Soldering Hints

① Put leads through mounting holes from the side with part outline. Ensue component evenly touch PCB.
② Solder leads at the other side. Solder should fully fill and cover soldering pads. Avoid bridges between neighbering pads.
③ Cut unused leads flush with cutter.

DSO 138 Oscilloscope DIY Kit

User Manual

Rev. 04
Applicable models: 13803K, 13804K

Tools you need

① Iron (20W) ④ Screw driver
② Solder wire ⑤ Flush cutter
③ Multimeter ⑥ Tweezers

Before you start

① Check part values & quantities against part list
② Always meter resistor values before soldering
③ Understand all part polarities and orientations

Important !!!
Install all SMD parts before proceeding to Step1 if you purchased kit 13804K.

Step 1 Assembly Main Board and LCD board (follow the order as numbered)

1. Resistors

Note:
Always meter resistor values before soldering

☐ R1, R14, R16	: 100K Ω	☐ R7, R36	: 180 Ω
☐ R2	: 1.8M Ω	☐ R8, R12, R13	: 120 Ω
☐ R3	: 200K Ω	☐ R9, R15, R26	: 1K Ω
☐ R4	: 2M Ω	☐ R10	: 3K Ω
☐ R5	: 20K Ω	☐ R11	: 150 Ω
☐ R6	: 300 Ω	☐ R38	: 1.5K Ω
		☐ R28, R40	: 470 Ω
		☐ R37, R39	: 10K Ω

2. HF-Chokes

☐ L1,L3,L4 : 100 μ H

3. Diodes

Cathode

☐ D1 : 1N5819
☐ D2 : 1N4004 (or 1N4007)

4. Crystal

☐ Y1 : 8MHz

5. USB Socket *

☐ J4 : USB mini-B

6. Tact Switches

☐ SW4, SW5, SW6, SW7, SW8 : 6 X 6 X 5mm

7. Ceramic Capacitors

		☐ C1, C9, C10, C11, C14, C15, C16, C17, C18, C20, C23	: 0.1 μ F
☐ C2	: 330pF	☐ C7, C8	: 120pF
☐ C3	: 3pF	☐ C12, C13	: 22pF
☐ C5	: 1pF		

8. LED

Solder positive pole (the longer lead) to the square pad

☐ D3 : Φ3mm, green

9. Pin header (for power)

Face the opening outward

☐ J9 : 2 Pin

10. Transistors

☐ Q1 : 8550
☐ Q2 : 9014

Attention!
Packages are similar. Do not mix up!

11. Regulators

☐ U4 : 79L05
☐ U5 : 78L05

Attention!
Packages are similar. Do not mix up!

12. Capacitor trimmers

☐ C4, C6 : 5 - 30pF

13. Power inductor

☐ L2 : 1mH/0.5A

14. Electrolytic capacitors

Solder positive pole (the longer lead) to the square pad

☐ C19, C21, C22, C24, C25, C26 : 100 μ F/16V

15. Power connector

☐ J10 : DC005

16. Pin-header (male) *

☐ J5 : 1 X 3 pin
☐ J6 : 1 X 4 pin

Note:
These pin-headers are optional.

17. Pin-header (female)

☐ J7, J8 : 1 X 2 pin
☐ J3 : 2 X 20 pin

18. Slide switches

☐ SW1, SW2, SW3 : 2P3T

19. BNC connector

☐ J1 : BNC

Note:
The thicker pins need to heat up longer to get good soldering result.

20. Test signal ring

1) Make a small ring with a lead cut-off.

2) Solder the ring to the two holes of J2 (as shown in the photo).

21. JP3

Short JP3 with solder

22. LCD Board

Note: Install to the side opposite to LCD panel.

☐ J1 : 2 X 20 pin

☐ J2, J3 : 1 X 2 pin

The assembly should look like after you have finished all part

Step 2 Test and Use

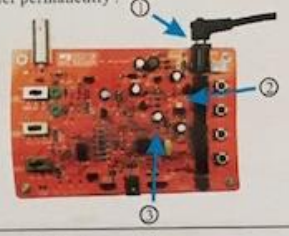
NOTE: You need a 9V DC power supply (at least 200mA capacity) to run the scope. This power supply is not included in the kit.

A. Check voltages

① Apply 9V power to J10 (or J9).

② Check voltage at TP22. It should be around +3.3V.

③ If voltage at TP22 is good disconnect power. Short JP4 with solder permanently .



B. Attach LCD board

Plug LCD board into the female headers J3, J7, and J8 on the main board.

C. Verify

① Connect power supply again. You should see LCD lights up and oscilloscope panel displayed.

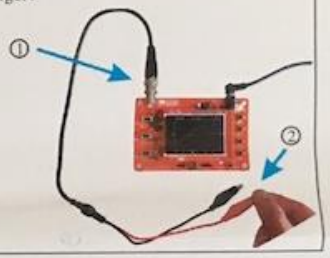
② Press various buttons and move switches to verify their functions.

"Trigger" LED blinking twice indicates booting-up is good.

A. Use

① Attach probe clips to J1.

② Touch the red clip with your finger. Do you see signal from your finger?



Troubleshooting

LCD Dark (No backlight)

- Is voltage at V+ good? No → Check power supply
- Yes → Is R36 value correct and soldered good? No → Fix R36
- Yes → Do you get about 3V between J1 pin 16 & 18 on LCD board? No → Check R36 and power again
- Yes → Check LCD board

No Display

- Short JP4 if it has not been done. See Step 2 above.
- Press SW8. Does LED blink? No →
  - ▶ Check +3.3V voltage
  - ▶ Check Y1, C12, C13
  - ▶ Check LED installation
- Yes →
  - ▶ Check J3 soldering for possible opens or shorts
  - ▶ Check J1 soldering on LCD board for possible opens or shorts (use Test Mode)

No Trace

- Are the values of AV+ and AV- correct? No → Visit forum for detailed troubleshooting guide
- Yes → Set CPL switch to GND and measure V1 and V2. Are they correct? No → Check U2B, U2C and related parts around these two amplifiers
- Yes → Check R12 and C8

NOTE 1: The voltages in the photo are for reference only. The voltages on your board could be different. But they should be close to the values shown.

NOTE 2: LED will be blinking constantly if MCU (U1) can not detect valid LCD controller. Check LCD pin-header soldering.

NOTE 3: Make sure U1 and LED working (you see LED blinks twice at pressing RESET) before using Test Mode.

Test Mode

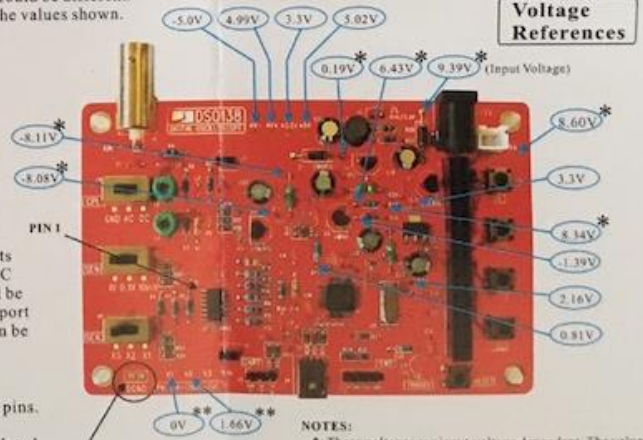
What it is and how it works

Test Mode is used to find out possible opens (for all port pins) and shorts (for pins PB0 - 15 and PC13-15). When entered it first checks PB and PC pins with special patterns to find out possible shorts. If found LED will be fast blinking. Otherwise, it generate 3.3V and 0V alternatively at each port pins (PA, PB, PC and PD) in cycle of about 4 seconds. These signals can be used to check for opens.

How to use

1. Hold down SW4 and press RESET to enter Test Mode.
2. If you see LED fast blinking that means there are shorts on PB or PC pins. You need to find out the shorts first.
3. If you see LED slowly blinking use a volt-meter to check each pin related connections that are suspected open. When you don't see voltage change at a spot which is supposed being connected to a port pin there may be open between the spot and the port pin.

Voltage References



Place the negative pen of volt-meter here to do voltage measurements.

NOTES:

*: These voltages are input voltage dependent. The values shown were measured when input voltage was 9.39V.

**: These voltages are measured when CPL switch (SW1) is set to GND position.