

# Construction description UniSAI

## Printed circuit board

The layout has very thin tracks and the photographic method is the only way to make the printed circuit.

To edit the layout I use Adobe Photoshop Elements and print it on an overhead sheet with an old laser printer.

For this I follow the next steps.

- Create a new document, size A4 - resolution 600 pixels / inch - RGB color mode.
- Open the bpm file with the layout.
- Select All
- Copy the selected with ctrl-C into the temporary buffer
- Paste the selected from the temporary buffer with ctrl-V 2 times in the new A4 document.
- Move the layouts for a suitable place in the document.

I put the layout 2 times in the document, cut them out after printing and glue them together with tape. If you have centered them well then the layout is good black and any misprinting than usually gone.

When printing, pay attention to changes in size, the printed circuit has to be 73 x 53 mm for version 2 and 73 x 73 mm for for version 4

With this “film” the printed circuit can be developed.

After etching, it is recommended to protect the traces. I silver-plate the traces but solder-flux is also a possibility.

## Installation of the components

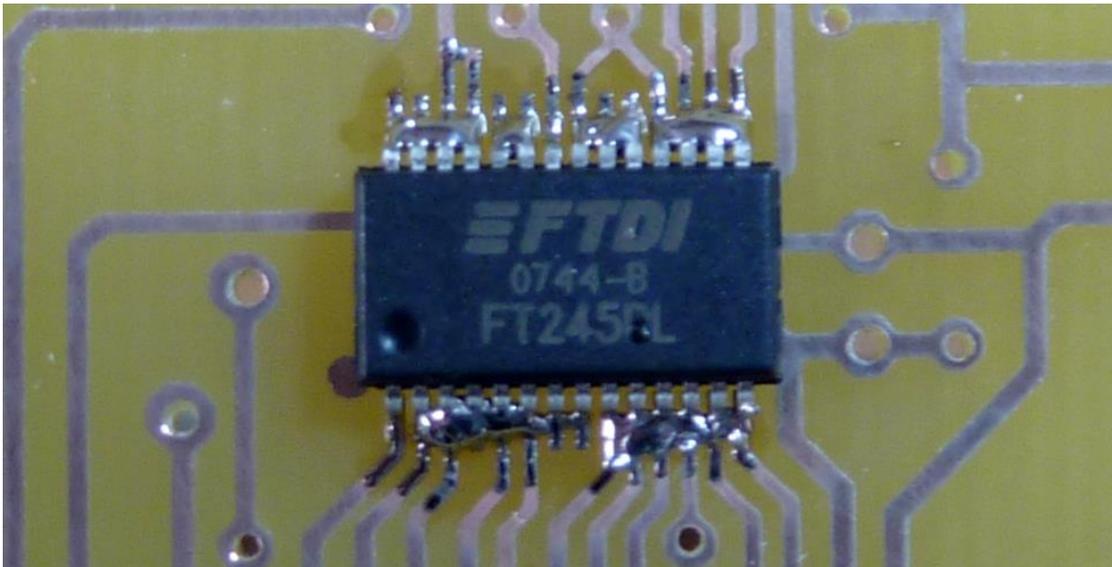
The first component I solder on the board is the FT245RL.

It is very small and that’s why I use a soldering iron with a fine point and a magnifying glass to see properly.

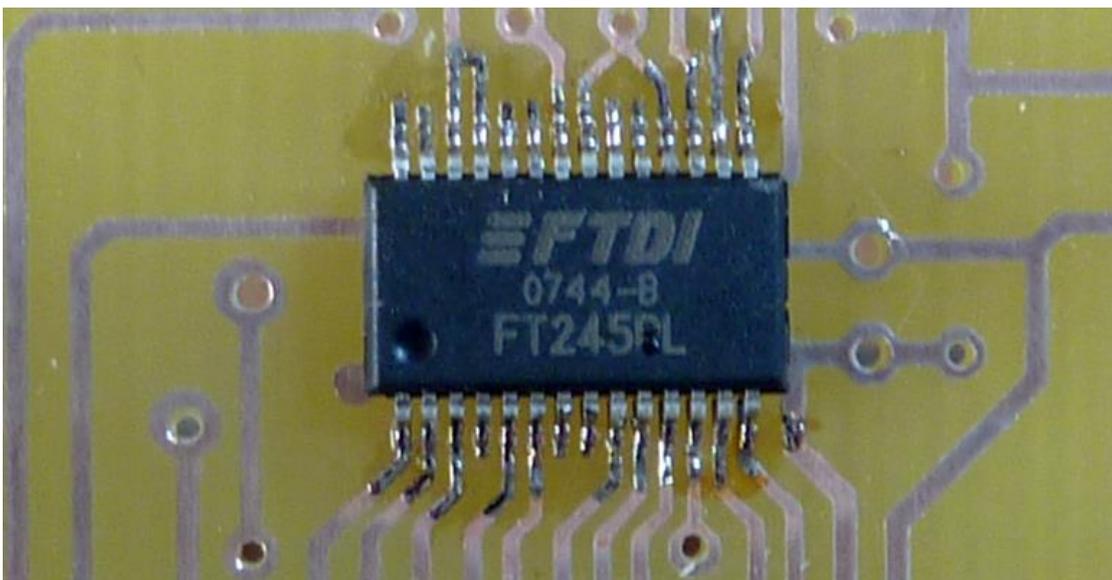
Put the ic properly in place and solder first diagonal 2 pens



Solder then the rest of the pins.



A number of pins have been melted together.  
This is solved by removing the excess solder with solder wick.  
Check with a magnifying glass that all pins are properly soldered.



Ultimately this is the result.

Placing the rest of the parts will not have many problems.

## **Circuit test**

During the first checks the processor is not placed in its holder.

For this circuit it is highly recommended to check all connections.

First I check connection for connection measuring with a digital ohmmeter and mark them on the schematic to indicate that I have had one.

And then I check all pins from the FT245RL for a shortcircuit to one of the other pins.

Time consuming job but you can get strange errors when there is a lose connection or a short circuit.

Then carefully put voltage on the circuit.

The best way to do this is by an adjustable power supply from which the current limit is set as low as possible. If you do not have a current limit you can put a 330 ohm resistor in the positive lead.

Slowly increase the voltage and measure the voltage after the 5V regulator, it should rise to about 5V and of course remain. Then measuring the voltage after the 12V regulator and increase the voltage from the power supply until this voltage remain at 12V

The circuit is drawing now about 22 mA.

Before we can proceed, the processor must be programmed.

The processor is now still empty and must be programmed with an appropriate programmer with the file Bootloader 1.0.0+UniSAI 2.0.0.HEX.

This file can be found on the PC in the folder C:\Program Files\UniSAI\Program.

Thereafter, the programmed processor can be be placed and the power again connected. If all goes well, the LED flashes for 2 seconds and then weak continuous light. (in some cases the USB must be connected to the pc to let this happen)

The circuit is drawing now about 30 mA.

Get the pc now for further testing of the interface.

## **Test USB**

Connect the USB connector to the pc/laptop. If you have a properly functioning interface Windows will indicate that new hardware is found and the driver will be installed.

In most cases, the detection of the interface goes well, if it is not one of the following procedures can be followed.

Connect the interface to the pc.

Close the "Found New Hardware Wizard".

Open the location with the installation and double click UniSAI.msi

If the installer program has started, then press 3 times on < Next> and then press on <Install>

The installer will detect the interface and the driver will be installed.

If it still does not work connect the interface again and then, when the window opens up and asks for the driver, choose for local search for driver and browse to C:\Windows\PnPdrvrs\UniSAI. Here are the driver files and can then be installed.

If the driver is installed, the USB interface can be tested and programmed as described in the document "Testing USB communication.pdf"

## Test the complete interface

Start the pc program.

Warning: do not select the menu option Interface\Program until the interface is fully tested and is working properly.  
the interface may, if it is not working properly, go running the bootloader and refuse to leave it, re-programming the processor is the only cure.

The conditions for these tests are - the USB interface is programmed.  
the serial number is set default in the program by the button <Set Default> found at USB\Program.

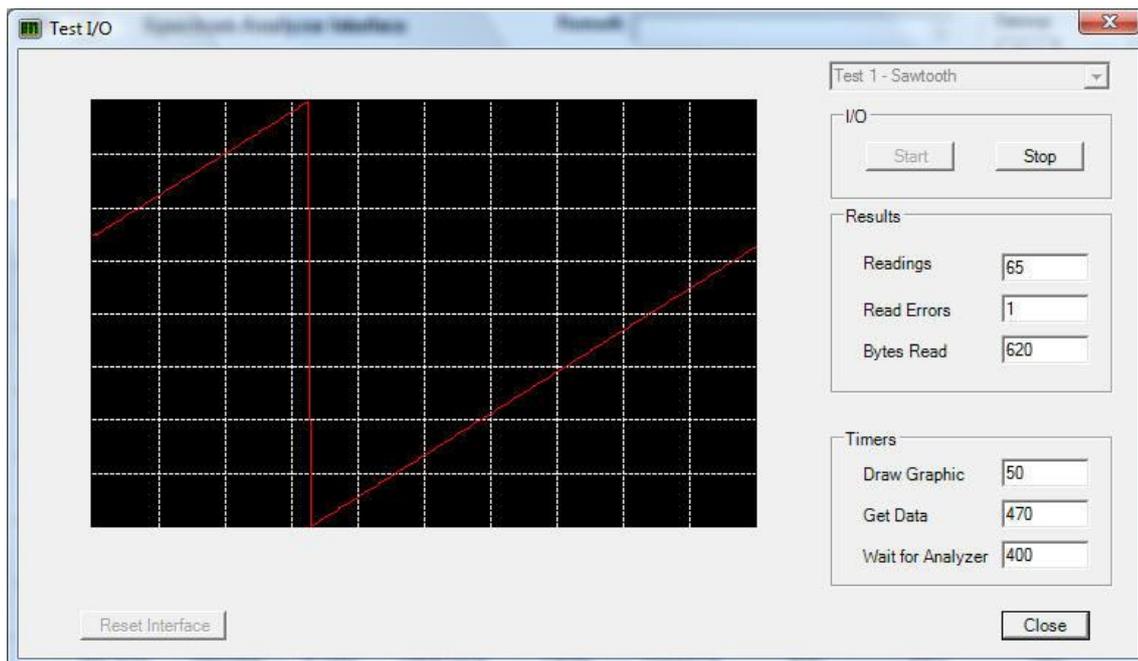
### Test Reset

Select the menu option Interface\Reset, the led had to be, just like what is happening by connecting the power, flickering for 2 seconds and then weak continuous light.

### Test 1

Select the menu option Interface\Test I/O this will show the window below.

If you press <Start>, “Test 1 – Sawtooth” will start running.



It is tested whether the processor is correctly communicating with the USB interface.

There are 10 packets with a total of 620 bytes sent with the data runs from 0 to 255.  
The graph should be obviously a continuous line and each period of Get Data (in this case 470 ms) move a bit to the right.

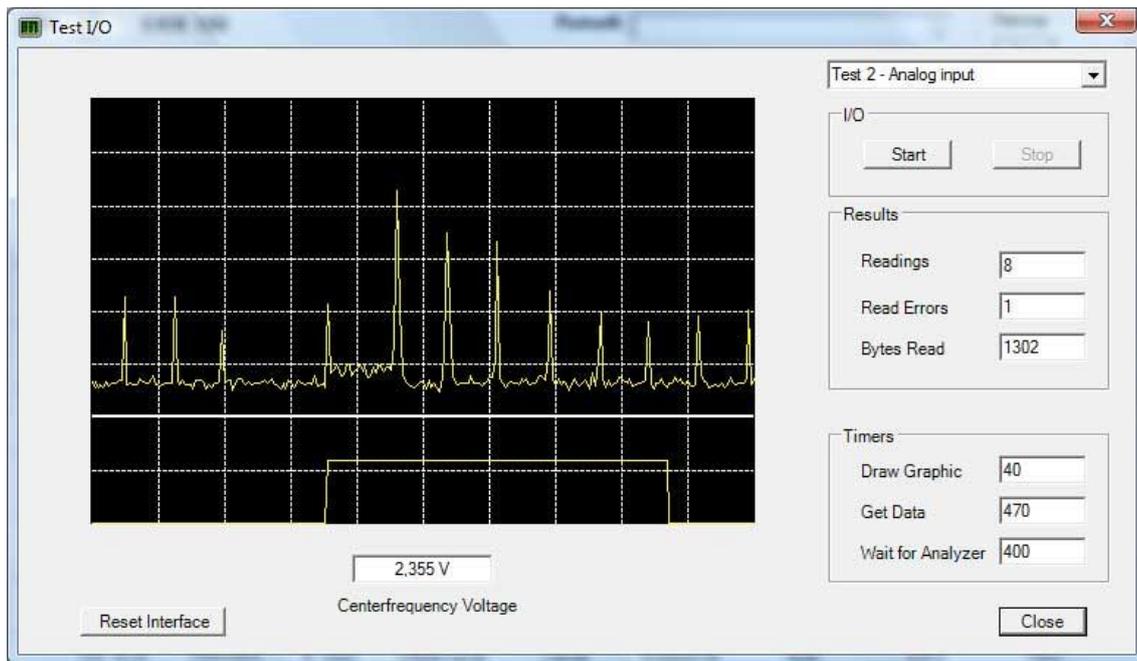
The moving can be stopped by closing the contact Triggermode.

In these times of Get Data changes the color of the chart each time between yellow and red indicating that the two screen buffers are receiving data.

Read Errors to 1 is normal, the test start always with 1 false reading.

## Test 2

Select from the dropdown list “Test 2 – Analog input” and press <Start>



It is tested whether the inputs are properly measured.

With this test there must be signals at the Log and Sweep start inputs.

Warning: the input signals must both be positive!

In version 4 of the interface, the polarity of the signal can be reversed with the jumpers 13 to 16 for the Log input and 17 to 20 for the Centerfrequency Voltage.

13-14 en 15-16 normal polarity  
13-16 en 15-14 reversed polarity

17-18 en 19-20 normale polarity  
17-20 en 19-18 reversed polarity

In this test the Log input and Sweep start signals are measured.

There are 20 packets and 1 packet with settings, a total of 1302 bytes, sent.

There is no synchronization, and the image will move.

You can try with the value of the timer GetData to get the image a bit stable. This can be done by changing the value and press <Stop> and then <Start>

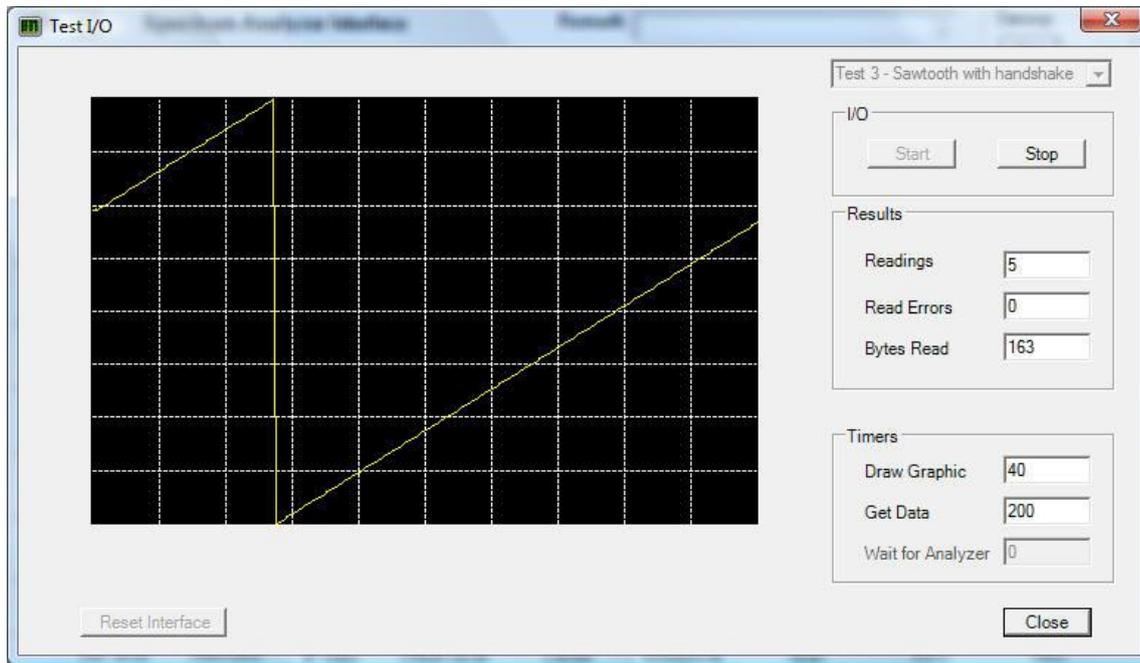
Read Errors to 1 is normal, the test start always with 1 false reading.

The image as shown here is a 100 MHz homebrew spectrum analyzer when the X and Y output are connected to the interface.

**Centerfrequency Voltage** will show up if is chosen for the type Y&Center or Y&Center2Range  
The voltage for the centerfrequency, which can be connected in case of this type, can be monitored here.

### Test 3

Select from the dropdown list “Test 3 – Sawtooth with handshake” and press <Start>



This test is similar to test 1.

Communication with the PC, however, is different.

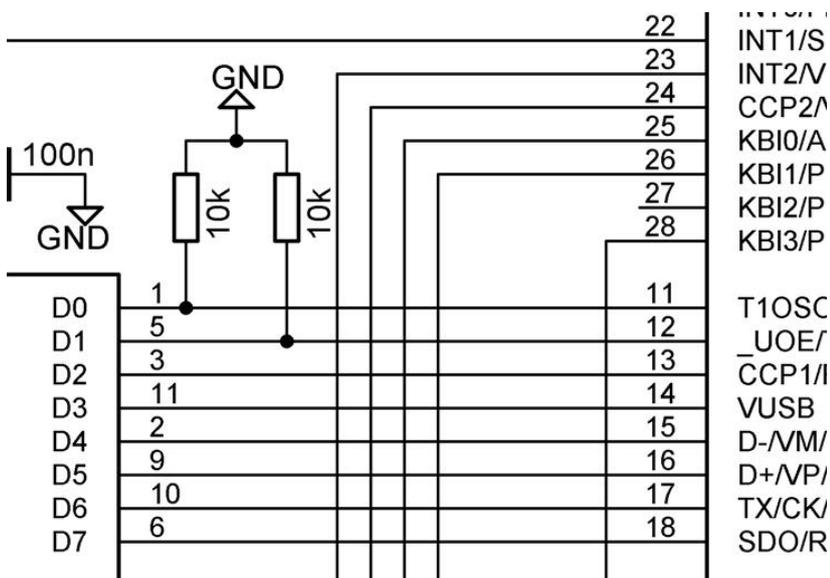
Each packet the interface sends to the pc is confirmed.

This is somewhat slow and has the purpose in case of problems to measure signals with a scope.

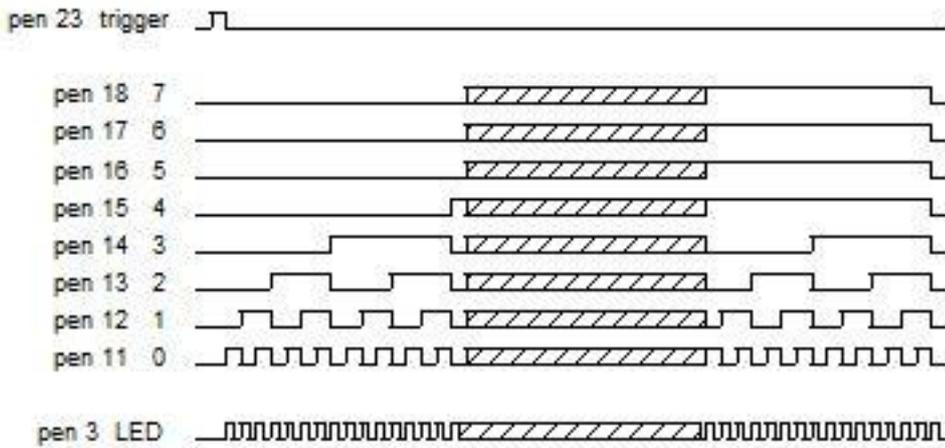
### Hardware test

If the above test does not work a hardware test can be started.

For this test to start it's needed to connect 2 resistors from 10k from pin 11 en 12 of IC5 to the ground.



If power is applied to the circuit this test will start running and generates the pattern below.



The test begins with pulse on pin 23 of IC5, this pulse can be used to trigger a scope. And then the test puts a binary number on port C (pin 11 to 18) of IC5. This number starts at 1 and increments each step with 1. During each step the led is blinking once. This continues to 255 and at that time, all pins are 1. The next step is 0 and then starts the cycle again. With a scope you can see whether the data bus behaves well. During this test there is no communication with the pc.

I hope this will help to make the interface work properly.

73, Nico PA3ESH