatic per-charge/charge circuits with current limitation.

- Enable/disable conditioning mode automatically by monitoring ultracapacitor and DC input status.

- All control logics are running automatically at background, no need any external control signal.

- On-board active balancers for ultracapacitor protection.

- LED indications for power on, power good, ultracapacitor full and conditioning modes.

- Optical isolators for internal control signals.

- Output is 100% following the input without any delay.

- USB-C input and output, compatible with USB-C protocol.

- DIY friendly, works for any 5V power supply, 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

D. UcConditioner Pro 2025 new features

- Parallel input elements making the voltage drop just as half as before for high current applications

- Re-designed four layers double copper thickness PCB to improve the performance even more.

- Larger grade input/output terminal block connectors

E. Layout and Dimensions (in mm)

UcConditioner Pro 2025 5V layout
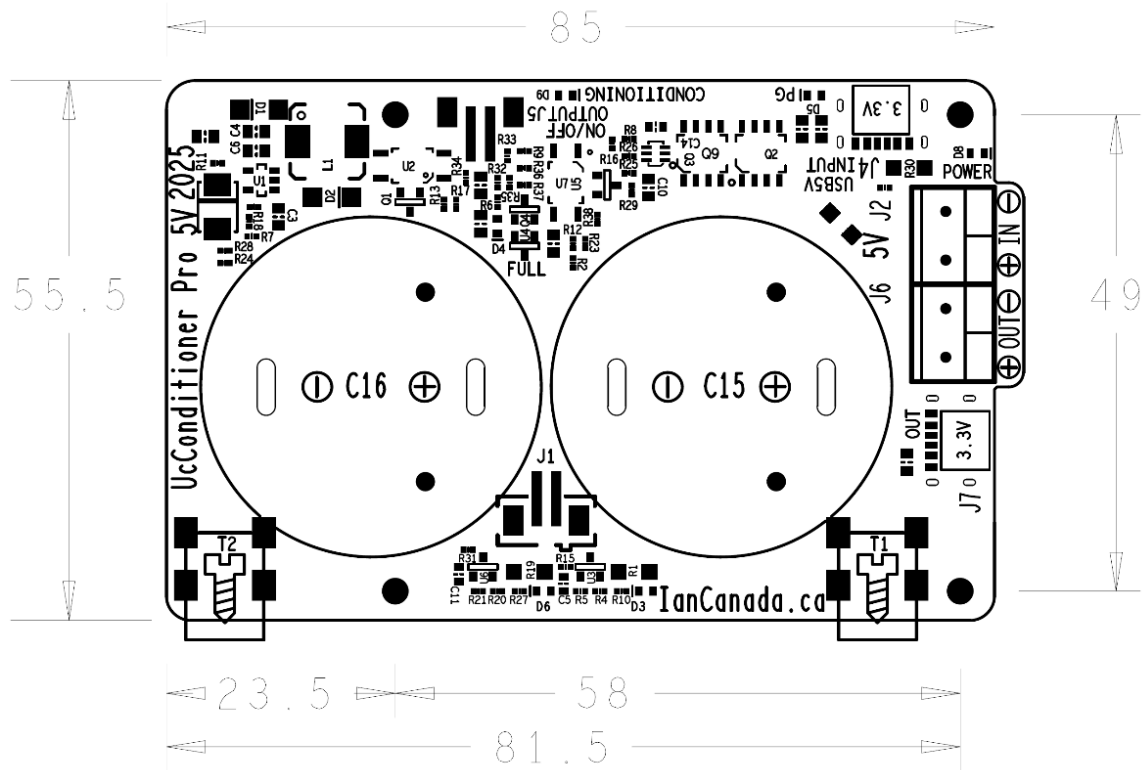
UcConditioner Pro PCB layout
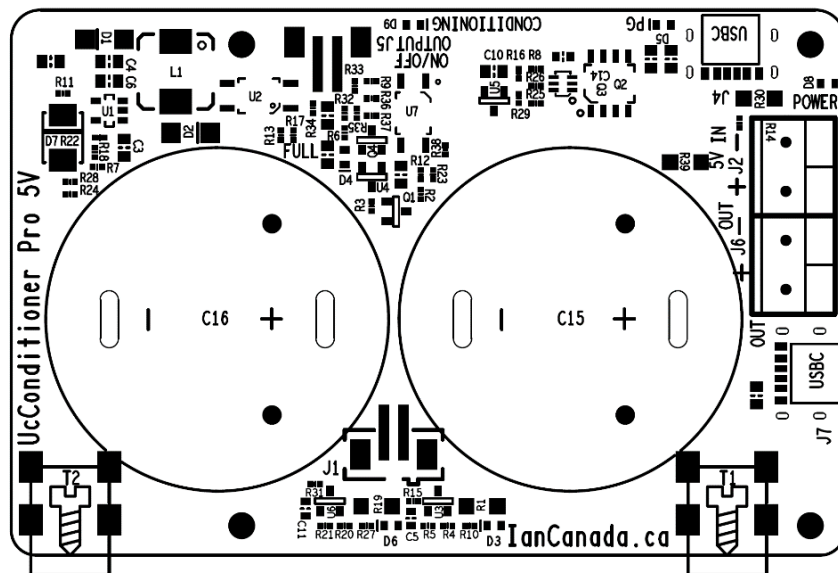
You can also download the dxf file at:

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

F. Getting start

1. Connect a 5V power supply to either the USB-C connector J4 or the input terminal block J2.

2. Turn on the 5V power supply, both power LED and power good LED will be lit up.

3. For the first time power up, it can take up to 10 to 20 minutes charging the ultracapacitors from 0V to 5V. Once they are fully charged, both FULL LED and CONDITIONING LED will light up.

4. After that, turn off the 5V input power supply. Connect UcConditioner output (J6 or J7) to the device that needs to be powered.

5. Turn on the 5V power supply. All of the above 4 LEDs will be lit up shortly after to indicate that the UcConditioner is in conditioning state. Now you can start to 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.

G. Connectors

J2: 5V DC power input connector
A 5V 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 4.9V to 5.3V. To power Raspberry Pi, rated current 2A or higher linear power supply would be recommended for this input. **Voltage higher than 5.5V (even at short time) may cause damage to UcConditioner.**

J4: 5V USB type-C input power connector (Support USB PD)
If you want to use a USB power supply, you can connect it to J4 and at the same time leave J2 unconnected. Rated current 2.5A or higher would be recommended. Please use high quality short USB cable. Please try to use USB-A to USB-C cable if you have problem with your power adapter's USB-C output.

J8: Additional 5V DC power input connector (UcConditioner Pro only)

J6: UcConditioner 5V output in 2-pin 5.0mm terminal
This is the ultracapacitor conditioned 5V output when conditioning LED is lit, otherwise it will be connected directly to 5V input.
UcConditioner output will be turned on or off automatically when 5V 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.

J7: UcConditioner 5V output in USB type-C connector

This output is alternative to J6 if your device can be powered by a USB cable. J6 and J7 are internally connected together.

J9: Additional 5V output connector (UcConditioner Pro only)

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

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

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

This is for legacy function and not recommended for new applications. Please leave it unconnected to avoid affecting internal control signals.

H. 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 4.9V when lit.

D4: Ultra capacitor full indicator. Indicating that the ultracapacitor 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.

I. Application notes

1. 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.

2. UcConditioner doesn't regulate the voltage. The output voltage will follow the input voltage. So, the input voltage must be within range of 4.9V to 5.3V. If it is lower, the UcConditioner will not enter the conditioning state. If it is higher, the ultracapacitors may have risk of damage or reduced the life time.

3. The internal charging current limitation is 2A. If the input power supply delivers less current than that, it may take longer time to charge the UcConditioner to 5V. In this case, I would suggest pre-charge the UcConditioner with a 5V USB power adapter at the first time of use. Both the UC FULL LED and CONDITIONING LED will light up when UcConditioner is full.

4. The output of UcConditioner will follow the 5V 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, a short time of delay will be expected to the UcConditioner output. This kind of delay is caused by the power supply itself, not the UcConditioner.

5. If the power LED D8 is lit up, but the PG LED D5 keeps off, that means that the input voltage is lower than 4.9V. There could be two possible reasons:
   A. The 5V input power supply is not qualified to keep the voltage while deliver high current.
   B. The input power cable is too long or the resistance is not low enough

J. Typical Application examples

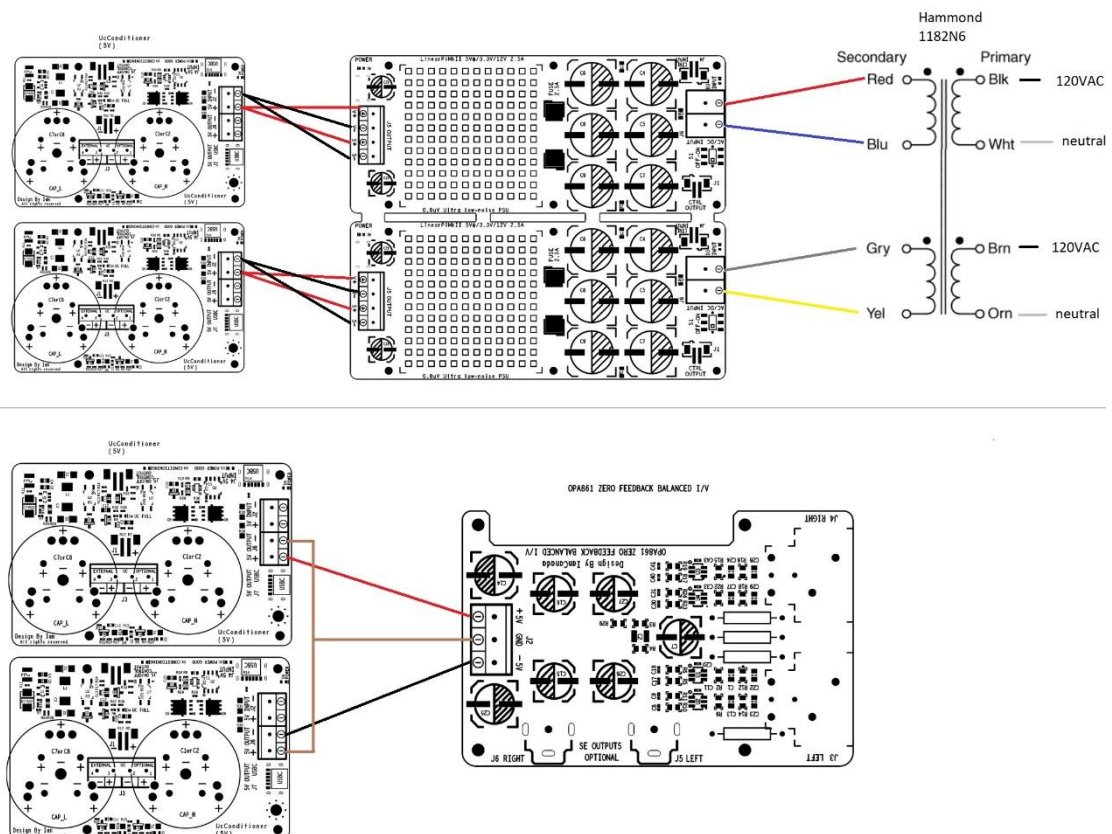1. Using UcConditioner to improve a USB power supply

2. Upgrade a 5V linear power supply (great for RPi, LinearPi 5V is in the picture)

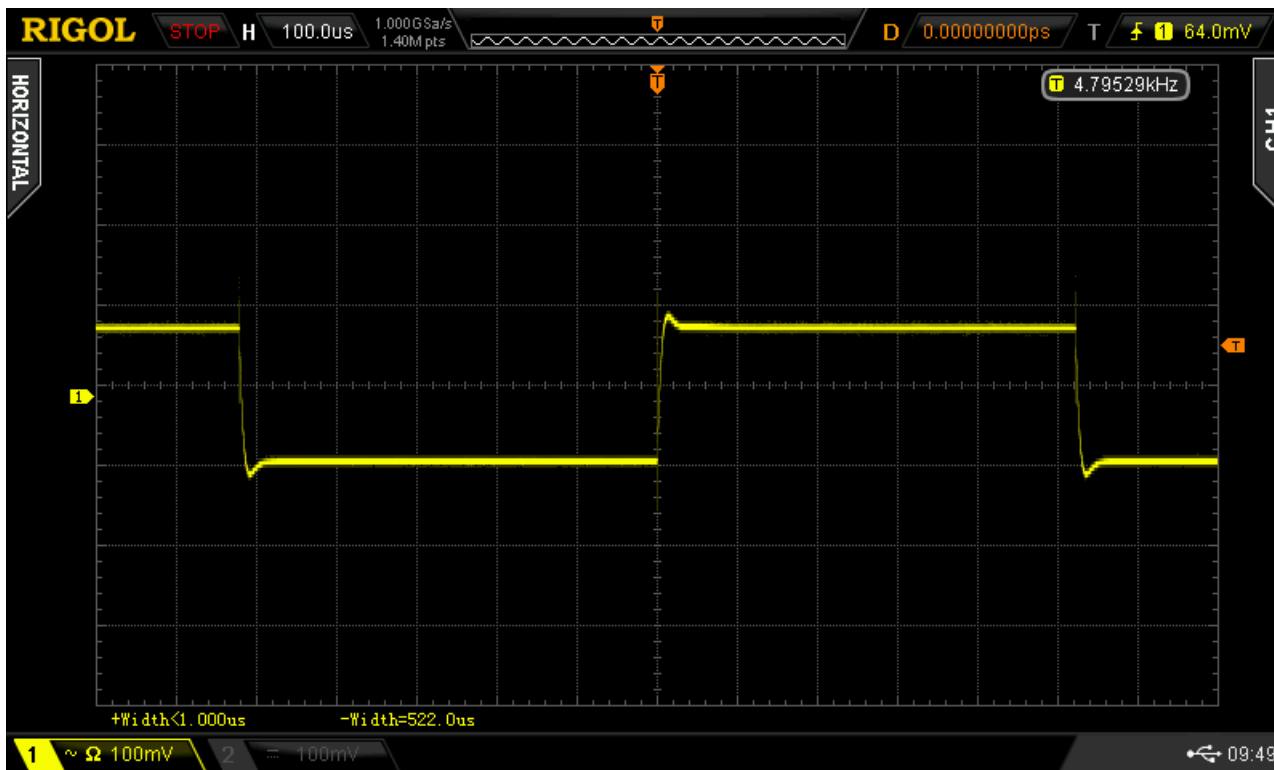3. Build ultra-high quality +/- 5V analog power supply (great for OPA861 I/V)

   Configuration: LinearPi Dual 5V (S+/S- are optional) + Two UcConditioner 5V
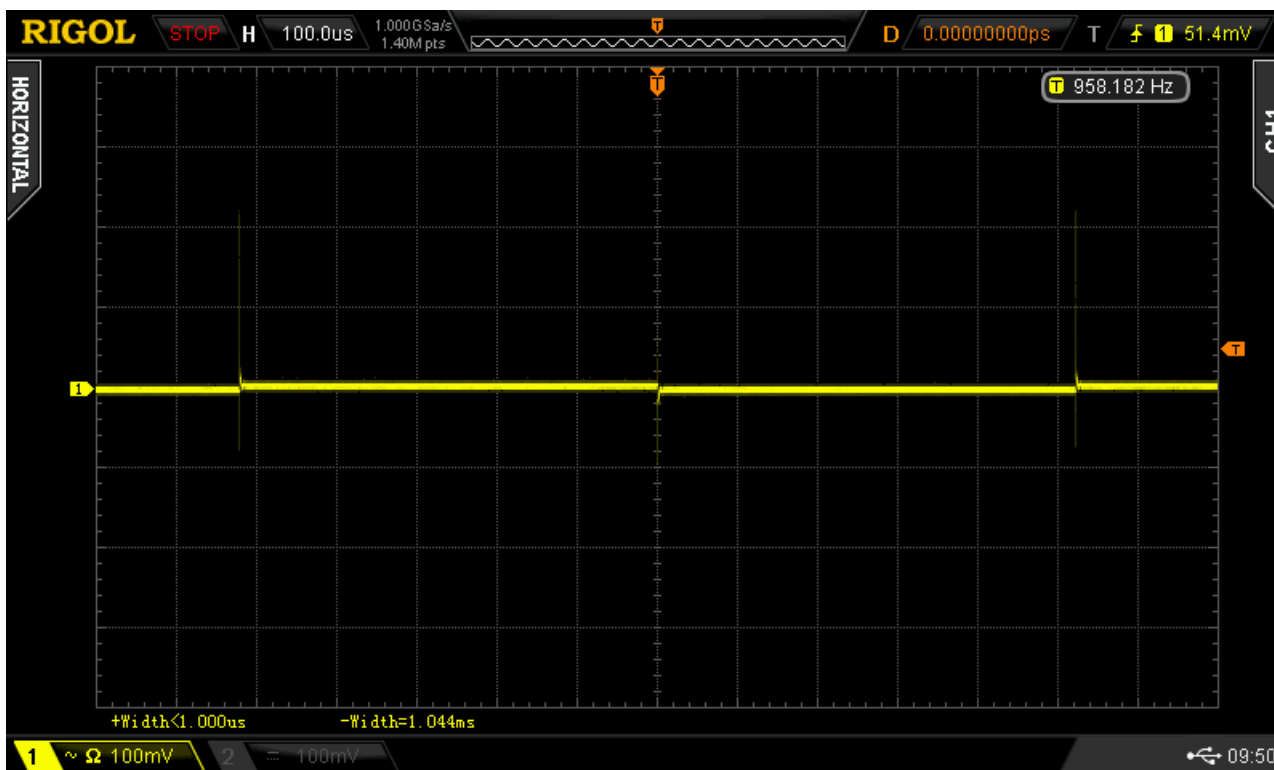
K. UcConditioner dynamic performance measurements

1. Dynamic 500mA load transient response of a typical 5V/3A external linear power supply

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

iancanada.ca

L. History of revising

May 28, 2020 V0.9b released

Aug 23, 2020 V1.0b released

June 23,2023 V2.0 released

Feb 25, 2024 V3.0 released for UcConditioner Pro 5V

Jul 25,2025 UcConditioner Pro 2025 5V