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Amateur Radio and Electronic Hobby Kits, Parts, and Accessories

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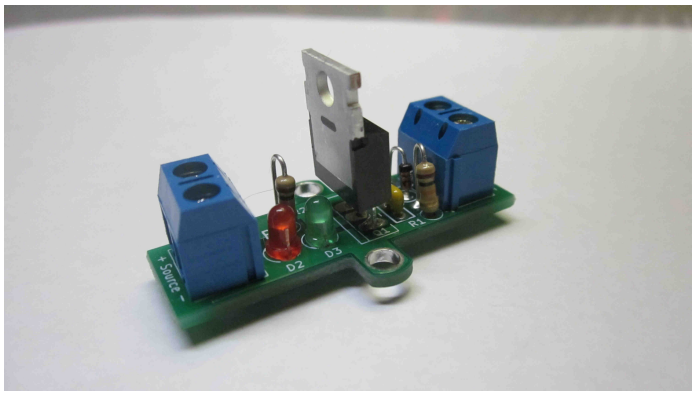
REVERSE POLARITY PROTECTION



RPP – Reverse Polarity Protection
Assembly Instructions

We have all done it, or will one day, hook the power cables to the radio backwards. Hopefully little to nothing will happen. Sometimes it's a minor repair like replacing a fuse or regulator. But on others you watch the equipment lose all it's magic smoke. Adding reverse polarity protection inside your QRP radio can prevent that accidental cross wiring smoke from happening.

Parts List included with this kit:

Qty	Ref	Description	Markings
2	P1 P2	Terminal Block 2-pin_5mm	
1	D1	Diode Zener 1N4733/1N5231 5.1V	
1	D2	LED 3mm RED	
1	D3	LED 3mm GREEN	
2	R1, R2	Resistor CF 250mW 5% 10K	Brown-Black-Orange-Gold
1	Q1	Transistor MOSFET IRF4905-TO220	
1	C1	Capacitor Mono .1ls 10% .047uF	473
1	PCB	Printed Circuit Board RPP	

Construction notes:

This kit was designed using through hole components and enlarged PCB solder pads for ease of assembly.

- The following tools are recommended:
  Pencil type soldering iron and solder.
  Needle nose or round nose pliers, Wire cutters/strippers, Small slotted screwdriver
  Small vice or PCB holder
  Hookup wire and optional #4 mounting screws and spacers
- Familiarize yourself with components using the included parts list.
  TIP: Not sure what part is what? The following sources have great articles on component identification and building techniques.
  - A copy of the ARRL Handbook
  - The GQRP web site: http://www.gqrp.com/databook.htm
- Solder and trim the excess leads after installing each component.

Board Assembly

All components are installed on the top side of the board which also shows the placement of the components. Trim excess leads on each part where needed.

1. Component Preparation:
   a) Hairpin one of the leads on each of the 10K resistor (Brown-Black-Orange-Gold)
   b) Hairpin the Cathode lead (banded end) of the 1N4733 Diode

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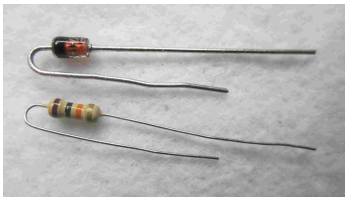
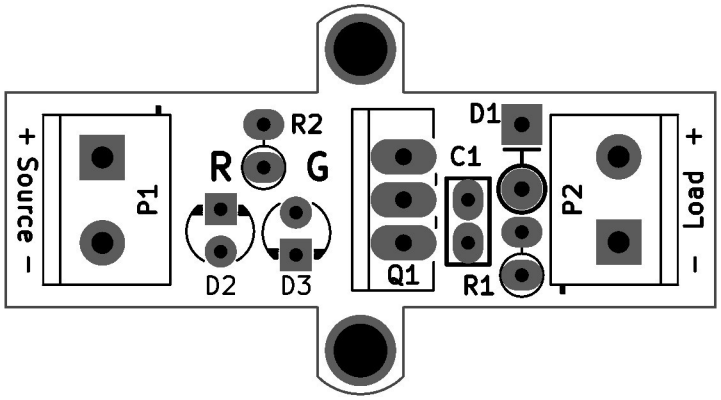


2. Insert and solder the following:
   a) The .047uF capacitor (473) at position C1.
   b) Red LED at position D2, observe the flat side of the LED with the flat mark on the silkscreen.
   c) Green LED at position D3, observe the flat side of the LED with the flat mark on the silkscreen.
   d) The 10K resistor (Brown-Black-Organge-Gold) at postions R1 aand R2.
   e) The 1N4733 diode at position D1. Note the hairpin (banded) end going into the square pad.
   f) Terminal blocks P1 and P2. Make sure the wire etrances are pointing toward the LEDs.
   g) The IRF4905 P-Channel MOSFET at position Q1. Place the metal heatsink side toward P1.



This completes the board assembly procedure.

Board Installation

A typical installation is made by interupting the connection directly after the power connector inside a radio. The following procedure shows the installation inside an HW-8.

1. Cut the power leads directly after the power connector.
2. Connect the positive lead from the power connector to the positive (+) SOURCE terminal on the RPP board.
3. Connect the negative lead from the power connector to the negative (-) SOURCE terminal on the RPP board.
4. Connect the positive lead going to the radio to the positive (+) LOAD terminal on the RPP board.
5. Connect the negative lead going to the radio to the negative (-) LOAD terminal on the RPP board.

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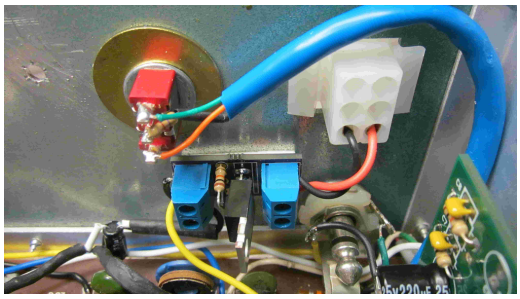
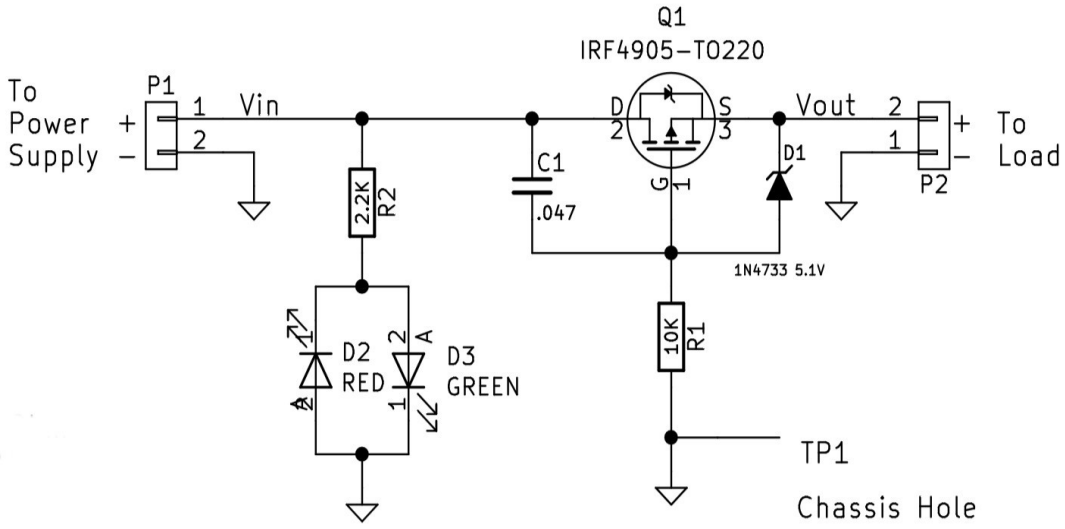
NOTE: Q1 heatsink is the same as the SOURCE+ terminal. Keep it electrically isolated from the ground and load.

Alternative connection: The negative leads do not necessairly need to be connected through the RPP board. Only a single negative (-) lead can be connected to the RPP board as long as a single common (AKA ground) connection within the radio exists for the power supply negative, radio negative, and RPP board. Additionally this alternative connection only works when a single device is connected to a power supply. The mounting tab near R1 is also a common negative lead on the RPP board which can also be used as a chassis mount point for the negative connection. Note the mounting tab near D1 is isolated and has no electrical connection.



RPP Schematic



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SPECIFICATIONS:

Supply voltage input:

Minimum: 4V (Vgsth) Maximum: 50V (Vdss)
(See IRF4905 spec sheet for details)

Current Load:

4.25A Continous (W/ heatsink preferred)
7A Peak

Typical Voltage Drop across RPP (loss @ 13.4VDC):

3mW@60mA 56mV@820mA 84mV@1.3A 425mV@5.4A for 30seconds

FAQs:

What do the components do?

- Q1 is configured to act as a switch, allowing current to pass when properly polarized and the circuit to appear open when reversed.
- C1 just helps prevent static discharge protection between the gate and drain.
- R1 and D1 help clamp the voltage between gate and source. In the case of the IRF4905 these 2 parts they are really not needed as long as the power supply remains below 20V (The Vgs max of the transistor). In this case the diode can be omitted and the resistor can be jumpered. When used the resistor is not critical, anything between 10K and 100K will work. The zener diode, however, must be a value between the MOSFETs Vgsth and Vgss maximim.

Hey! This MOSFET is rated for 74A, why the above current limits??

First off it's 74A with a maximum power dissipation of 200W at room temperature. Push a bunch of current through it, which causes heat, and that 74A derates to 52A at 212F (100C). Secondly the terminal blocks are rated for 15A maximum. But the PCB itself is the biggest limitation. PCB traces of 1.4mils thick and conductors of 1/2" long by 80 mils wide calculates to about 4.25A of maximum current. Although the traces are duplicated on both sides of the PCB, it might handle up to 7A but we decided to keep the safety margin of 4.25A in place. Adding a heat sink to Q1 along with duplicating the power traces with thick wires could increase the current ratings. The MOSFET was chosen for it's low RdsOn, not it's maximum amperage.