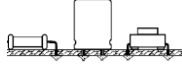


### Component welding methods and requirements

1. Insert the component leads through the corresponding mounting holes from the installation side, ensuring the component sits evenly and snugly against the PCB. (See diagram below)
2. Solder the leads on the opposite side of the PCB using solder. The solder joints should be full and secure, but not excessive. (See diagram below)
3. Use wire cutter to cut the extra pins.



## DSO138 Oscilloscope Kit User Guide

### Component welding methods and requirements

1. Soldering iron (20w)
2. Soldering wire (0.8mm)
3. Multi-meter
4. Screwdrivers
5. Wire cutters
6. Rice

Rev. 03

Applicable models: 13803K, 13804K

Preparation work:

1. Verify the quantity and specifications of components according to the material list.
2. Verify the resistance of all resistors with a multimeter.
3. Confirm the polarity and installation direction of the component in advance.

### First Soldering main board and Display board(Place follow the order no.)

**Note: For the 13804K kit, please solder the SMD component first, then solder the through hole component.**

#### 1. Resistor



Recommendation:  
Use a multimeter to confirm the resistor value before install to avoid errors.

- |   |  |
|---|--|
| <input type="checkbox"/> R1, R14, R16 : 100K $\Omega$ | <input type="checkbox"/> R7, R36 : 180 $\Omega$      |
| <input type="checkbox"/> R2 : 1.8M $\Omega$           | <input type="checkbox"/> R8, R12, R13 : 120 $\Omega$ |
| <input type="checkbox"/> R3 : 200K $\Omega$           | <input type="checkbox"/> R9, R15, R26 : 1K $\Omega$  |
| <input type="checkbox"/> R4 : 2M $\Omega$             | <input type="checkbox"/> R10 : 3K $\Omega$           |
| <input type="checkbox"/> R5 : 20K $\Omega$            | <input type="checkbox"/> R11 : 150 $\Omega$          |
| <input type="checkbox"/> R6 : 300 $\Omega$            | <input type="checkbox"/> R38 : 1.5K $\Omega$         |
|   | <input type="checkbox"/> R28, R40 : 470 $\Omega$     |
|   | <input type="checkbox"/> R37, R39 : 10K $\Omega$     |

#### 2. Inductor



- ☐ L1, L3, L4 : 100  $\mu$ H

#### 3. Diodes



- Negative
- ☐ D1 : 1N5819
- ☐ D2 : 1N4004 (或 1N4007)

#### 4. Crystal



- ☐ Y1 : 8MHz

#### 5. USB



- ☐ J4 : USB mini-B

Note: The installation of this component do not affect the operation of the oscilloscope.

#### 6. Tact Switch



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

#### 7. Ceramic Capacitor



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

#### 8. LED



Put the positive pole (longer pin) solder to the square solder pad.



- D3 :  $\phi$ 3mm, 绿色

#### 9. 2 pin Header (Power input)



The gap is facing outwards.

- ☐ J9 : 2 Pin

#### 10. Transistor



- ☐ Q1 : 8550
- ☐ Q2 : 9014

Note: The packaging is similar, don't mix up!

#### 11. Regulator IC



- ☐ U4 : 79L05
- ☐ U5 : 78L05

Note: The packaging is similar, don't mix up!

#### 12. Variable Capacitor



- ☐ C4, C6 : 5 - 30pF

#### 13. Power inductor



- ☐ L2 : 1mH/0.5A

### 14. 电解电容



把正极 (较长的引脚) 焊接到方形焊盘



- ☐ C19, C21 : 100  $\mu$ F/16V
- ☐ C22, C24, C25, C26

#### 15. Power Plug



- ☐ J10 : DC005

#### 16. Header (M)



- ☐ J5 : 1 X 3 pin
- ☐ J6 : 1 X 4 pin

Note: J5, J6 will not affect the operation of oscilloscope.

#### 17. Header (F)



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

#### 18. Slide Switch



- ☐ SW1, SW2, SW3 : 2P3T Switch

#### 19. BNC connector



- ☐ J1 : BNC

Note: Thicker pins need to be heated for a long time when soldering.

## 20. Test the signal output port



1. Use the component pin to bend it into a small ring.
2. Weld the small ring to the two holes of J2 (as shown in the picture).

## 21. JP3



Short circuit JP3

## 22. LCD Display Board header



Note: The header should be installed to the opposite side of the LCD screen

- ☐ J1 2x20 pins
- ☐ J2, J3 1x2 pins



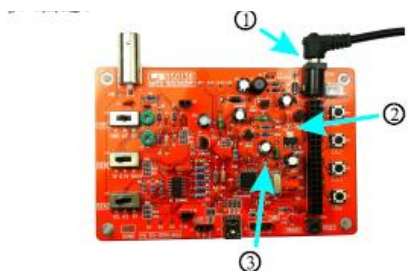
安装完成后的样子

## 第二步 调试使用

**Note: Prepare a 9V DC power supply (current capacity, the kit does not include the power supply).**

### A. 检查电压

1. Connect the 9V power supply to J10 (or J9).
2. Measure the voltage at TP22, which should be about 3.3V.
3. If the voltage at TP22 is normal, disconnect the power supply and use solder to



### B. Connect LCD Board

Insert the welded LCD display board into the row J3, J7, and J8 on the main circuit board.



### C. 检查各功能

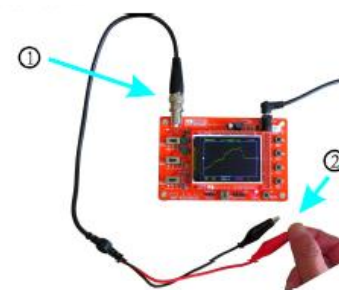
1. Connects the power supply, you should see the LCD backlight light up, and the screen show main manual.
2. Operate each button and switch, observe the display of the corresponding content to confirm that their functions are normal.



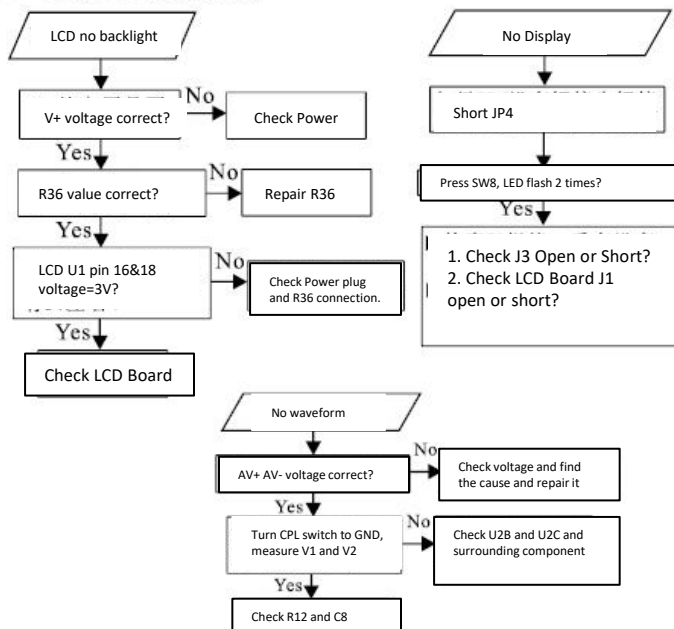
启动时该二极管闪两次, 表示程序启动正常。

### A. 使用

1. Connect the probe to J1.
2. Touch the red probe by your finger. You can see the waveform on the screen.



## 故障排除方法



Explanation 2:  
If the LED keeps flashing, it means that the single-chip computer fails to detect the TFT controller, which means that the part connected to the LCD is faulty.

Note 3:  
Confirm that both the single-chip computer and the LED are working can the test mode be used to check the open circuit and short circuit.

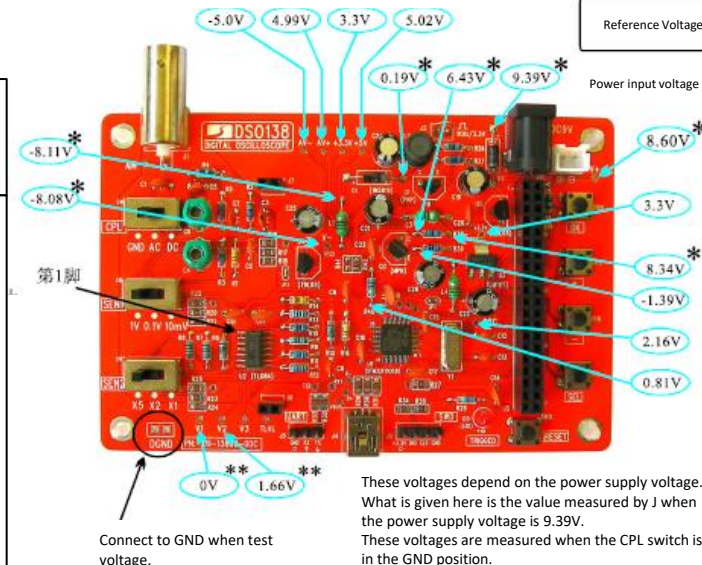
### Test Mode:

The test mode is used to help to find the open circuit (for all single-chip computer ports) or short circuit (for PB and PC) of the single-chip computer pin-related circuit. After entering the test mode, the single-chip computer will first automatically detect whether there is a short circuit in the terminal PB and PC. If there is short, the LED will flash quickly. Otherwise, it will output 0 to 3V square wave with 4 second of each cycle. These signals and voltmeters can be used to check whether the connection to the port is open.

### How to use:

After pressing the SW4 key, press the RESET key to enter the test mode.2. If you see the LED flashing quickly, it indicates that there is a short circuit in the PB0-PB15 or PC13-PC15 of the single-chip computer. It should be found and removed before continuing.

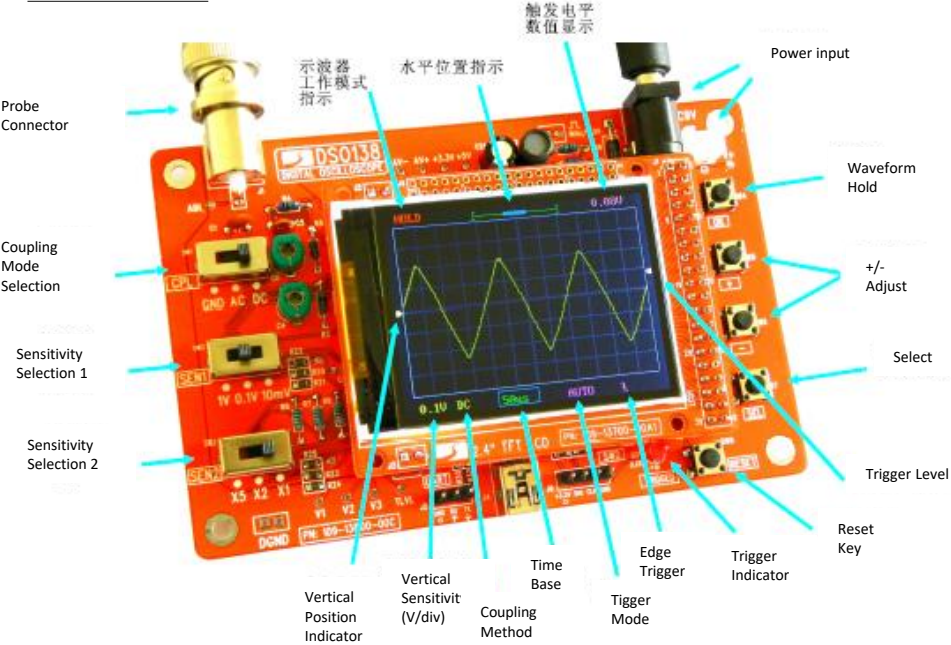
Note 1: The voltage marked here is for reference only. The voltage on the non-return board may be slightly different, but the value is given here.



These voltages depend on the power supply voltage. What is given here is the value measured by J when the power supply voltage is 9.39V. These voltages are measured when the CPL switch is in the GND position.



Control Panel



Connection Method

**Power Supply:** Connect the power to J9 or J10. The voltage must be within the range of 8–12V.  
**Probe:** Connect the probe to J1.

Operating Instructions

- Press the [SEL] button: Select the parameter to adjust. The selected parameter will be highlighted.
- Press the [+] or [–] button: Adjust the parameter selected by the [SEL] button.
- Press the [OK] button: Freeze the waveform (enter HOLD state). Press again to unfreeze and resume waveform updates.
- Toggle the [CPL] switch: Set the coupling mode to DC, AC, or GND. When set to GND, the oscilloscope input is disconnected from external signals and grounded (0V input).
- Toggle the [SEN1] or [SEN2] switch: Adjust sensitivity. The actual sensitivity is the product of the [SEN1] and [SEN2] settings, displayed in the lower-left corner of the screen.
- Press the [Reset] button: Perform system reset and restart.
- Hold SW4 and press the [Reset] button: Enter test mode.

0V baseline alignment

Sometimes the 0V baseline (that is, the trajectory when the input voltage is 0V) and the vertical position indicator on the left side of the curtain will be misaligned, which can be eliminated by performing the “0V baseline alignment” function. The specific practice is: first put the [CPL] in the GND position (even if you enter >0V), then press ISEL" to select the vertical position indicator (highlight it), then press the [OK] key and hold it for about 2 seconds, and you will see that the 0V baseline is aligned with the vertical position indicator. When the vertical sensitivity selection is relatively high, you may find that there are still some misalignments after making 0V baseline pairs. This is due to the high sensitivity, which is a normal phenomenon and does not affect the use of the oscilloscope.

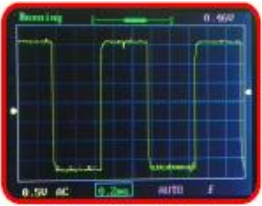
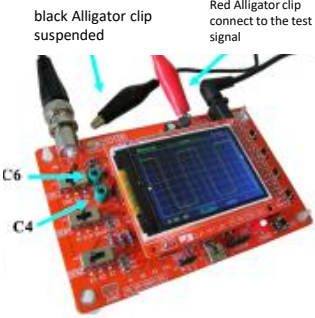
Warning

1. The power supply voltage must not exceed 12V; otherwise, component U5 will overheat.
2. When using a fish probe, the maximum allowable signal voltage is 50V peak (100V peak-to-peak).

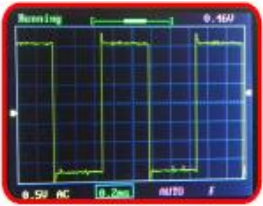
Probe Compansation Procedure

Due to the capacitance between the oscilloscope's input terminal and ground, the probe must be properly compensated and calibrated to achieve accurate signal observation—especially for high-frequency signals. This calibration can be performed using the oscilloscope's built-in signal generator. The specific steps are as follows:

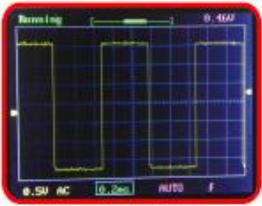
1. Connect the red clip of the probe to the test signal output terminal, and leave the black clip unconnected (see photo on the right).
2. Set [SEN1] to 0.1V, [SEN2] to X5 (vertical sensitivity is 0.5 V/div), and set [CPL] to AC or DC position.
3. Set the time base to 0.2 ms. You should see a waveform similar to the one shown below. If the waveform is unstable, adjust the trigger level (indicated by the pink marker on the right side of the screen) to stabilize the waveform.
4. Use a small screwdriver to adjust C4 (fine-tuning capacitor) to make the waveform show sharp right angles (as shown in Figure C below).Once done, the 0.1V compensation calibration is complete.
5. Switch to the 1V range. Keep other settings unchanged. Set [SEN1] to 1V, and [SEN2] to X1 (in this case, the vertical sensitivity is 1 V/div, so the waveform height will look different from the previous figure).Adjust C6 to make the waveform display sharp right angles. At this point, the probe compensation calibration is fully complete.



A. Under compensation



B. Over compensation



C. Proper compensation

Turn On/Off Digital Display

Press [SEL] to move the cursor to the time base position. Then press and hold the [OK] button for about 2 seconds, then release. This will toggle the digital display of voltage, frequency, etc., on or off.

Waveform Save and Recall Save Waveform:

Press [SEL] and [+] simultaneously to save the currently displayed waveform to internal memory (it will not be lost when powered off).Recall Waveform: Press [SEL] and [–] simultaneously to recall and display the waveform saved in internal memory.

Triggering and Trigger Modes:

Triggering refers to the event where a signal level crosses a specified threshold (trigger level) in a set direction (trigger edge, which can be rising or falling). The oscilloscope uses this event as a time reference point to achieve stable waveform display and measurement. There are several commonly used trigger modes:

Auto Mode:

The oscilloscope continuously updates the waveform display regardless of whether a trigger occurs. If a trigger is detected, the waveform is displayed using the trigger point as a reference; otherwise, the waveform is displayed randomly. Therefore, you'll notice that when a trigger is present, the waveform display is stable, and when there is no trigger, the waveform appears to scroll.

Normal Mode:

The oscilloscope updates the waveform display only when a trigger occurs. If no trigger is detected, the waveform on the screen remains static.

Single Mode:

Similar to Normal mode in that the waveform is updated only when a trigger occurs. The difference is that in Single mode, after the waveform is displayed, the oscilloscope will entre HOLD state automatically. You must manually exit this state to perform the next waveform acquisition and display.

Normal and Single modes are commonly used to capture waveforms that occur infrequently or only once.

Specification	
Maximum Real-Time Sampling Rate	1 MSa/s
Analog Bandwidth	0 ~ 200 kHz
Vertical Sensitivity Range	10 mV/div ~ 5 V/div
Maximum Input Voltage	50 Vpk (1X probe)
Input Impedance	1 MΩ / 20 pF
Vertical Resolution	12 bits
Record Length	1024 points
Time Base Range	500 s/div ~ 10 μs/div
Trigger Modes	Auto, Normal, and Single
Trigger Position	50% of buffer
Power Supply	9V DC (8 ~ 12V)
Power Consumption	~120 mA
Dimensions	117 × 76 × 15 mm
Weight	70 g (excluding probe)

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