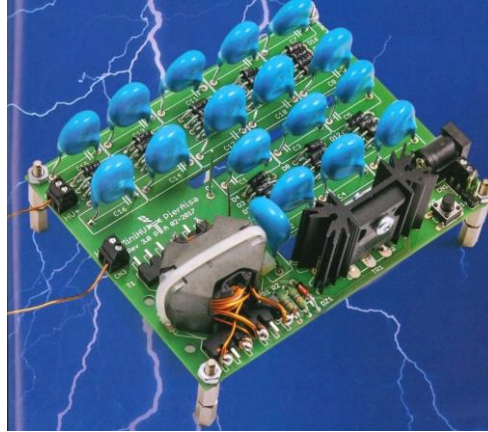


- Create a 50.000 DC Voltage from a 12V Input
- Create Sparks-with length up to 14mm
- Working frequency in the range of 10-30KHz
- Corona Effect
- Ionized air generator
- Single IGBT Transistor oscillator



Mini Hv Generator

#### DESCRIPTION

This project is aimed at all those who are intrigued and fascinated by high voltage and all the phenomena related to it such as electric discharges, corona effect, ionic wind, the principle of the tips and ionization of the air, but who for obvious reasons they have never experienced them directly. Our MiniHV board can be used as a small laboratory to become familiar with high voltage in order to see and understand its effects in the surrounding environment, learning the concepts related to the amount of charge, the electric field and electrical insulation, without take risks, because the energy that the card can deliver is limited. In our daily life, high tensions are actually very present and close to us. Just think of when we put on a pair of rubber-soled shoes, walk on the carpet of the house and as soon as we approach the key to the car door we see a small electric arc that is triggered. In this case the voltages can even reach 50,000 Volts and beyond but we only feel a little discomfort when we come into contact with the electric arc, because this high voltage is actually combined with only a minimum current of the order of micro-amperes. . The case of a lightning bolt is different, where in addition to the very high voltages (we can easily reach millions of volts) it is also valuable and lethal to humans, definitely of the order of hundreds of amperes. The project presented today is part of the first, that is, it allows the generation of high DC voltages, but with little current available and therefore not dangerous for humans. However, we warn you right away to strictly follow the indicator in the "Precautions and warnings" box so as not to come into direct contact with high voltage and not to "get shocked".



#### WARNINGS AND PRECAUTIONS

When the MiniHV is in operation it gives rise to the formation of the corona effect in the high voltage areas the electric arcs are able to ionize the air in order to produce a small quantity of negative ions and ozone (O3) and therefore it is necessary to ventilate the room frequently, to avoid the inhalation of Ozone, which is harmful to health. Furthermore, given the presence of a strong electric field, the use of this dominated is not recommended for all those who wear medical devices sensitive to electric and magnetic fields such as **pacemakers**, because the coil could alter its regular operation. It is advisable to position the coil away from electronic devices, to avoid too strong stresses due to intense electromagnetic fields, due to the oscillation of the coil at a frequency of a few MHz, which is a radio frequency that propagates very well; in fact, you could notice some perturbations in nearby objects such as LCD screens and televisions. This coil has been called "the Tesla coil for everyone", precisely because of its simplicity of construction and the low danger, in fact usually Tesla coils do not have these conditions, because they usually involve very high voltages and dangerous currents, but we must not underestimate anyway the electrical risk. Pay also attention to eyes and body not to go in contact with the MiniHV in operation.



## TECHNICAL DATA

PARAMETER	DESCRIPTION	VALUE			UNIT
		MIN	TYP	MAX	
P	Power Consumption	20	25	40	W
f <sub>RES</sub>	Resonant Frequency	10	15	30	kHz
L	Arc length	6	8	14	mm
V <sub>IN</sub>	Power Supply Voltage	10	12	24	V
I <sub>IN</sub>	Power Supply Current	2.5	3	3.5	mA

## PCB TECHNICAL DATA

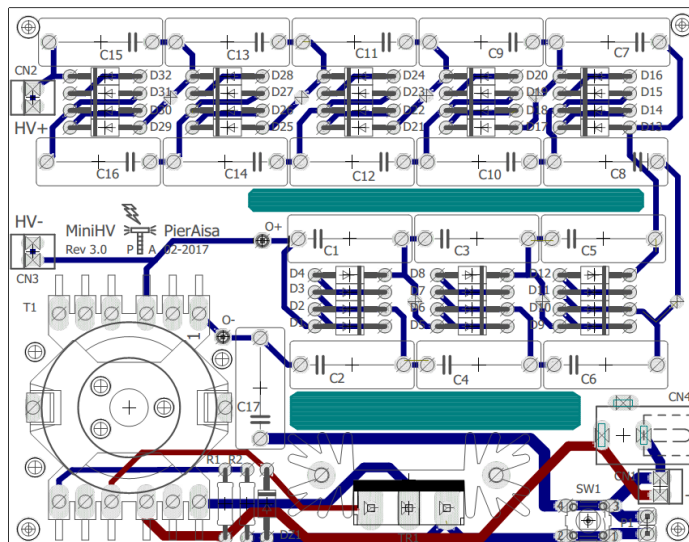
PARAMETER	VALUE	UNIT
Dimensions Length x Width	96 x 77	mm
Colors	RED	
PCB thickness (RED, YELLOW)	1.6	mm
Layers	2	
Surface finish	HASL	
Copper Weight	1	oz
Material Details	FR4-Standard Tg 130-140C	

## BILL OF MATERIALS

- C1-C17: 2.2nF ceramic capacitor 7.5KVDC
- D1-D32: Diode GP02-40 4KV
- DZ1: zener diode BZX85C12
- R1,R2: 470 ohm 1/4W
- T1: Custom transformer
- SW1: switch
- T1: IGBT FGH60N60SMD
- JP1: 3 pin male header
- DC : Connector

## USER INFORMATION

Please use socket and mount IC with PIN1 as indicated by the point as per following figure. Jumpers J4 and J5 set GND to the unused NOT port of U2.



PCB References

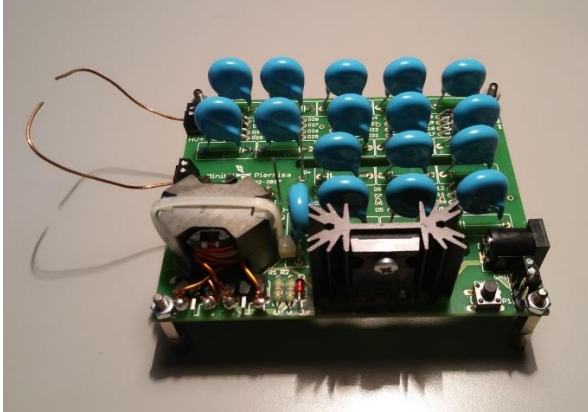


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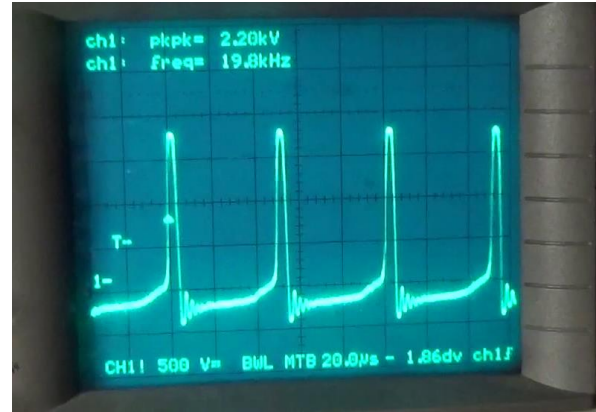
<https://pieraisa.it/forum/> pieraisaforum@gmail.com

**ASSEMBLY INSTRUCTIONS**

- The MiniHV generator is supplied with the printed circuit board and components separately. Initially proceed with the assembly of the low profile components: the diodes, the resistors, the button, the connectors and then with the capacitors.
- Mount the IGBT transistor on the heatsink using an M3 screw with a nut facing the outer side of the board.
- Make the transformer as indicated in the box and solder it to the PCB. Insert 4 hex spacers to lift the PCB.
- Finally, connect two metal electrodes made using a rigid conducting wire, about 5 cm long, using for example the 1mm diameter wire used to make the transformer.
- The two ends of the electrodes must be devoid of insulation for about 5mm to ensure a good contact resistance and must be oriented towards the outside of the board as shown in Figure



MiniPCB assembled



Voltage measured at the output of the transformer

**OPERATION in ELECTRIC ARC MODE**

To make sure that the capacitors are not charged, discharge the capacitances by making a short circuit between the electrodes as described in the precautions for use. Space the electrodes approximately 4mm apart. Remove jumper P1 to enable button operation. The circuit must be powered by an external generator, which can supply a DC voltage between 10V DC and 12V DC maximum and with sufficient output power; if the maximum expected voltage of 12V DC is applied, we recommend a power supply unit with power not less than 40W. We do not recommend the use of transformer power supplies made for the 230V socket, because they usually do not have a good leveling of the output voltage and therefore will produce discharges with less efficiency. Insert the 12V power jack into the CN4 connector. Press the button and check that a practically continuous electric arc starts between the electrodes. NOTE: Maintain the arc for less than 10 seconds to avoid the risk of overheating the IGBT transistor. To make sure that the capacitors are not charged, discharge the capacitances by making a short circuit between the electrodes as described in the precautions for use. Space the electrodes about 10mm apart and press the button. It can be observed how the arc changes shape, intensity and frequency of ignition, due to the greater distance of the electrodes.

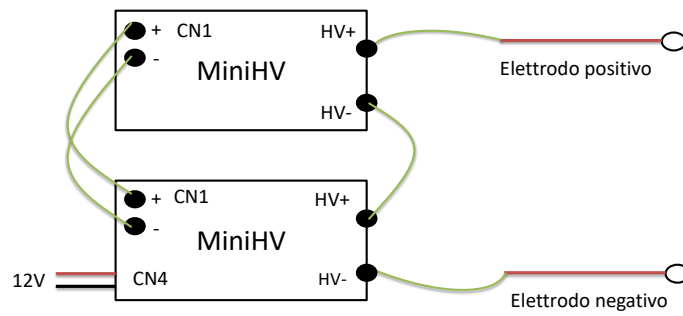
**OPERATION in CORONA EFFECT MODE**

To make sure that the capacitors are not charged, discharge the capacitances by making a short circuit between the electrodes as described in the precautions for use. Space the electrodes at a distance of about 20mm. At this distance the voltage produced by MiniHV is not sufficient to ignite the electric arc and if you look closely at the area around the tips you can see the corona effect represented by a purplish area around the tips and you should hear an “electric” sound.

**SERIES OPERATION of several MiniHV modules**

For those wishing to further raise the output voltage, there is the possibility of connecting several MiniHV modules in series. For this connection it is necessary to make the connections indicated in Figure 8. Pay close attention to the insulation distances between the two MiniHV modules, using spacers of at least 2.5cm. To distribute the 12V power supply to the second module, the CN1 connector can be used as shown in the Figure, verifying that the power supply is capable of delivering at least 80W of 12V power.

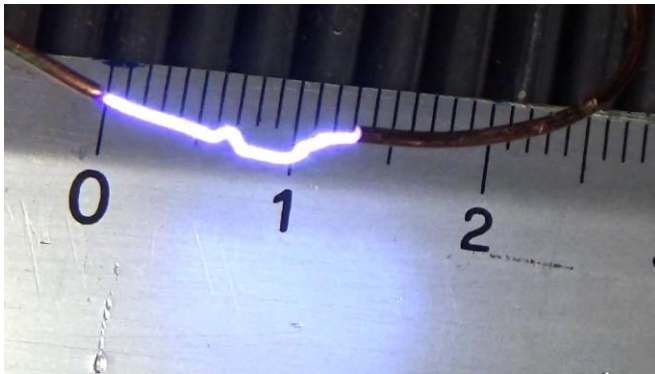




SERIES OPERATION of several MiniHV modules

## ADDITIONAL INFORMATION

Following pictures show the PCBTC in operation producing corona effect clouds, stand-alone arcs and discharge arcs on metallic parts.



OPERATION in ELECTRIC ARC MODE



OPERATION in CORONA EFFECT MODE

## ORDERING INFORMATION

[pieraisaforum@gmail.com](mailto:pieraisaforum@gmail.com)



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<https://pieraisa.it/forum/> pieraisaforum@gmail.com