

JFET Matching Jig

Purpose: This board is designed mainly to match SMD JFET's with their saturation drain current(I_{dss}) and pinch-off voltage(V_p)also known as V_{g-s} off (Cutt off voltage for V_{g-s}). If you want to match based on a given I_d (drain current) with a source resistor on there is a provision to do that too. There are no such kits available in the market at present for SMD JFETs. I tried with few makeshift jigs often causing more confusion than getting the work done.

Two version of PCBs were made available during the process, with 1oz and 2oz traces. The only reason for making a 2OZ design is to provide double thickness for SMD pads. I assumed if it going to be used a lot those pads are going to see a lot of drama from tweezers and SMD pins scratching them constantly. But if you are savvy enough, a careful coating with tin on the pads will work better than the 70um thickness of copper.

SMD JFET Packages that can be measured using this kit

SOT 23

SOT 23-3

SOT 323

SOT 346

Through hole JFET

TO 92

TO 92-100

Assembly

If you have the kit, you have everything you need to start working.

There are

- sockets for through-hole JFETs(6),
- jumper(2) sockets (The largest, with tail)
- sockets for through-hole resistors for measuring I_d (2),
- sockets for LED(2)
- Test points - red and black, 1each
- a switch to change between I_d and V_p measurements.(ON-OFF-ON)
- three resistors 100R, 1Meg, 3.65K ohm
- LED
- Power input connector for battery

Start assembling with smallest components first. The smallest ones in the kit are 6, JFET mounting sockets.They are together in one bag. place and solder one by one after applying firm pressure from the other side to level them even. LED mounting sockets are also small and need careful handling.Next will be resistor mounting sockets.

Next, in turn, are 3 resistors. Please check with a multimeter before soldering and make sure you are placing 100R in its place.

When mounting the jumper sockets please make sure they are positioned in line with each other and vertically. the mounting hole turned out slightly bigger than it needs to, and hence may mal-align. If you are using the jumper provided with the kit just put the sockets on to the pins on the jumper and then mount them on PCB and quickly solder. Beware if your doing this way don't apply heat for long.

Next mount and solder PCB test points in their respective places.

Soldering Power input connector needs attention, make sure orienting the wire opening to the left and positioned properly in holes before soldering.

The switch is unique and fits in only one direction (just follow the bigger holes in PCB while mounting switch).

Next cut short the LED leads and insert them into the socket following the direction below. LED indicate the board is powered (useful when you don't see any reading in multimeter!) For testing N Jfets mount LED with the square pad in LED pattern to the Kathode and round pad to the anode. Just flip the direction of LED for P channel Jfets.

Other than kit, following are needed for measuring JFETs

1. 9V battery
2. Multimeter(MM)
3. Alligator clips for connecting multimeter
4. A battery connector
5. A cloth hanging clip for holding SMD Jfets in place. I picked mine at home depot(HDX 80001) recommend them. But feel free to experiment.
6. a tweezer/ forceps preferably curved

Measuring procedure for N channel JFETs:

The board has markings for battery polarity for both types of Jfets (Rectangular boxes with marking N and P before power connector). Carefully wire the battery following the pattern as shown on the board with right polarity for each JFET. The LED will turn on indicating power-on state. Keep the switch position in the middle. Connect multimeter's positive and negative probes using alligator clips to PCB test point and set MM to measure voltage in Volts to the maximum precision your's allow to measure.

Carefully place SMD JFET on the pad making sure the pins are making contact with their corresponding pads. Use the cloth clip to hold JFET in position. it is nearly impossible to do the positioning for SMD jfets without a good quality curved forceps. For measuring I_{dss} use the jumper provided, to close the loop (on PCB marked as Short). if you are measuring the I_d (drain-source current for a given resistance leave the short position open, but mount the required resistor into the socket, marked as R_d).

Flip the switch to I_{dss} / I_d position. I_{dss} is the value you are seeing in Volts divided by your exact resistance (100.7ohm in my case). It is not important in the matching process and you can simply divide the volts by 100 to get I_{dss} value in ampere. For example mine reading as 1.547V. $I_{dss} = 1.547 / 100.7 = 0.01536$. But for matching you do not have to calculate the I_{dss} each time (that is not easy to do in real life anyway

due to the small values involved). The voltage measured is a surrogate number for matching two jfets.

Matching I_d (drain-source current for a given resistance) is more useful in certain situations like Feucht buffer design. Use a resistor with very low-temperature drift, if possible the same one you are planning to use in the design for those measurements.

Flipping the switch to the right side after off position will get you the pinch voltage(V_p).

Measuring P channel Jfets:

Everything except battery connection stays the same for P Jfets. Just reverse battery polarity as shown on the board. Also, don't forget to reverse the LED if you want power indicator light to be turned on. everything else remains the same

Please allow up to 30s to a minute before measurements from Jfets for thermal settling time.

Important: Since jfets are symmetric devices consensus is that one can flip between drain and source. I am yet to find an SMD JFET with the source or drain on the middle pin. My understanding is the middle pin (aka pin 3) is also serve as the heat dissipating pin for most SMD packages, so it is unlikely. I have provided enough width for gate pads for the same reason.

Through hole Jfets:

Though getting extinct if you still plan to use them there is provision to do so. The pin combinations on PCB should allow all the possible combinations with gate, drain and source pins available in the market.

For through-hole Jfets please follow the same procedure outlined above after double checking the pins before mounting them to socket.

Thank you for all your support and enthusiasm!

Now enjoy matching few JFETs!

Parts List from Mouser:

Multimeter point

534-5000

534-5001

Wire Fixed terminal

649-220327-C021B01LF

Resistors

603-MFR-25FTE52-1M

279-YR1B100RCC

603-MFR-25FBF52-3K6

Shorting pin

855-D3087-99

sockets

575-0336015013401 x2

575-055210 x6

575-0338015011527 x2

LED

859-LTL2R3KRD-EM

LED PIN

575-055621

Slide switch

642-MHS123K