

DIY Wind Turbine Charging Circuit

Theory of operation

This charging circuit can charge a lead acid battery with a capacity from 4A to 20A. It is possible to connect up to two hub dynamos to the input, powered by a wind turbine.

The battery charging is managed by a special charger for lead-acid batteries, the PB137 (IC1). This regulator can provides up to 1.5A at 13,7V. It employs internal current limiting, thermal shutdown and safe area protection, making it essentially indestructible. The capacitors C5 and C6 belong to the regulator IC1.

The lead-acid battery needs to be attached to fastener K3.

For usage with hub dynamos no special heatsink is needed for IC1

There are two inputs for hub dynamos, fastener K1 and K2. The circuit is protected with 36V zener diodes D5/D6 and D7/D8.

The generated alternating current is rectified by D1/D2 and D3/D4 and smoothed by C1/C2 and C3/C4. This part of the circuit is a Delon voltage doubler.

You can use just one hub dynamo at K1 or K2, or use two dynamos in parallel. When both inputs are used it should be noted that the sum of both voltage should not exceed 40V. The zener diodes should be chosen accordingly, for example with a breakdown voltage of 18V.

The jumper block K5 connects the voltage doubler to the charging regulator IC1. Please configure it accordingly to the used inputs (K1 or K2).

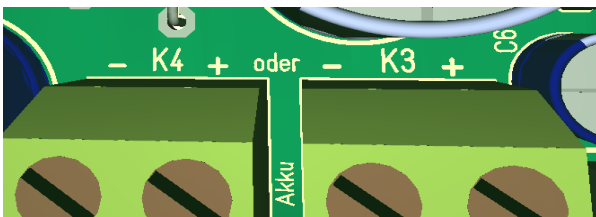
A fast spinning wind turbine, build with one hub dynamo should deliver enough power to charge the lead-acid battery. However, slow spinning wind turbines may use two hub dynamos, each connected to one input. It is also possible to use two wind turbines, each one build with one hub dynamo.

Build your wind turbine according to your wind conditions. For this circuit a Savonius or Darrieus Rotor - a vertical axis wind turbine (VAWT) - is an excellent choice for DIY and easy to build.

With a 3D printer you can download several designs for such savoious rotors online.

The fastener K4 is a directly connected output to the Delon voltage doubler. This output is mainly used for measurements.

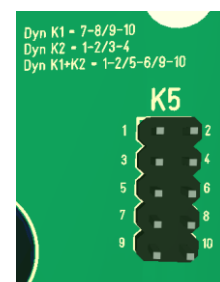
A usage of K3 and K4, other than for measurements, is not recommended.



The circuit board provides two mounting holes. Please attach this circuit board to a dry and protected place, preferably inside a waterproof box.

Configuration

1 hub dynamo connected to K1:	Jumper K5 to 7-8 and 9-10
1 hub dynamo connected to K2:	Jumper K5 to 1-2 and 3-4
2 hub dynamos connected to K1 and K2:	Jumper K5 to 1-2, 5-6, 9-10



Bill of Material

Pos	Amount	Name	Value	Package Type	Conrad #	Mouser #	Digi-Key #
1	4 Stk	C1,C2,C3,C4	470µF	D13R5,08_ELKO	468134	80-ESK477M063AL4EA	399-6658-1-ND
2	1 Stk	C5	1µF	D6R2,54_ELKO	472450	594-2222-365-16105	BFC236516105-ND
3	1 Stk	C6	10µF	D6R2,54_ELKO	472484	647-UFG1H100MDM	493-13388-ND
4	4 Stk	D1,D2,D3,D4	1N5819	DO41	155460	511-1N5819	1N5819FSCT-ND
5	4 Stk	D5,D6,D7,D8	36V	DO41	180726	78-ZPY33	ZPY33-TRGICT-ND
6	1 Stk	IC1	PB137	TO220	179418	511-PB137ACV	497-5376-5-ND
7	4 Stk	K1,K2, K3, K4	2 pol		731986	571-2828372	281-1882-ND
8	1 Stk	K5	2 x 5 pol	Stiftleiste_2x05_G_2,54	734200	2 x 710-61300511121	2 x 732-5318-ND

C1,C2,C3,C4 - Elektrolyt-Capacitor, 470 µF, 63 V, 20 %, 13 mm x 26 mm

C5 - Vishay 2222, Elektrolyt-Capacitor, 1 µF, 40 V, 20 %, 10 mm x 8 mm

C6 - Yageo SC035M0010B2F-0511, Elektrolyt-Capacitor, 10 µF, 35 V, 20 %, 5 mm x 11 mm

D1,D2,D3,D4 - Schottky-Diode, 1N5819, DO-41, 40 V

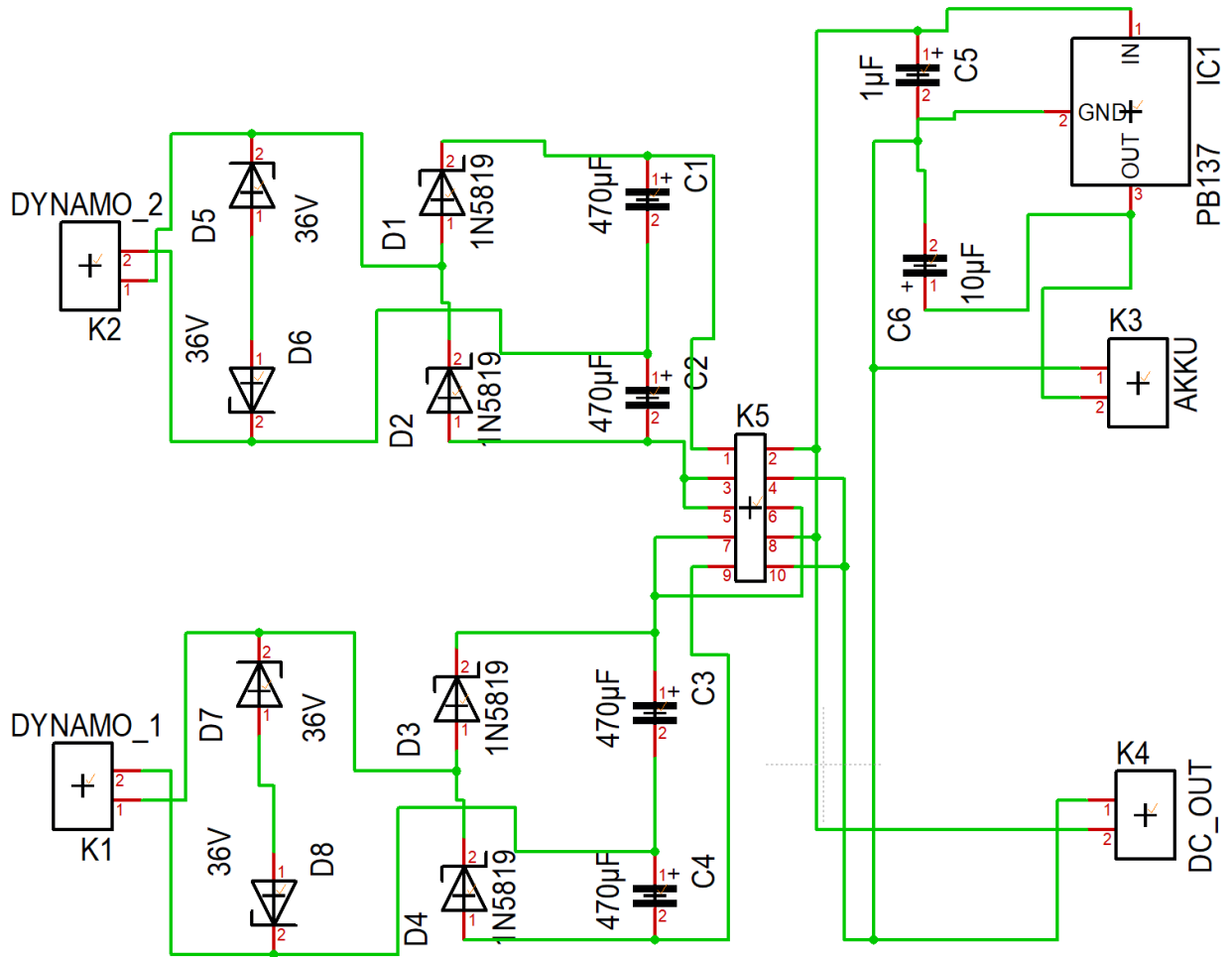
D5,D6,D7,D8 - Z-Diode, ZPY33, DO-41, 33 V, 1.3 W

IC1 - PB137ACV, TO-220AB

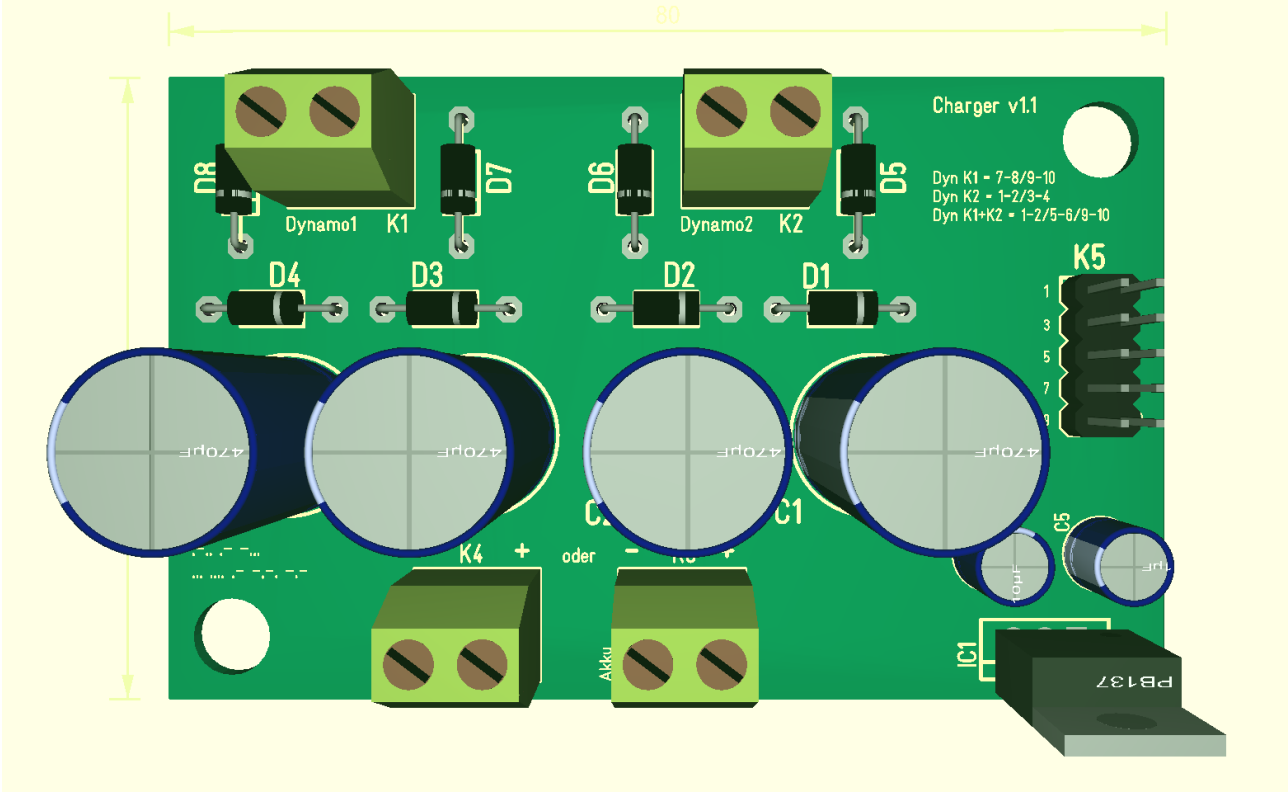
K1,K2,K3,K4 - PTR AKZ350/2-5,08-V

K5 - MPE Garry Pin Header 2,54 mm

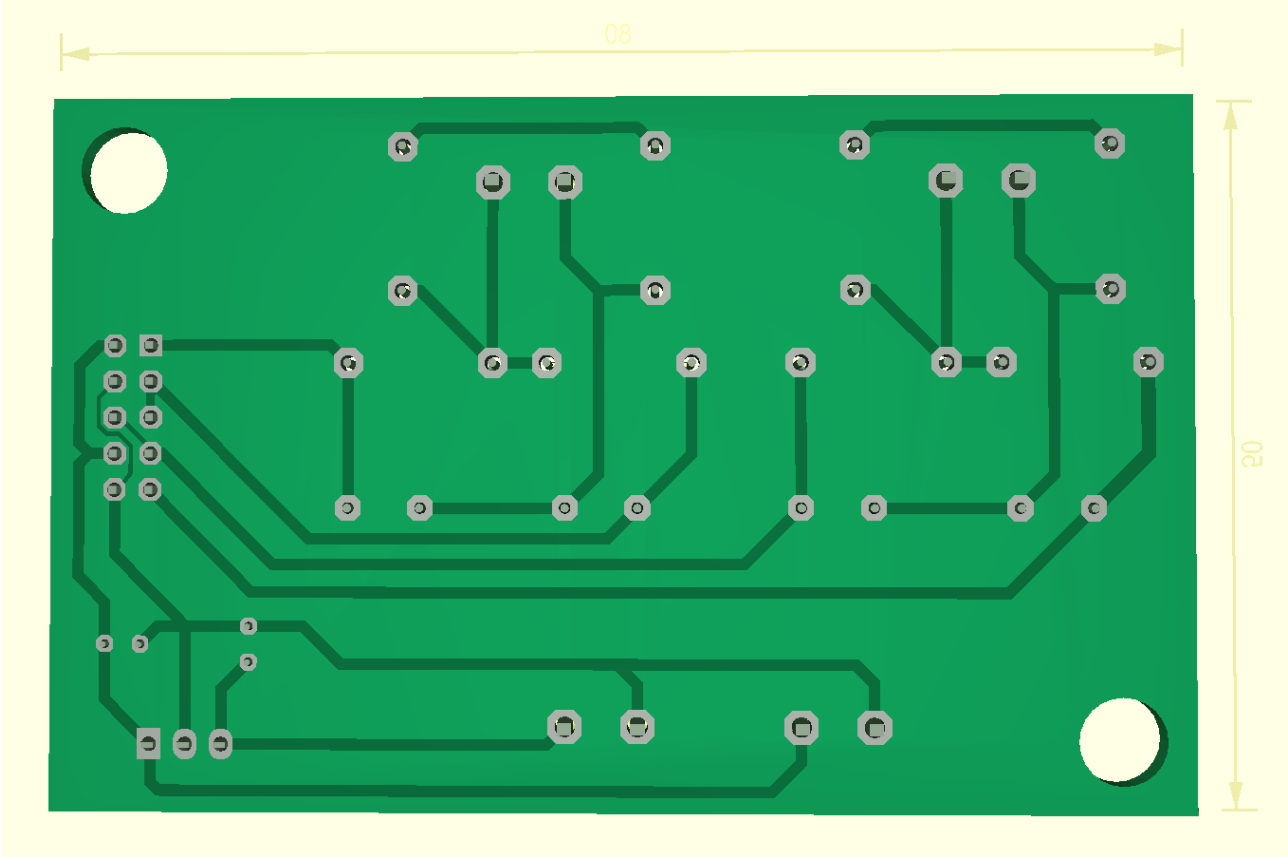
Circuit:



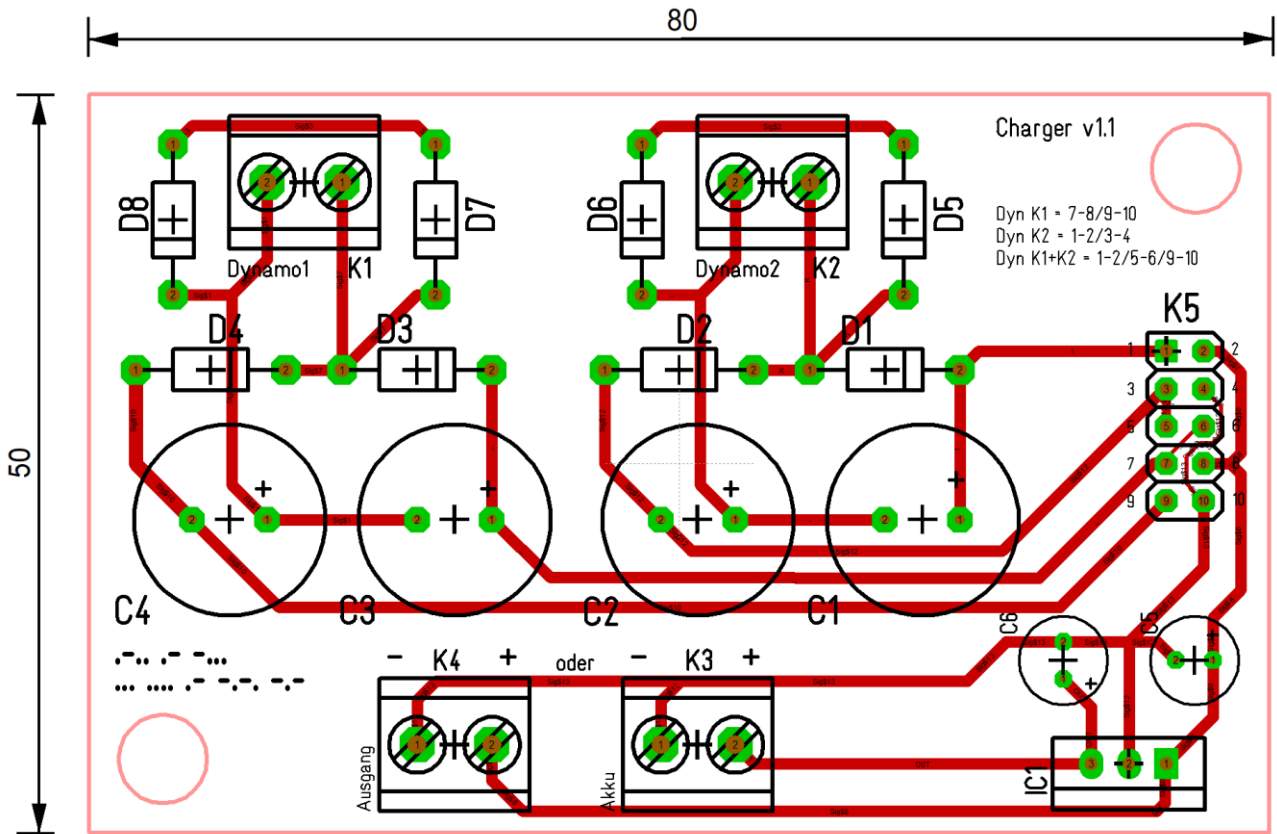
PCB (TOP):



PCB (BOTTOM):



Layout:



DIY Wind Turbine Charging Circuit, Version 1.1 (24.04.2013), LabShack