

# Stereo Audio Signal Generator

Documentation

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February 9, 2021



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## 1 Highlevel description

### 1.1 Block diagram

The block diagram (equal to the schematics) of the **Stereo Audio Signal Generator** is shown in figure 1: The device consists of a NodeMCU module (V0.9) feeding a DAC

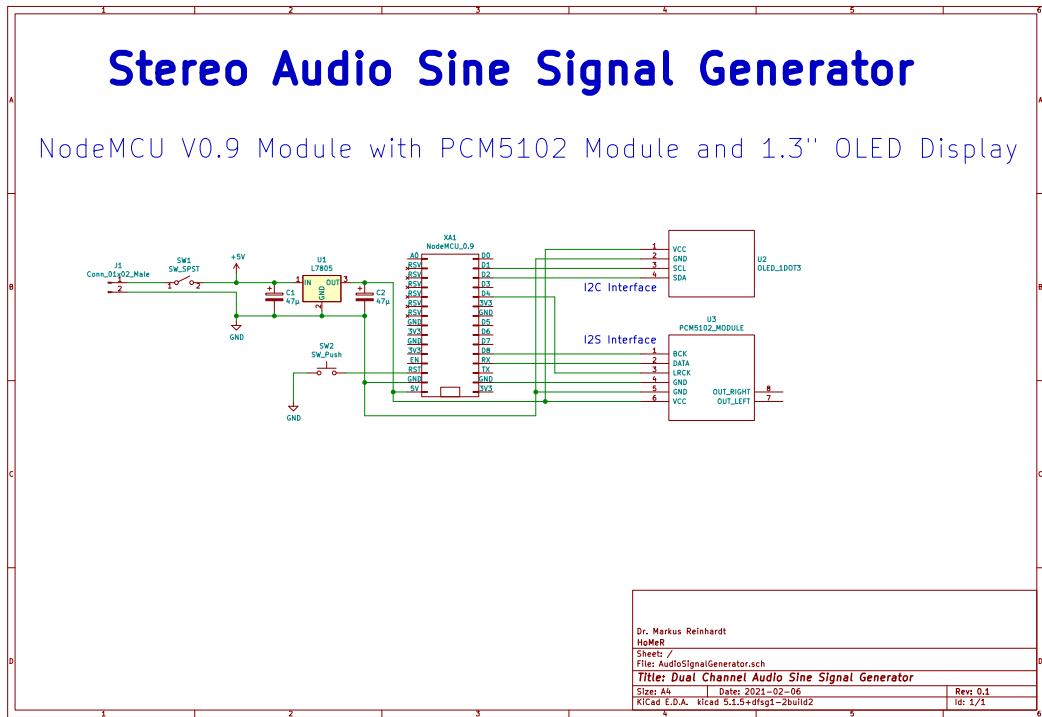


Figure 1: Stereo Audio Signal Generator top level block diagram

module with a DAC of type PCM5102 via the I2S interface, a 1.3" OLED display fed from the controller via the I2C interface and a power supply with an external SMPS module connected to the 5V voltage regulator of type LM7805.

## 1.2 Generated signals

The generated signals of the **Stereo Audio Signal Generator** displayed on an oscilloscope are shown in figure 2:

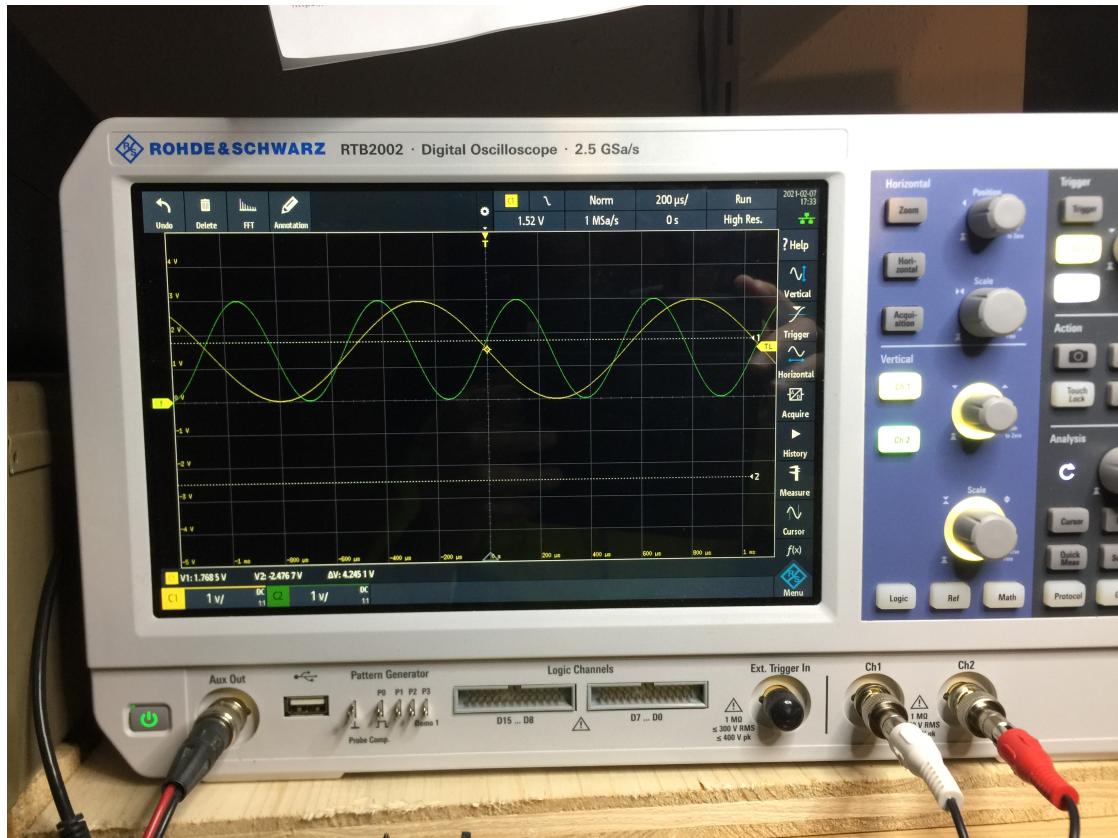


Figure 2: Stereo Audio Signal Generator: Generated signals on the oscilloscope

## 2 Hardware description

### 2.1 Casing

The Stereo Audio Signal Generator is housed in a standard black plastic case, see the following picture:



Figure 3: Audio Signal Generator top level block diagram

## 2.2 Mechanical assembly

The mechanical assembly inside the case is shown in figure 5 The display is mounted on

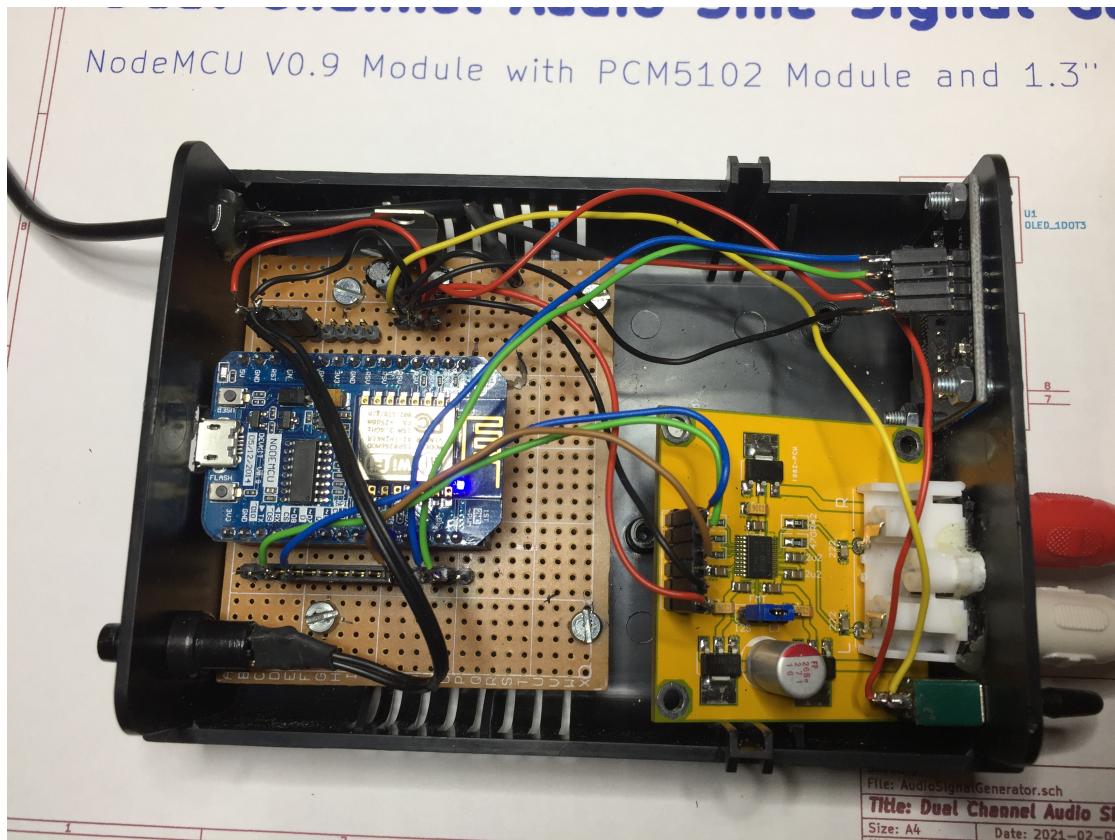


Figure 4: Audio Signal Generator: internal mechanical assembly

the front panel (right side in the figure). The cinch sockets of the DAC module are also going through the front panel. The on/off switch is mounted on the front panel on the left side viewed from the front. The NodeMCU module is mounted on a bread board which also carries the power supply part. The reset button is mounted on the back panel. The power supply cable is entering the case through the back panel. The NodeMCU is mounted inside the case such that its USB connector can be easily connected via a USB socket and cable from the back plate. This is visible in the following back view picture of the case, showing also the reset button and the power supply cable:



Figure 5: Audio Signal Generator: back view

### 3 Schematics

The top level schematic of the Stereo Audio Signal Generator is shown in figure 6. The

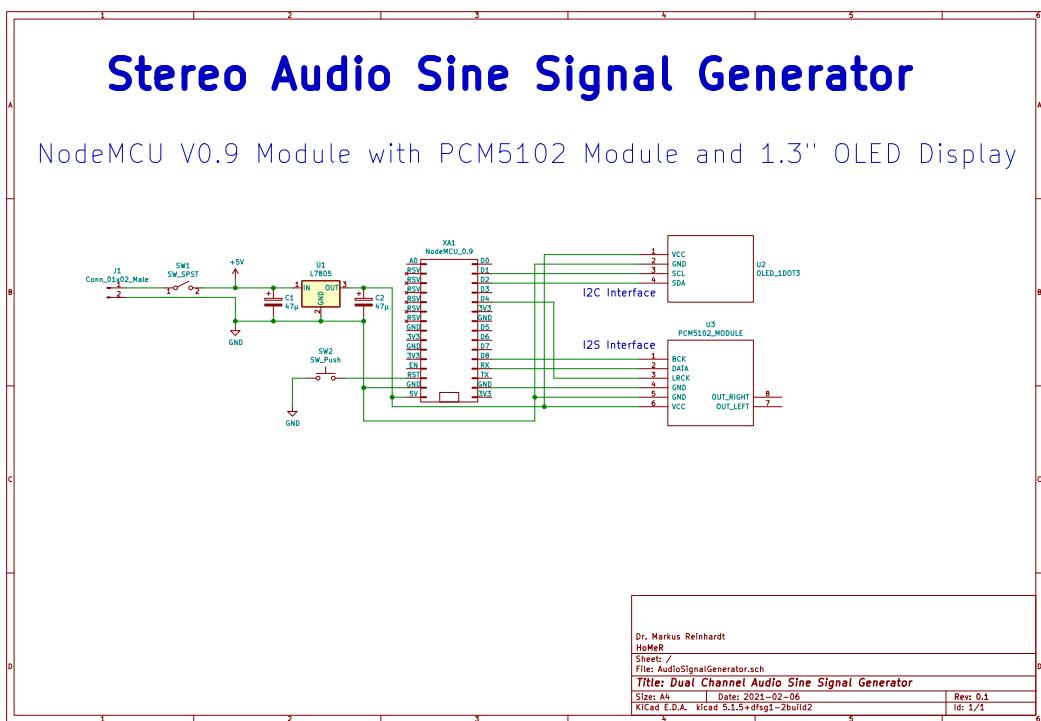


Figure 6: Audio Signal Generator top level schematics

main controller is a NodeMCU module (V0.9) that runs the software to create I<sub>2</sub>S signals for the DAC module and the soft ware to feed the display via the I<sub>2</sub>C interface. The DAC module is pre-built and available off-the-shelf. The power supply regulator is of type LM7805. Two capacitors at the input and output care for a low noise power supply voltage of 5V. The controller can be reset with a reset push-button, connecting the RST pin of the NodeMCU module to ground.

## 4 Software description

The software is realized via the Arduino IDE and Arduino environment. The sketch is named AudioSignalGeneratorESP8266PCM5102.ino.

### 4.1 Existing functionality

The software consists mainly of two parts. The first part realizes the generation of I2S signals for stereo signals, the second part realizes the control of the display. Stereo signal generation is implemented with separate C++ classes for the signal generation itself (files ESP8266DDSGenerator.h / ESP8266DDSGenerator.cpp) and for the I2S interface handling (files IS2Handler.h / IS2Handler.cpp). The display handling is based on the U8G2 library and the routine displaySetup() called from the setup() routine of the main Arduino sketch. In the current version the software creates the signals with a sample rate of 48kHz and each sample for the left and right channel is 16bit wide.

### 4.2 Planned software extensions

A webserver shall be implemented with the NodeMCU module such that the signal generation can be parameterized via WLAN and a browser.