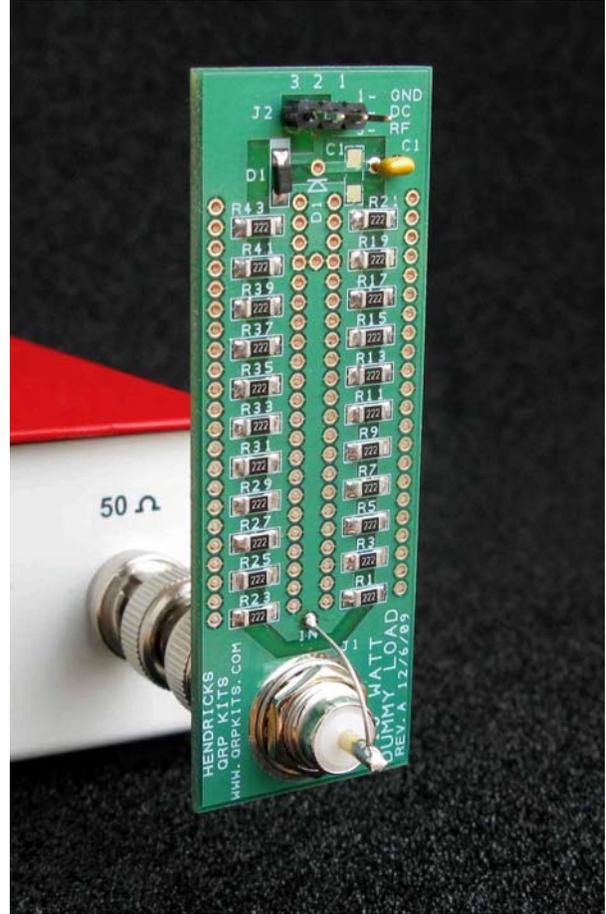


Hendricks 10 Watt Dummy Load Assembly and Operating Manual



Introduction

The Hendricks 10 Watt (DC–150MHz) 50 Ohm Dummy Load kit is a compact, through hole, or SMT (Surface Mount Technology) design, that in addition to the dummy load, has an on board Schottky diode that rectifies the RF voltage and provides a peak detected output. With the use of an inexpensive 11 Megohm digital voltmeter, it will provide accurate power measurements from about 0.5 watts to 10.0 watts. This kit includes all the components and circuit board for both the through hole or SMT version. You chose at the time of assembly which best suits your needs. Both assembly techniques are detailed and produce the same performance. The through hole option can be assembled with common soldering tools and techniques, and the SMT alternative is good training kit for anyone wanting to gain some experience using simple SMT techniques with 1206 size components.

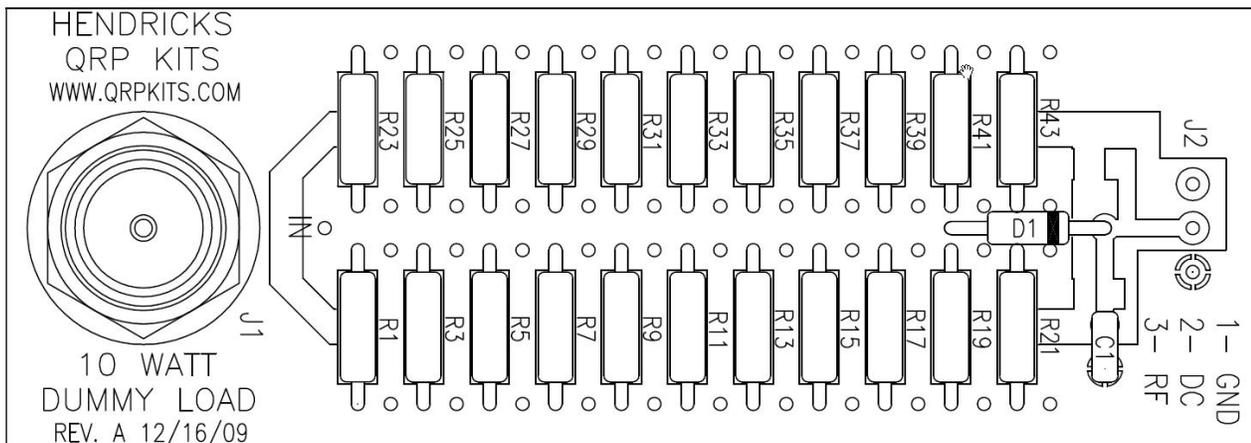
First off, check to see if the parts match the parts list...

- 44 – R1-R44, 2.2K 1/4 watt axial resistor (red-red-red-gold)
- 44 – R1-R44, 2.2K 1/4 watt smt resistor (marked 222). Extra smt resistors are provided.
- 1 – D1, 1N5711 axial diode (marked 1N5711)
- 1 – D1, 1N5711 smt diode (marked SA)
- 1 – C1, .01uF radial capacitor, yellow, (marked 103)
- 1 – J1, BNC chassis mount female connector
- 1 – J2, 3 pin header
- 1 - PCB

Through hole assembly

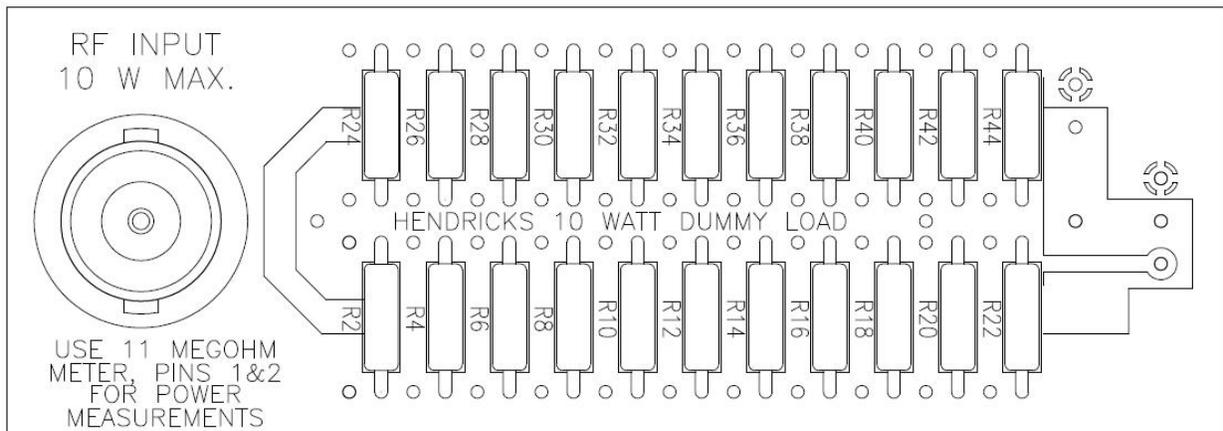
We will refer to the side of the board with the odd numbered resistors, as the rear. The front side will have the even numbered resistors. We will start with the resistors first, as there are extras. There are no extras for the diode or capacitor.

- Solder the all the odd numbered 2.2K ohm resistors (red-red-red-gold) to the rear side of the board, in the rectangular box outlined for the smt resistors. The resistance between pin 1 and 3 should be 100 ohms at this point.
- Solder D1, the 1N5711 diode on the rear side, (placing the polarity band to the header, J2, end of the board).
- Solder C1 , .01uF (103) to the rear side.



Rear Side

- Solder the all the even numbered 2.2K ohm resistors to the front side of the board, in the rectangular box outlined for the smt resistors. The resistance between pin 1 and 3 should be 50 ohms at this point.



Front Side

- Solder the 3 pin header, J2, into the three holes provided, with the exposed pins to the rear side of the board.
- Assemble the female BNC connector with the star lock washer and nut provided. The washer, and nut should be on the rear side.
- Use a short piece of wire, or one of the clipped resistor leads, and connect the center pin of the BNC connector to the hole on the board marked "IN".

This completes the through hole electrical and mechanical assembly.

SMT assembly

Using the techniques detailed below, you can assemble this kit in an hour or less. Here's a list of the basic tools and equipment you will need:

1. .015" dia. Rosin core solder – 60/40 or 63/37 ***NO ACID CORE***
2. A temperature controlled soldering iron
3. Small diameter soldering iron tip
4. Solder Wick®
5. Tweezers
6. A cookie sheet w/ 3/4" raised edges to avoid losing parts
7. Headband or illuminated magnifier
8. Adequate lighting, the brighter, the better
9. Masking tape to hold the board in place, during assembly
10. Multimeter

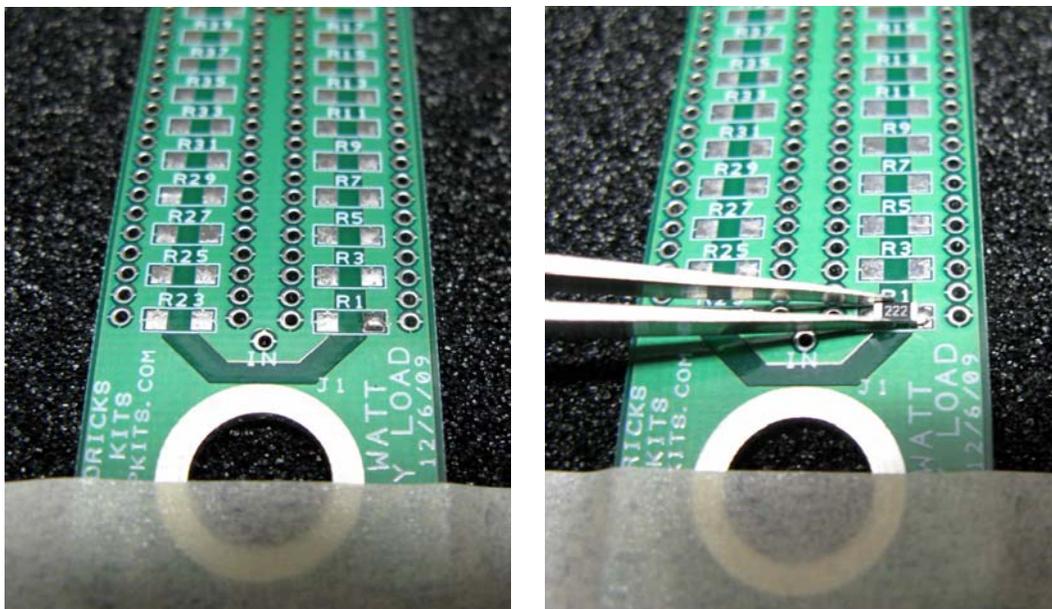
A 700°F tip temperature works well for soldering SMT components. It allows a minimum contact time before the solder flows into the joint, without excess time that can damage components.

The parts are spaced far enough apart to prevent solder bridges, but if one occurs you can easily remove it with Solder Wick®. A good pair of tweezers is a worthwhile investment. Choose a comfortable pair, and they are available from many of the component and surplus houses.

While working with SMT components, good lighting and magnification cannot be overemphasized. There are many headband and stationary magnifiers types to choose from. Pick one that is comfortable and flip down extra magnification is also desirable.

We will refer to the side of the board with the odd numbered resistors as the rear side, and the side with the even ones, the front side, for the following instructions.

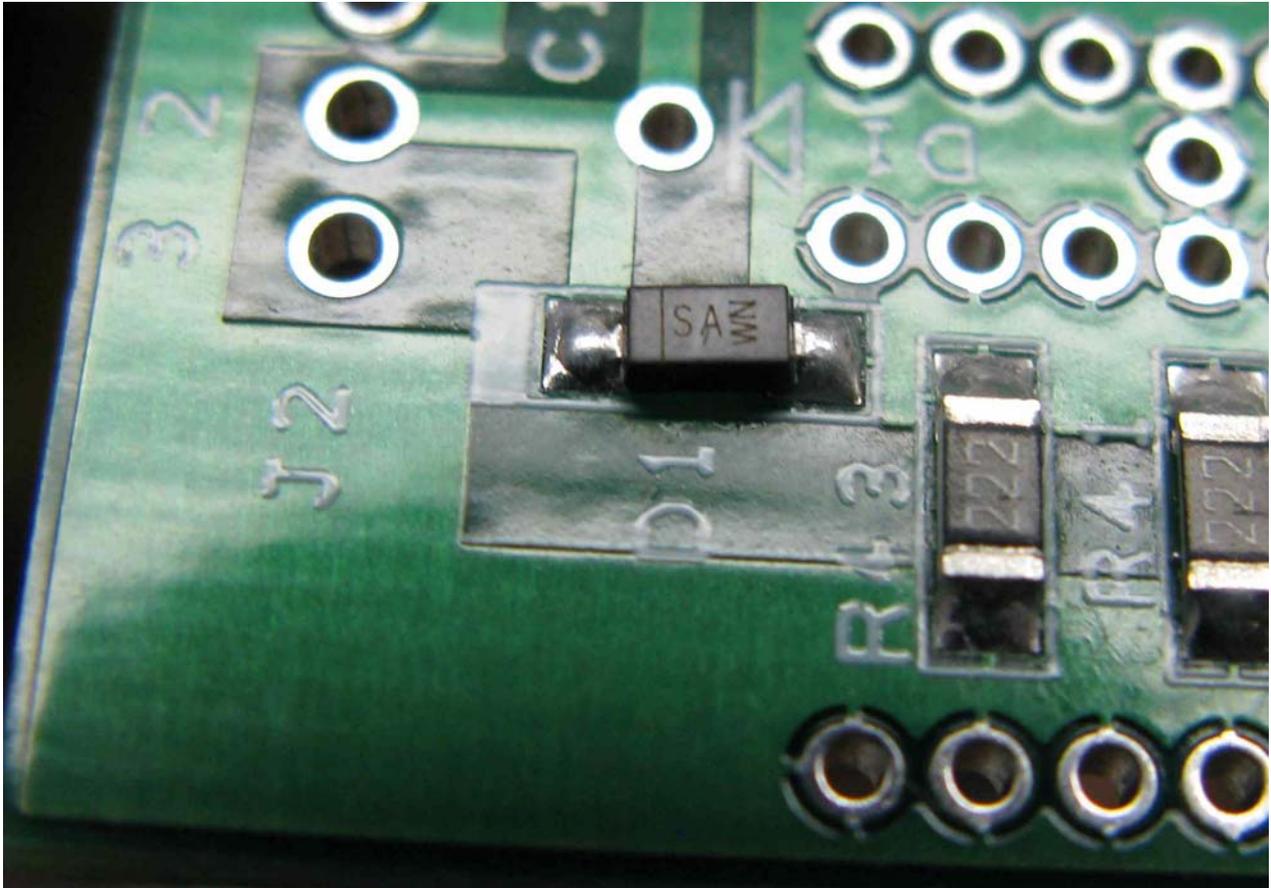
- It is best to work inside the cookie sheet to keep from losing components. We will start by installing the odd numbered resistors first, so tape the board down with the rear side facing up.
- Orient J2 at the top and we will begin with R1 in the lower right corner. The method we will be using, is to apply a small amount of solder to the right side of the pad as shown below.



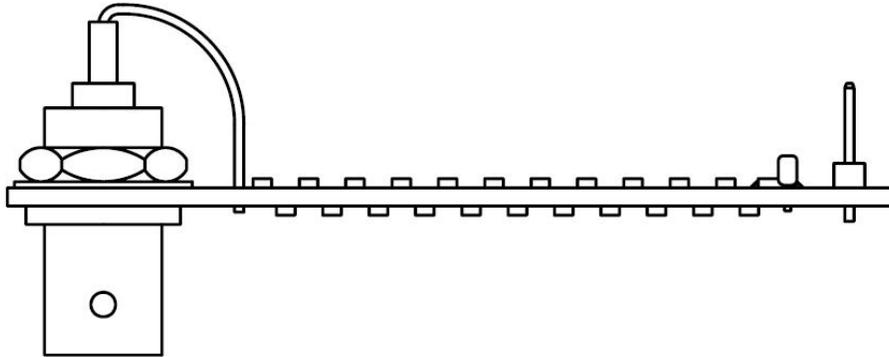
- Peel back the plastic to remove only one of the resistors, and place the resistor in place with your tweezers, value up.
- Now, reheat the solder you put on the pad previously. You should feel the resistor settle in place as the solder melts. Now you can now solder the left side of the resistor.

Repeat this process for all the odd numbered resistors on this side. When you are finished with this side, the resistance between pin 1 and 3 should be 100 ohms.

- Due to a board error it is necessary to use the radial capacitor in place of an SMT capacitor. Solder C1, .01uF (103) in the thru holes shown for C1, not the SMT pads.
- Solder D1, the smt 1N5711 diode in place, with the polarity band towards J2. This laser etched band is difficult to see, but will look like the picture below.



- Turn the board over, re-tape to the cookie sheet , and solder the even numbered resistors as before. When you are finished with this side, the resistance between pin 1 and 3 should be 50 ohms.
- Solder the 3 pin header, J2, into the three holes provided, with the exposed pins to the rear side of the board.
- Assemble the female BNC connector with the star lock washer and nut provided. The washer, and nut should be on the rear side.
- Use a short piece of wire, or clip one of the resistor leads, and connect the center pin of the BNC connector to the hole on the board marked "IN".



This completes the electrical and mechanical assembly.

Specifications

Power Handling: 10 watts for 1 minute
 5 watts for 3 minutes

Input Impedance: 50 Ohms +/- 5%

Useable Frequency Range: DC – 150MHz

Outputs:

1. Peak detector DC output: 1 – 10 watts
2. RF monitor output for precision low power measurements, with external detector.

Operation

The built-in detector provides useful power measurements from less than 1 watt to greater than 10 watts. The DC output appears between J2 pins 1 and 2. Pin 1 is ground. Figure 1 shows the unit's DC output voltage at various power levels. A digital voltmeter with an 11 Megohm input resistance is needed to make the measurements. You can use this graph directly to determine output power, or make up your own chart. The diode is rated for 70 volts. This means that you shouldn't put more than 12 watts into the dummy load to prevent damaging D1. Pin 3 provides direct output to an external detector.

Accurate, lower power measurements, (down to 50 microwatts) can be achieved with the NorTex Accuprobe, see http://www.kk5na.com/kk5na_files/accuprobe.htm.

Special thanks to Tony Parks, KB9YIG, who graciously permitted duplication of the basic design.

Appendix A

