Frequent viewers know, that I use a Siglent oscilloscope for normal work on my bench. Sometimes, I have to do work outside the Lab, or I am in a hotel room and want to tinker a little during the lonely evenings. This is, why I bought a DS203 Mini oscilloscope. Today, I will show you, how it works in typical situations and also test, if its results are usable.

The first impression is very good. A very nice aluminum case with a very nice finishing. It is very small and fits in every baggage. It has a color display, which increase its usability a lot, as we will see later.

Officially, it has 2 analog plus two digital channels, but it only comes with two 10x probes. So, I will only test these two channels. The probes are ok, however, you cannot trim them. I read somewhere, this can be done inside the oscilloscope, but I did not want to open it. Because everything is so small, the probes have IPX connectors. So, you cannot mix them with conventional probes which usually have BNC connectors.

Let’s now start with DC. I switch all not needed channels off by using the small knobs and switches at the top of the case. You have to try yourself a little, how it works. Generally, one switch moves the upper menu level, and the other the detail level. You can switch between the horizontal and the vertical menu by pressing the “triangle” button.

Colors matter a lot for the operation of the oscilloscope. They always correlate with the respective channel. If something is displayed in blue, it relates always to channel 1, if it is yellow, it correlates with channel 2.

So, let’s check the accuracy of the measurement. I use my very precise voltage reference, which outputs 2.5, 5, 7.5, and 10 Volt. It is calibrated to 5 digits after the comma, so we can trust it for this purpose. I directly connect this reference to channel 1 and show you the measured values by pressing the “circle” button. As usual, you have not only one value displayed, because an oscilloscope shows voltage over time. So, I chose the values like peak to peak, RMS, low, high, and also DC voltage. Because our voltage does not change, all values should be the same, and the peak-to peak nearly zero.

Let’s check. I start with 2.5 volt and I select 1 volt for the vertical range. The display is not exactly at 2.5 volt. But this we have to expect. An oscilloscope is not a multimeter. We see also a small noise on the timeline, which in reality does not exist. Now let’s compare the different values: The first thing which is wrong is the peak-to-peak voltage. It clearly should be very small for a DC voltage. If we go to min voltage, we see the cause: The DS203 measures somewhere zero volt, which definitively is not true for a DC voltage. RMS, Max, and DC are comparable, which is ok.

Now, I start to adjust the volts per division. Look, what happens: The displayed curve displays ok, but the calculated voltages change completely. So, pay attention, if you use this function and ask always the very important question: “Can it be”?

Let’s quickly compare it with the much more expensive Siglent. Here, the measured values are also not exact, but peak-to-peak voltage is small, as expected, and if I change the voltage per division, the measured values stay the same. Also as expected.

BTW: The same applies to all voltage levels, not only to the 2.5 volts.

But we did not buy our oscilloscope to replace our multimeter. So, let’s go on: We want to measure changing signals. As an example, I use the signal generated by an ESP8266. I used a very nice library to play music in my subscriber counter. It was ported by maxint R&D to the ESP platform and you find a link to the library in my comments. This library reads widely available MML files and plays the music on one of the pins of the ESP. I use one of the example sketches to produce some tones and want to check it with my oscilloscope.

First, we listen to the tones with a loudspeaker and in parallel, we watch the voltage across the loudspeaker. We see, that the frequency of the tones change, and that we have pauses between the tones. We also see, that we do not have a real square wave signal. When the sketch waits for the next input, we hear a very short “chirp” and we see something on the screen. But, what is it?

This is a good signal to test the storage function of our oscilloscope. First, we set the trigger level. Now, we see this very short signal, but we cannot analyze it. If we change to “single”, we activate the storage function. Now, we see the short signal and can do some analyzes. With my Siglent, I even could now zoom-in, but unfortunately, I did not find this function on the DS203. Maybe a viewer knows, how to do it. So, we just reduce the time base and wait for the next “chirp”. Now, we start to see its details and even can adjust the markers to its begin and end to measure, to measure, that the whole signal takes about 13 mS and, by zooming, we can measure the cycle time and calculate the frequency.

There are a few additional trigger patterns available, if you need them.

Now, let’s compare and connect the same signal to the Siglent. It looks similar, maybe it is a little steeper because the Siglent can track much higher frequencies. But for sure you can see, that to connect a loudspeaker directly to a pin might not be a good idea, because the big voltage peaks could easily destroy delicate electronics devices.

Now, I try to look at a signal with a higher speed. I feed channel one with a square wave from my SDG1050 wave form generator and I start with 1 MHz. This is not a very high frequency, because even the Arduinos are clocked with 16 MHz. The 1 MHz signal is clearly a square wave. This changes if we increase the frequency, and around 4 MHz, it looks more like a sine than a square. This is, because also square waves consist of sine waves, but they also contain waves on higher frequencies. If your device cannot process these high frequency parts, they are filtered and the remaining signal is just a sine wave.

If we look at the specifications of the DS203, it says: 72 MHz. But in reality, its suitability for digital signals stops at 3 MHz latest. So, if you look at the cheaper DS202, this has only 10 MHz sample rate. So, the usable maximum frequency for digital signals is also 7 times lower, which is only a few 100 kHz. And this can limit its use considerably.

Now let’s look at the wave form generator, which is also built in. Let’s generate a square wave signal of 1 MHz and look at it on the Siglent. It has a swing of about 2.5 volts and looks ok. If we go up to the maximum of 8 MHz, again, it looks more like a sine than a square wave.

If we want to generate a sine wave, we see, that the maximum frequency is only 20 kHz. If we look at the output, we immediately see, why. The sine wave is generated by a digital-to-analog converter, or DAC, and this one is neither fast nor accurate. So, at the end, it produces this ugly signal. We can count 16 discrete steps, which means, that the DAC has 4 bits. To show you the difference, I compare it with the output of my waveform generator. You see the difference with your eyes, and if we look at the frequencies contained in the two signals, we see, that the pure sine wave produced by the Siglent only has one frequency component (or at least, nearly). The wave generated by the DS203 contains a lot of other frequencies, which is not ideal. See also, that the main component is much smaller, even if the two curves have more or less the same amplitude.

If we continue with the features of the DS203: It has the capability to store files on a disk, which can be read by a computer, if the USB cable is connected: You can store the display as a bmp file or the measured values as a text file, which afterwards can be read by Excel. In contrast: To get a bmp with the Siglent, you need an additional software, and I never heard of a functionality to save the measured values as a text file.

So, summarized, I like the shape and the make of the DS203. It is a really good looking small device and fits also in the smallest package. Its build quality is excellent. The operation is, because it only has a few buttons and switches, more complicated than with the big Siglent with many knobs. So, this is definitively not, what I would buy for the bench. But for the journey, the DS203 is the winner, also because it has a small waveform generator, which can be handy sometimes if you quickly need a square signal to try something.

And it has a huge advantage: If not connected to the USB, it has absolutely no ground reference and it can be used like a multimeter also on the “high side” without creating any ground loop. If you are interested in this topic, watch my videos about measuring currents.

The readability of the display is good, at least inside my lab. Because I live in Switzerland, I am currently not able to test it in the sun, if you know, what I mean… The usage of colors definitively enhances its usability.

The triggering and storage functions are ok for general purpose at frequencies used by the I/O of our devices. So, you can check, if a signal is there, if the levels are ok, and if it looks about how you would expect it. You even can check timings.

As we have seen, the readouts and calculations of voltages are sometimes completely wrong. So, you always have to use your brains to validate, and also change the volts per division to get a more probable result.

The maximum frequencies are ok for this model. I think, you should not buy a cheaper oscilloscope, or you might find its limitations where you do not expect them.

All in all, this is a typical second oscilloscope which you take with you. It is suitable for Arduino or ESP projects. If you go lower with the specifications, the chance of being disappointed once in a while will increase.

I hope, this video was useful or at least interesting for you. Bye

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<https://github.com/maxint-rd/ESP-MusicEngine>

<https://archeagemmllibrary.com/>