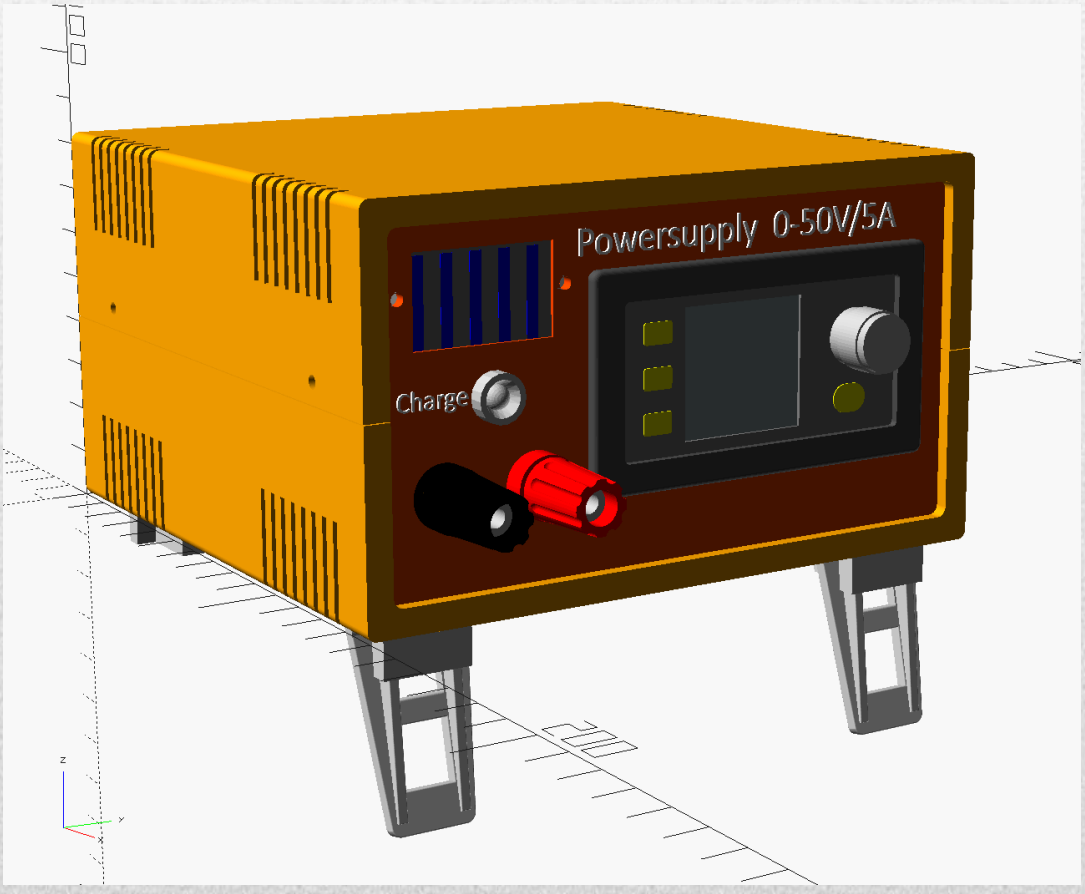
Electronic development

Mobile Mini-Powersupply

Created With "Advanced Ultimate Box-Maker" using OpenSCAD



2021-09-12 Version 1.1 *M.Ostermann*

Mobile Mini-Powersupply

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Introduction

For my projects in electronics I often need an appropriate housing.
Commercial products have the disadvantage that they don't fit exactly and cause a lot of work for manual drilling, cutting, adapting, etc.
I needed a software solution for creating an individual box using a 3D-printer.

- The software must have mainly a parametric design so that the properties of the box can be easily changed.
- The software must have a GUI for changing the parameters so that the program code does not need to be changed.
- Ideally the software allows to save the parameters in individual files.

The software with the less disadvantages I could find, was OpenSCAD.
It is relatively easy to learn and has a so called customizer for changing and saving the parameters. But it has also a lot of restrictions to deal with. Despite this OpenSCAD was the first choice. My normally used CAD-Software "Fusion-360" is nice to use but has only a bit of a customizer.

For that reason, the decision was using OpenSCAD and I searched around which programs to create boxes exists to solve my problem.

I found the "Ultimate Box Maker" with its forks and put me on to extend the features of these programs with help of some excellent libraries.
The result is this "Advanced Ultimate Box Maker". (see the appropriate Docu)

Main design aspects of the DIY Powersupply

- The powersupply should be rather cheap and easy to build.
- It should consist of ready to use modules.
- Powersupply should be powered by chargeable batteries or external AC-adpater.

The "Advanced Ultimate Box-Maker" with OpenSCAD

For Description of the features, the installation and how to use the software please read the paper "Advanced ultimate-Boxmaker"

Features of the Powersupply

- Outputvoltage 0-50V up to max.5A (in AC-Mode)
- Constant current, Constant Voltage (CC, CV)
- Switchable operation between AC-Adapter and battery

- Battery-Indicator
- Autom. battery charge during AC-operation
- Remote control over Bluetooth with smartphone app or USB PC-App

Explanation of the parts

Buck-Boost converter DPH-5005 from Ruideng

It is a ready-to-use kit from china. It has 4 modules:

- The converter itself
- the control-panel with the display
- Add. Consists of an USB-interface and
- Bluetooth-Interface for remote control of the powersupply.

Li-ion charger module

Charging module (3S) for charging the three 18650 cells during AC-mode.
Charges the cells with 0.5A and has a charge cuttoff voltage of 12.6V.

Protection module for batteries (BMS)

This module protects the batteries in several manner:

- Overvoltage during charging
- Undervoltage during discharging
- Overcurrent protection for discharging

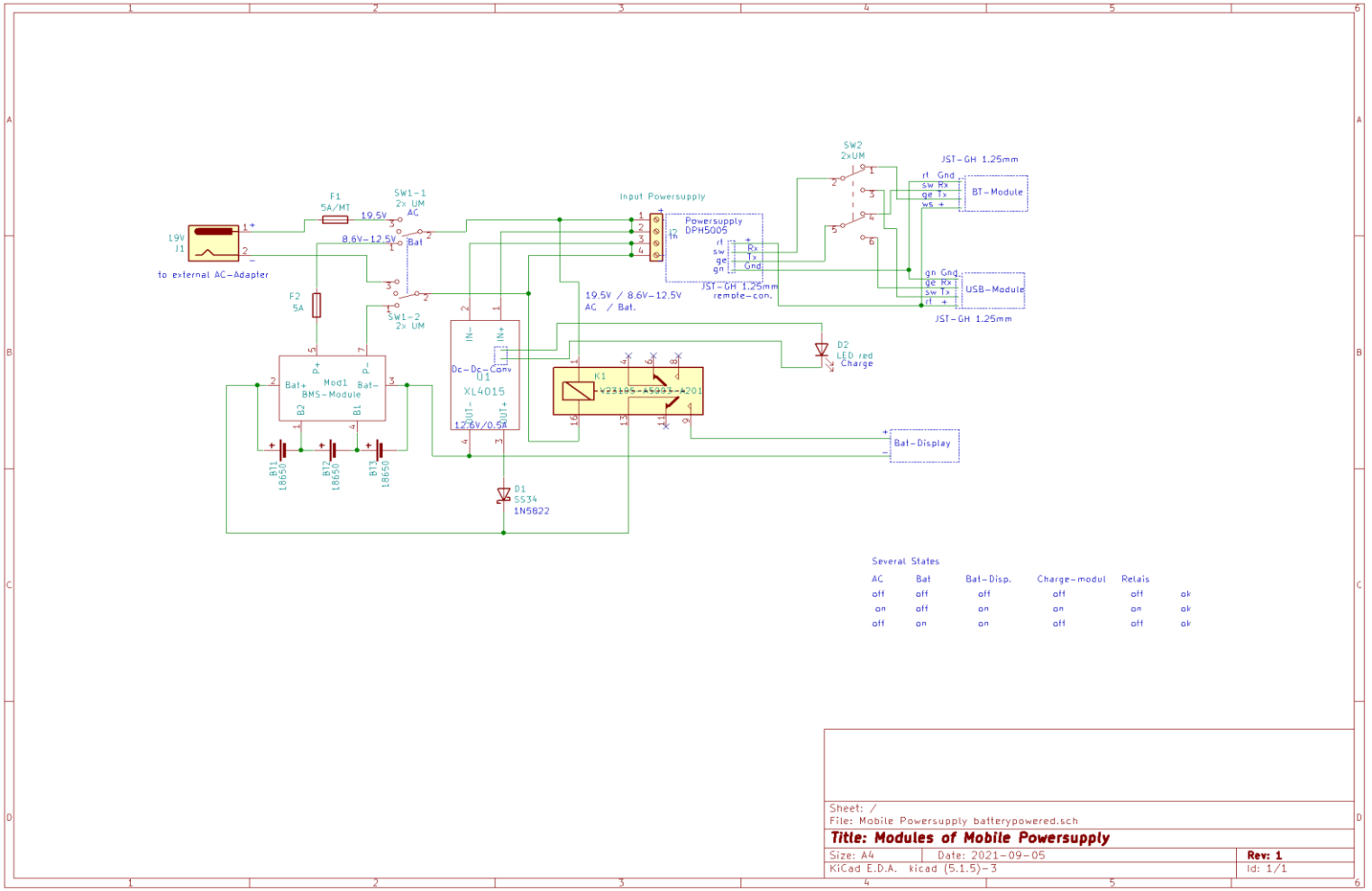
AC-adapter with 19V / 4.5A

The AC-adapter is switchable between 12V – 24V. 19V is the recommended voltage output.

3x Li-Ion battery cell 18650

Samsung INR18650-25R 2500mAh cells without protection

Module view of the Powersupply



Bill of Materials (BOM)

The parts are rather cheap and the source of supply is mostly in china and ebay

Description		price
DPH5005 Buck-boost converter with USB- and BT-communication	https://de.aliexpress.com/item/32840324731.html without USB/BT-modules	47€- 40€
XL4015 5A DC-DC Step Down converter	https://www.ebay.de/itm/402597361624 or https://www.aliexpress.com/item/32891328430.html	3,70€ or 2,30€
(270g/93m Filament 1.75mm PLA grey		~5,00€)
Axicom D2N12-960Relay DPDT (2xUM) V231005-A5003-A201	Kessler electronic https://www.ebay.de/itm/111447113032	2,30€
BatteryIndicator LEDdisplay	Naltronic https://www.ebay.de/itm/123571387480?var=424142377263 or https://www.aliexpress.com/item/1005002375550407.html	 5,80€ or 2,80€
Battery-BMS, BalanceBoard, 6A-8A max Mesacomponents	https://www.ebay.de/itm/254159873534?var=553510124474 or https://www.aliexpress.com/item/4000385806747.html	9,90€ or 2,30€
Switch On-off-on Wippschalter Ein-Aus-Ein	https://www.aliexpress.com/item/32967528231.html or https://www.ebay.de/itm/264813617899	2,20€ or 6,00€
Submini slide switch DPDT (Schiebeschalter 2xUM)	Kessler electronic https://www.ebay.de/itm/311859237255	1,00€
Powerplug High-Amp Switchcraft SC1943-ND	Digikey https://www.digikey.com/en/products/detail/switchcraft-inc/S1017/3909312	7,00€
Threated inserts M3x6g Gewindeeinsätze M3x6g (gegenläufig)	Msr-coptertools https://www.ebay.de/itm/173779404364	6,00€
Fuse-Holder Sicherungshalter Snapin SH8	Centralsystems-isp https://www.ebay.de/itm/284368894849	3,55€
Fuse-Holder incl Si. 5A , 5x20mm, 12mm°	https://www.ebay.de/itm/173575874739	3,50€
Schottky-Diode 1N5822	https://www.ebay.de/itm/254069873397	3,00€
Kfz-Flachsicherungen 10A	https://www.ebay.de/itm/233933295008	2,50€
Laptop AC-Adapter 12V-20V / 4.5A (19V-20V)	Flystorefly https://www.ebay.de/itm/402696857628	18,20€
Akkuhalter (Batteryholder) for 3 18650 cells	https://www.ebay.de/itm/174814565327	4,50€
Fan (Lüfter) 40mmx10mm, 5V, 2-pol	https://www.ebay.de/itm/384372531353	5,00€
LED with socket	https://www.ebay.de/itm/164496995162	2,75€
	Amount, (Summe)	112€ -137€

Handling of the Powersupply

The power switch

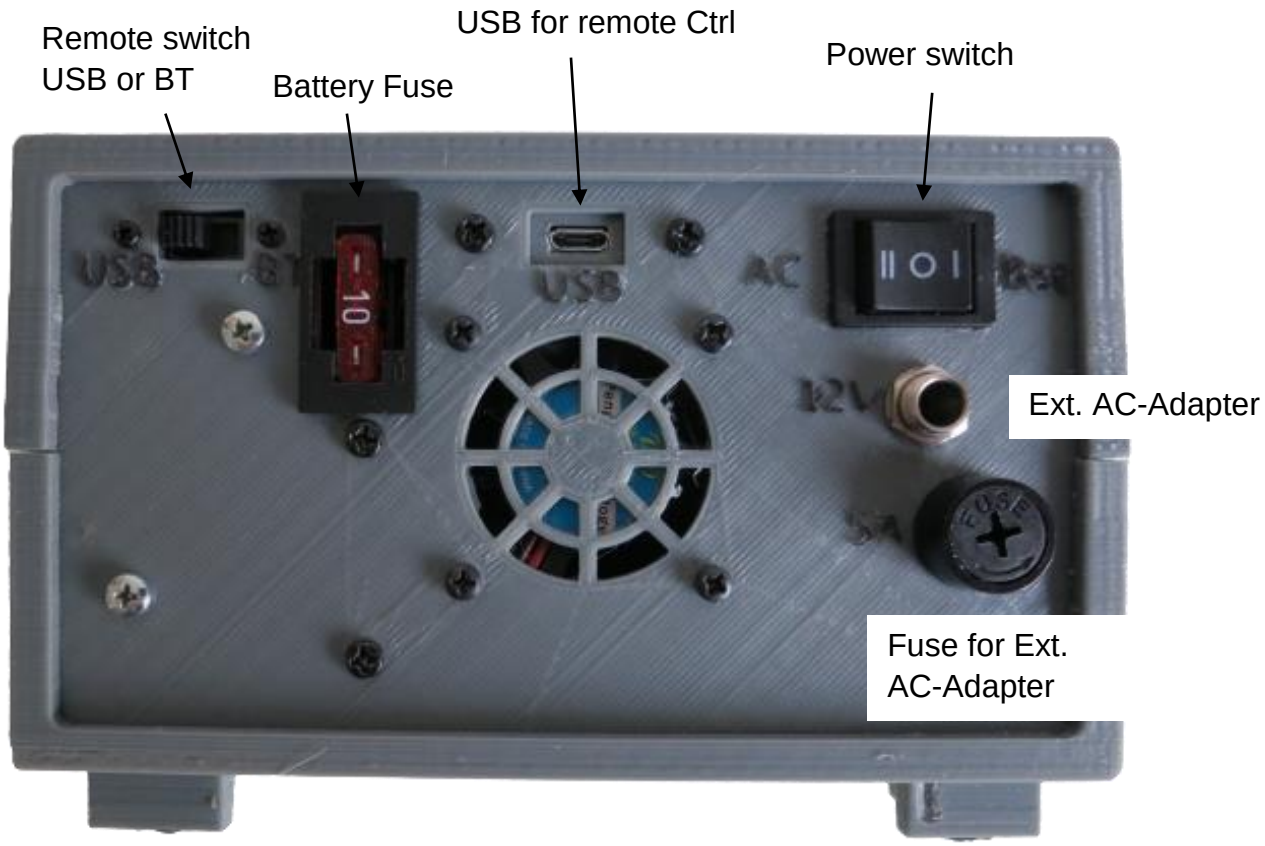
The main power switch is on the backside and has three positions:

- **the middle position** is the off-postion. Powersupply is turned off.
- **in postion "Bat"** the device works in battery mode. It uses the internal battery-cells.

  ⚠ be careful, not to draw more than 4 A **from the cells** for a longer time. The batteries heat up and because battery socket is made of plastic, the contact springs expand. That will cause contact problems to the batteries.

  To avoid this, you must use nickel stripes and a spot welder instead of sockets for connecting the batteries.
- **In postion "AC"** the external AC-Adapter must be connected. The batteries are autom. charged and the powersupply can deliver more current. Batteries cannot be overcharged, the charge process is automatically completed.

Connections on the backside



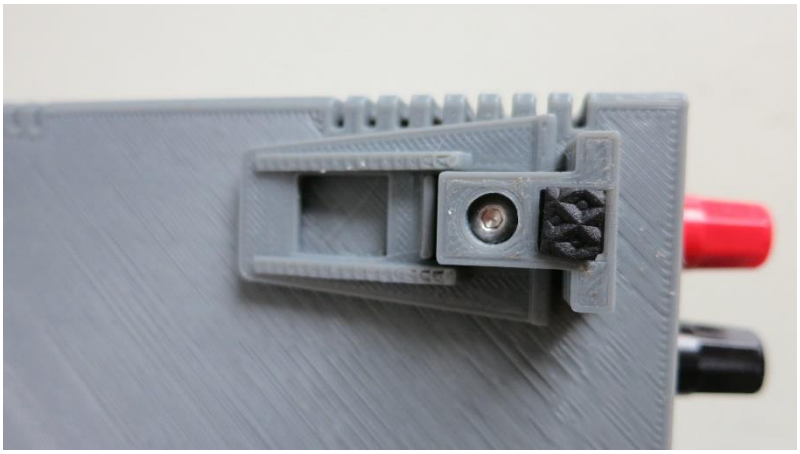
Additional work to do

External LED for charge state

The small red LED on the PCB of the charge module ha to be desoldered for connecting the external LED.
Desolder the LED and solder two wires on the small pads.
On the other end solder these two wires to the external red LED.
Pay attention to the polarity of the LED. Don’t use another LED color.

Additional rubber feet for foldable feet

To prevent the powersupply form sliding over the ground the some rubber-feet can be added into the recess of the foldable feet.



But it must be self-adhesive rubber material not spongue rubber. That’s too soft.