DSO138mini Oscilloscope DIY Kit (Model: 13805K)
User Manual Rev. 05

Applicable PCB: Main: 109-13800-00I
Analog: 109-13801-00[H, J]
Applicable firmware: 113-13810-110 or later

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

Before you start
① Check values & quantities against parts listed
② Understand all part polarities and orientations
③ Prepare a USB cable with USB-micro connector

Notes
① Instructions for optional parts (including *BNC probe, enclosure,* and *battery charger*) are not given in this manual. If you have purchased these parts please refer to their own manuals available at www.jyetech.com .
② Please visit www.jyetech.com for other documents about schematics, troubleshooting, firmware upgrade, mechanical, waveform upload, etc.
③ Items marked with [H] are for analog board ver. H. Items marked with [J] are for analog board ver. J.

Step 1   Test and Assembly Main Board

1. Check the main board
① Before mounting any parts to the main board Use an USB cable with USB-Micro plug to power the main board through J7.
② You should see the scope boots up to a screen similar to the photo below. D1 (LED) should blink three times during the booting.

① Apply power
② Check display
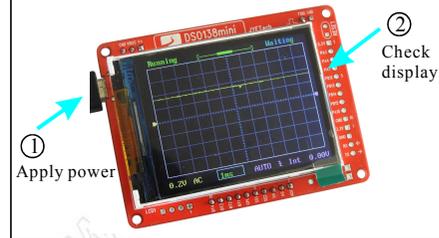
2. Pin-headers (female)
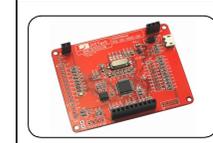
☐ J4	: 1 X 10 pin
☐ J8	: 1 X 2 pin
☐ J9	: 1 X 3 pin

Attention
Do not solder any parts to the board if you find problem. Otherwise warranty will be voided. Report to your vender or JYE Tech for any problem found.

Step 2   Assembly Analog Board (follow the order as numbered)

1. Resistors

Note:
Always meter resistor values before soldering because color bands are easy to mis-read.
Resistors are all 1/8W.

☐ R5	: 20KΩ			
☐ R1, R13	: 100KΩ	☐ R6, R14, R17	: 300Ω
☐ R2	: 1.8MΩ	☐ R7, R11	: 180Ω
☐ R3, R15	: 200KΩ	☐ R8, R12	: 120Ω
☐ R4	: 2MΩ	☐ R9, R10, R16	: 1.1KΩ

2. Diode

Cathode

☐ D1   : Zener, 2.0V

3. HF-Chokes

☐ L1,L2   : 100μH

4. LED

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

☐ D2   : LED, blue, dia. 3mm

5. Capacitor trimmers

☐ C4   : 5 - 30pF (green)
☐ C6   : 5 - 30pF (green)[H]
                2 - 6pF (blue)[J]

6. Ceramic Capacitors

☐ C1	: 0.1μF
☐ C2	: 220pF
☐ C3	: 3pF
☐ C5	: 1pF [ver. H only]
☐ C7	: 120pF [H]
	500pF [J]

7. Pin header

☐ J1, J6 : 2 Pin, 2.54mm, rightangled

Note:
Do not install J1 if BNC connector is to be used.

8. Electrolytic capacitors

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

☐ C10, C11, C12, C13, C14   : 100μF/16V

9. Slide switches

[H]   [J]

☐ SW1, SW2, SW3 : 2P3T   ☐ SW4 : DPDT

10. Pin-headers (male)

☐ J5	: 1 X 10 pin
☐ J2	: 1 X 3 pin
☐ J3	: 1 X 2 pin

11. Test signal ring

1) Make a small ring with a lead cut-off.
2) Solder the ring to the two holes of J4 (as shown in the photo).

12. Tact Switches
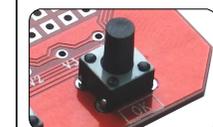
☐ BTN1, BTN2, BTN3, BTN4 : 6 X 6 X 9mm

13. Jumpers
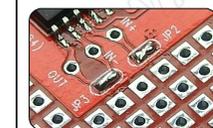
Short JP2 and JP3 with solder (see photo at left). Keep JP4, JP5, JP6 (on the bottom side) open. JP1 has been pre-shorted.

14. Hook Probes

Put wire through hood cap and sold the wire onto hook terminal as shown. Match wire color with hook color.

Finished look

[H]   **[J]**
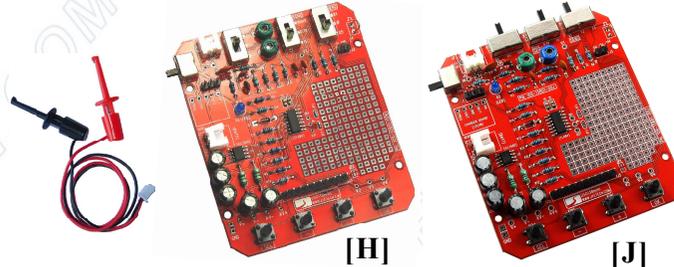
Step 3 **Test analog board**

1. Check voltages and controls

[Analog board ver. H shown]

Couple switch (set to GND)

VBUS

V1

Power input (USB)

Place negative pen at GND

V2   V3   V4

AV+

AV-

V-

V+
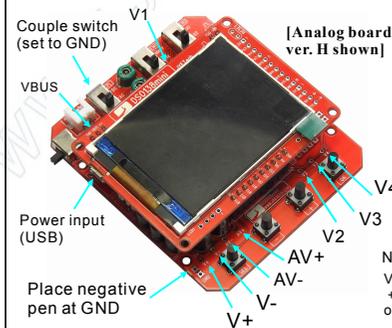
References
(*) Input dependent

VBUS	+5.10V
V+ (*)	> 3.5V
AV+ (*)	> 3.5V
V- (*)	< -3.5V
AV- (*)	< -3.5V
V1	0V
V2	1.05V
V3	2.1 V
V4	-1.05V

Note:
V2 - V4 could have up to +/- 0.2V variance depending on power supply voltage.

① Attach the main board to the analog board. Apply 5V DC power through J7.
② Set switch [CPL] to GND, [SEN1] to 1V, and [SEN2] to X5.
③ Check voltages at the points as shown in the photo.
④ Check slide switches and push-buttons for correct operation.
⑤ Calibrate C4 & C6 if everything is fine (see instructions to the right).

Display and Controls

[Analog board ver. H shown]

[SEN1]: Sensitivity Selection 1

[SEN2]: Sensitivity Selection 2

Reset (by shorting the two pads)

Trigger State

[CPL]: Couple Selection

Horizontal Position

Signal Input

Oscilloscope Mode

Power input

Vertical Position Indicator

Couple

Sensitivity (V/div)

Timebase (s/div)

[SEL]: Parameter Selection

[+] and [-]: Parameter Adjustment

[OK]: HOLD / RUN

Trigger Mode

Trigger Slope

Trigger Source

Trigger Level (internal only)

Trigger Level Indicator

Ext. Trigger In (PB15)

Attention
1. Power supply voltage must not exceed 8V.
2. Allowed maximum signal input voltage is 50Vpk (100Vpp).

Specifications

Max realtime sample rate	1MSa/s
Analog bandwidth	0 -- 200KHz
Sensitivity range	10mV/div - 5V/div
Max input voltage	50Vpk (1X probe)
Input impedance	1M ohm/20pF
Resolution	12 bits
Record length	1024 points
Timebase range	500s/Div -- 10us/Div
Trigger modes	Auto, Normal, and Single
Trigger position range	Center (fixed)
Trigger sources	Internal/External
Ext. trigger thresholds	Low: 1.1V, High: 2.2V
Ext. trigger input range	0V - 10V(max)
Power supply	3.5V - 5V DC
Current consumption	< 100mA
Dimension	85 x 75 x 15 (mm)
Weight	50 gram (without probe)

Calibrating C4 & C6

1. Insert hook probe to J1. Connect the red hook to the test signal terminal J4 and leave the black hook un-connected.
2. Set [SEN1] switch to 0.1V and [SEN2] switch to X5. Set [CPL] switch to AC or DC.
3. Adjust timebase to 0.2ms. You should see waveform similar to that shown in photos below. If traces are not stable adjust trigger level (the pink triangle on right screen border) so as you get a stable display.
4. Turn C4 (capacitor trimmer) with a small screw driver so that the waveform displays sharp rightangle (photo C).
5. Set [SEN1] switch to 1V and [SEN2] switch to X1while keep all other settings unchanged. Adjust C6 so that sharp rightangle waveform is displayed.

Leave black hook un-connected

Connect red hook to test signal output

C6   C4
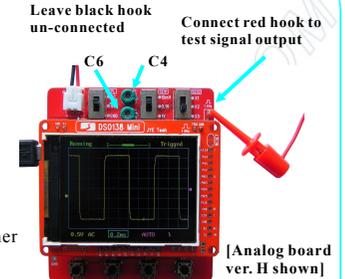
[Analog board ver. H shown]
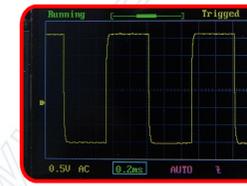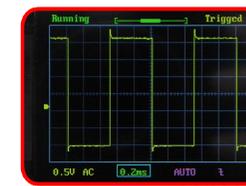
A – Not enough   **B – Too much**   **C – Good**
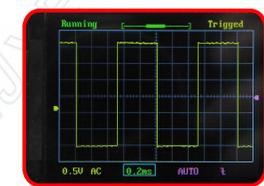
Operations

[SEL] button: Select parameter to be adjusted. The selected parameter will be highlighted.

[+] and [-] button: Adjust the parameter selected by [SEL] button.

[OK] button: Freeze waveform refresh (entering HOLD state). Press on it again will de-freeze.

[CPL] switch: Set couple to DC, AC, or GND. When GND is selected the scope input is disconnected from outside and connected to ground internally (0V input).

[SEN1]/[SEN2] : Adjust sensitivity. The product of [SEN1] and [SEN2] settings makes the actual sensitivity which is displayed at the screen lower-left corner.

More Operations

Functions	Operations
VPos Alignment	Move cursor to VPos indicator. Hold down [OK] for 3 seconds. Then follow screen prompts.
Measurements ON/OFF	Move cursor to timebase. Hold down [OK] button for 3 seconds to turn ON or OFF on-screen measurements including Vmax, Vmin, Vavr, Vpp, Vrms, Freq., Cycle, Pulse width, and Duty cycle.
Save Waveform	Press [SEL] & [+] buttons simultaneously. The currently displayed waveform will be saved to EEPROM. The existing data in EEPROM will be over-written.
Recall Waveform	Press [SEL] & [-] buttons simultaneously. Recalled waveform is always displayed in Hold state.
Default Restore	Hold down [+] and [-] buttons simultaneously for about 3 seconds.
Center HPos	Move cursor to the top bar. Hold down [OK] button for about 3 seconds. This will move the display window to the center of capture buffer.
Center Trigger Level	Move cursor to trigger level indicator. Hold down [OK] for 3 seconds. This will set the trigger level to the medium value of signal amplitude.
Send Waveform Data	Hold down [SEL] button for 3 seconds will send waveform data in texts via serial port J5. The baudrate is 115200. Data format is 8N1.
Toggle Test Signal Amplitude	Move cursor to trigger slope indicator. Hold down [OK] button for 3 seconds to toggle test signal amplitude between 3.3V and about 0.14V. The amplitude is indicated by ⎍ to screen top.
Calibrate Analog Gain	Move cursor to trigger source indicator. Hold down [OK] button for 3 seconds to enter analog gain calibration mode. Follow the on-screen instructions.