www.didel.com/diduino/LogicTesterKit.pdf

Logic tester *LoPen* – an easy and useful kit

A logic probe or logic tester shows the state of a logic signal. If that state is zero or one, a simple LED can be used.
A logic signal can also be floating, that is not connected or in three-state mode.
It can also be a short pulse your LED will not see, or it is pulsing too fast for your eyes.
LoPen takes care of these situations:
a yellow LED shows floating signals.
Visible blinks are given for glitches as short as 100 nanoseconds. A slow blink shows a high frequency signal.

Note: you have to power from the circuit you test, or have a common ground

Logic levels and input impedance

Let's consider a 5V microcontroller design. Most signals are digital. Zeroes with a voltage close to 0V (< 1V to be safe), ones with a voltage close to 5V (> 3V to be safe).
Floating signals have any voltage. The tip of LoPen is floating when not touching a signal. This is detected with 100 KOhm resistances that assign the tip voltage to 2.5V.

For a "good zero", the red LED is on, for a "good one" the green LED is on.
It does not correspond exactly to circuit specifications, anyway all slightly different, but it is sufficient for debugging. And it works from 2 to 6 Volts.
The shematic includes one-shots and 100 nanosecond pulses are converted to 0.3s red or green blinks. You even can get a good feeling of PWM percentage, but notice the red/green blinking frequency is not related to the PWM frequency.
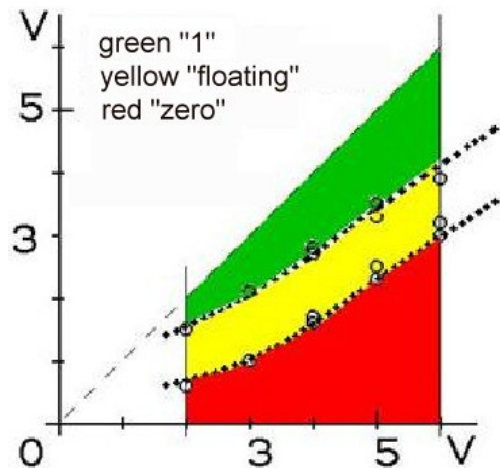
The kit

1	LoPen PCB
2	74HC00
3	1N4148 diode
1	Led yellow
1	Led red
1	Led green
4	100k brown black yellow
2	10k brown black orange
2	1k brown black red
3	1 uF electrolith capa
1	3-pin male strip
1	tip pin
1	40 cm flex wire
1	shrink tube 22mm flat 75mm long
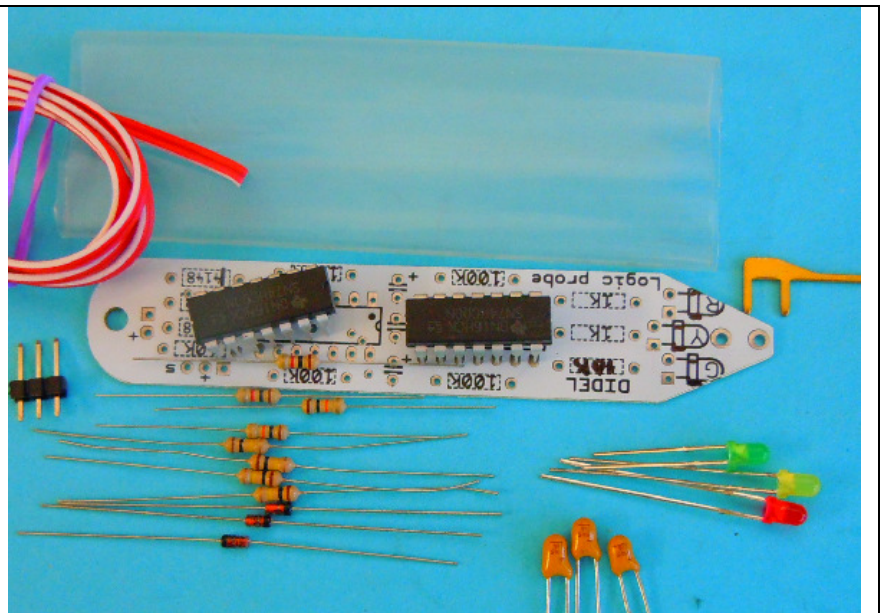
Assembly

Just follow PCB marking, but note two changes.
The green Led associuated resistor is preferably 10 kOhm, it is written 4.7k on the PCB.
The 3 Leds are drawn incorrectly. The square pin is the anode, + side.

The general rule is to start with the components of small heigh:
diodes, resistors, 74HC00, LEDs if horizontal, pin, capacitors.
For the LEDs, notice there is a flat part on the side of the short pin. Maybe you should bend the led to have the shrink tube going over the LEDs. Also, position the side capacitor horizontally, it will be more easy to push the shrink tube over the PCB.
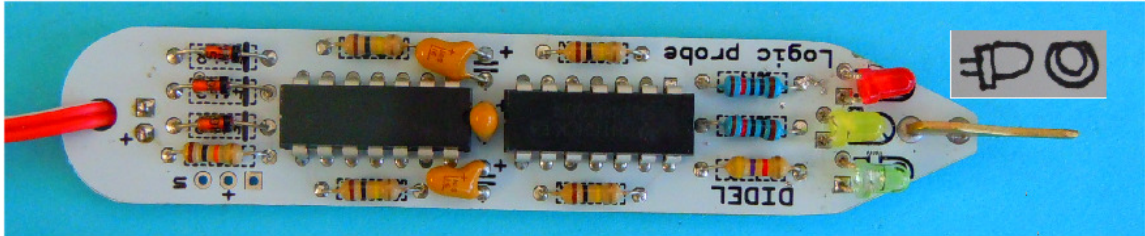
Power

Power is 2 to 6V. Use a red wire for the positive supply and a black wire for the Gnd.
A diode protects the circuit in case of polarity inversion.
We do not provide the connector on the board. We use a 3-pin male connector for the supply, is avoid many wrong connections. Sometimes the 3rd pin disturb, cut-it short.

Protection shrink tube

There is no real need to add a protection around the pen. It is just cleaner to add the shrink tube, if you have the good equipment. The tube needs some time to be heated, making the heat turn around. Avoid too much heat, the plastic power wires may not like it. The best is to hold the pen with a wood clothes pin or a plyer.

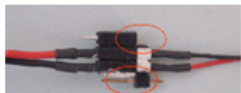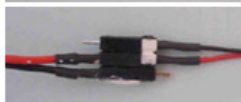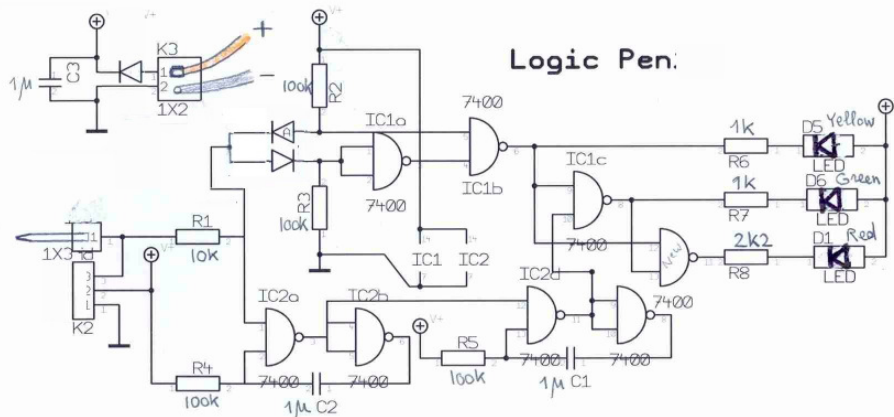| Sharp pin	
The Lopen pin is strong – good. But to pinpoint on your PCB, you need a sharp pin. If you are lucky, you find in a small bag a rivet and a pin that accept to be soldered.	
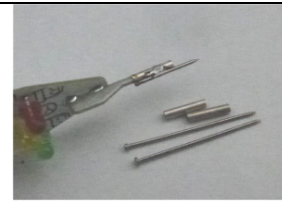
If you do not like to solder, we have the Mini Lopen 60x10mm, fully assembled and tested. We are using and selling locally the Mini Lopen.for many years. Doc in french: www.didel.com/diduino/Testeur Logique.pdf	