## DSO138mini - Add a Volt-meter

Applicable firmware: 113-13810-116 or later

Starting from firmware version 113-13810-116, an independent DC volt-meter feature was added to DSO138mini. This volt-meter can measure a positive DC voltage and display the readout at the top-right corner of the screen. It can be used for monitoring battery or other purposes. To use this feature some modifications to the oscilloscope are required. This design note explains how to make these modifications. An example of modification was also provided.

## **Modifications**

To implement the volt-meter make the following changes:

- 1) Remove the resistor R50 on the mainboard (Fig. 1).
- 2) Add a voltage divider as shown in Fig. 2. The experiment area on the analog board is a good place to accommodate the voltage divider.
- 3) Connect the point B in the schematic to the PA7 pin on the mainboard. Connect the point A to the point where voltage is to be measured. Connect the ground in Fig. 2 to the digital ground of the oscilloscope.

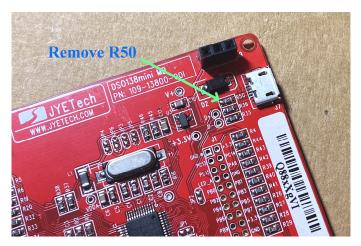


Fig. 1

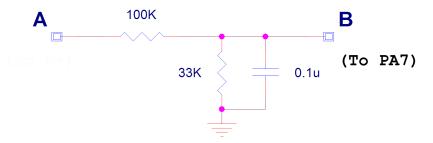


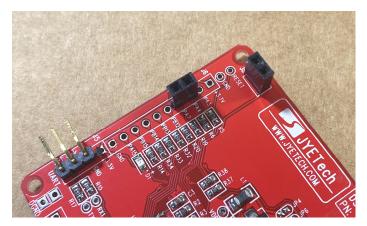
Fig. 2

## **Notes:**

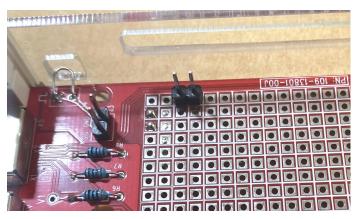
- 1) The measurement range of the volt-meter is 0 +13V. When voltage is higher than 13V the display will turn red.
- 2) If your DSO138mini is powered by a battery through 118 breakout board and the volt-meter is used for monitoring the battery voltage the input of the divider (point A in Fig. 2) should be connected to V+ on the analog board instead of connecting it directly to the battery terminal. This is to avoid the divider to drain the battery when the oscilloscope is not in use. The voltage of V+ is slightly smaller (about 0.1V) than the true battery voltage due to the voltage drop of the 118 board. A good solution to avoid battery drainage and the voltage drop is to use the spare part of SW4 to control the connection of the volt-meter. Such a connection is left for users to figure out.

## An Example

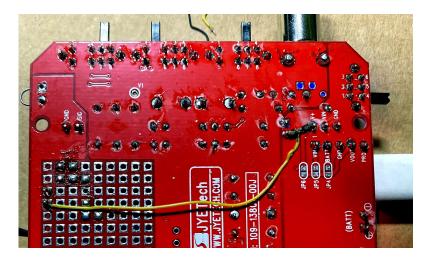
The following photos show an example that uses the voltage to monitor the voltage at V+.



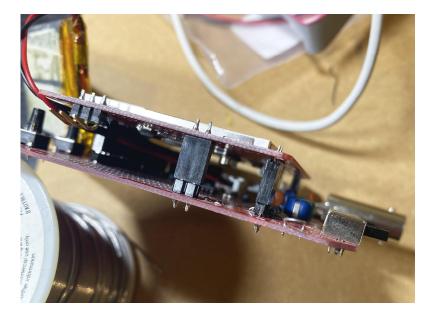
Solder a socket to PA7 on the mainboard.



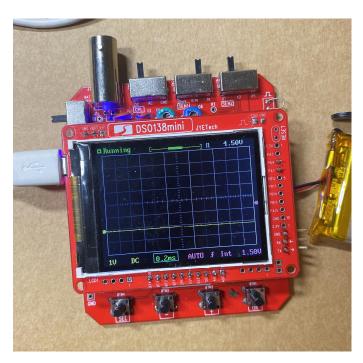
Solder a pinheader to the location of analog board that matches the socket on the mainboard.



The voltage divider was soldered directly to the pad V+ and a neighboring ground pin using SMD devices. The yellow wire connected the output of the divider to the pinheader.



Attach the main board to the analog board.



Show the voltage at V+ when USB the oscilloscope was powered by USB.



Show the voltage at V+ when the oscilloscope was powered by battery.