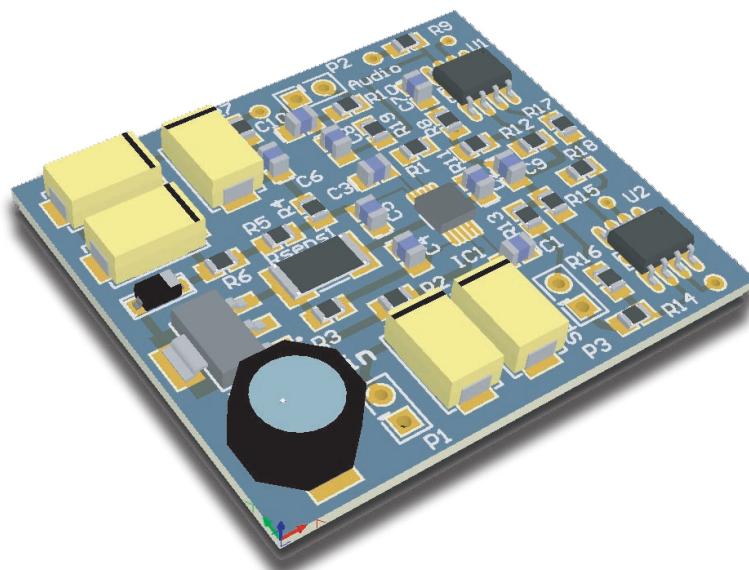


Piezo-Ceramic Audio Amplifiers

sonitron® PAA-StepUpBTL-01

Appnote PAA-StepUpBTL-01 Amplifier



March 2010

Sonitron n.v.
R&D department

Appnote PAA-StepUpBTL-01 Amplifier

To go loud is to amplify the input signal to a large Voltage peak to peak swing of maximum 60Vpp. Tuned on the SPS piezo speakers the "StepUpBTL" piezo audio amplifier is designed for a very loud audio sound in a room.

The creation of a 60Vpp swing derives from a stable DC power source of 30 V DC.

The boostconverter circuit is designed to a minimum surface with a maximum varity at the input source. A variation of the input voltage between 5V and 25V gives at the end a stable 30VDC to power the opamps with efficient power consumption.

The amplifier circuit is a perfect balance between power consumption and space design. The Bridge Tied Load amplifier topology makes it possible to swing the signal to 60Vpp.

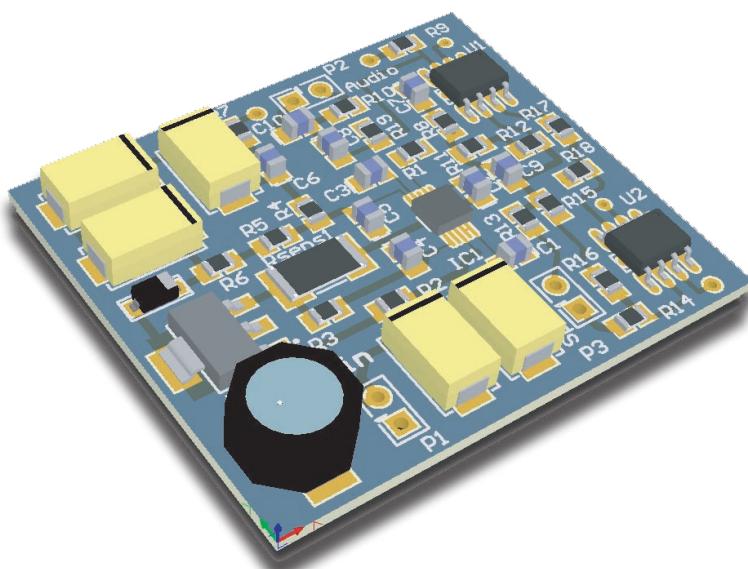
Specifications:

- Input voltage 5V to 25V
- Fixed amplification ratio +/- 90
- Output Audio Signal: Max 60 Vpp
- Dimensions: 35mm on 40mm

- **Ideal:** **+input:** 9Vdc
+output: 40Vpp

Boost converter + Amplifier

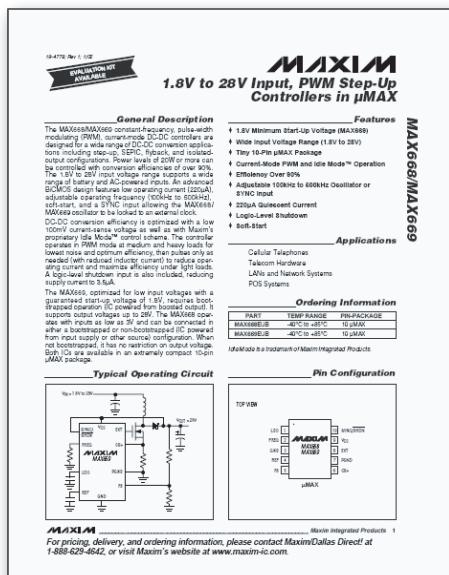
- DC-DC- converter: Max 669
=> output: 30 Vdc
- Amplifier circuit: OPA 551
=>"Bridge tied load configuration"



Specifications:

This Piezo-amplifier consists out of two electronic circuits.

The Step Up Converter The Bridge Tied Load



The heart of the Step Up Converter is the Max688 from MAXIM. The IC is configured in the high-voltage non-bootstrapped mode and is used as a non-isolated power supply.

The input voltage can vary from 5V DC to 25V DC.
The output is set to 30 VDC and can deliver +/- 500mA.

Datasheet:

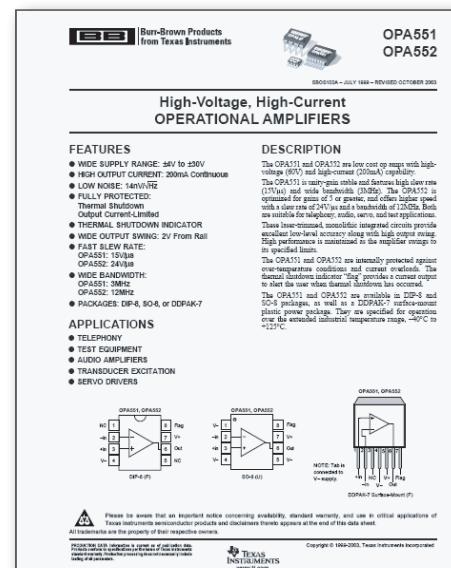
<http://datasheets.maxim-ic.com/en/ds/MAX668-MAX669.pdf>

The Bridge Tied Load circuit is powered by 30V. The IC OPA551 Burr- Brown product from Texas Instruments is used for the high voltage amplification.

A Bridge Tied Load circuit is a technique to create a larger output voltage swing than that is possible with one amplifier. A second amplifier inverts the signal and the load (SPS-speaker) is connected between the two outputs (**BTL** = Bridge-Tied-Load)

Note that, each amplifier sees the half of the load impedance and hereby double the current, thereby doubling the dissipation within the amplifier.

Datasheet: <http://focus.ti.com/lit/ds/symlink/opa551.pdf>



The first amplifier is set as a non-inverting amplifier with amplification ratio A and the second amplifier is a unity inverting amplifier -A

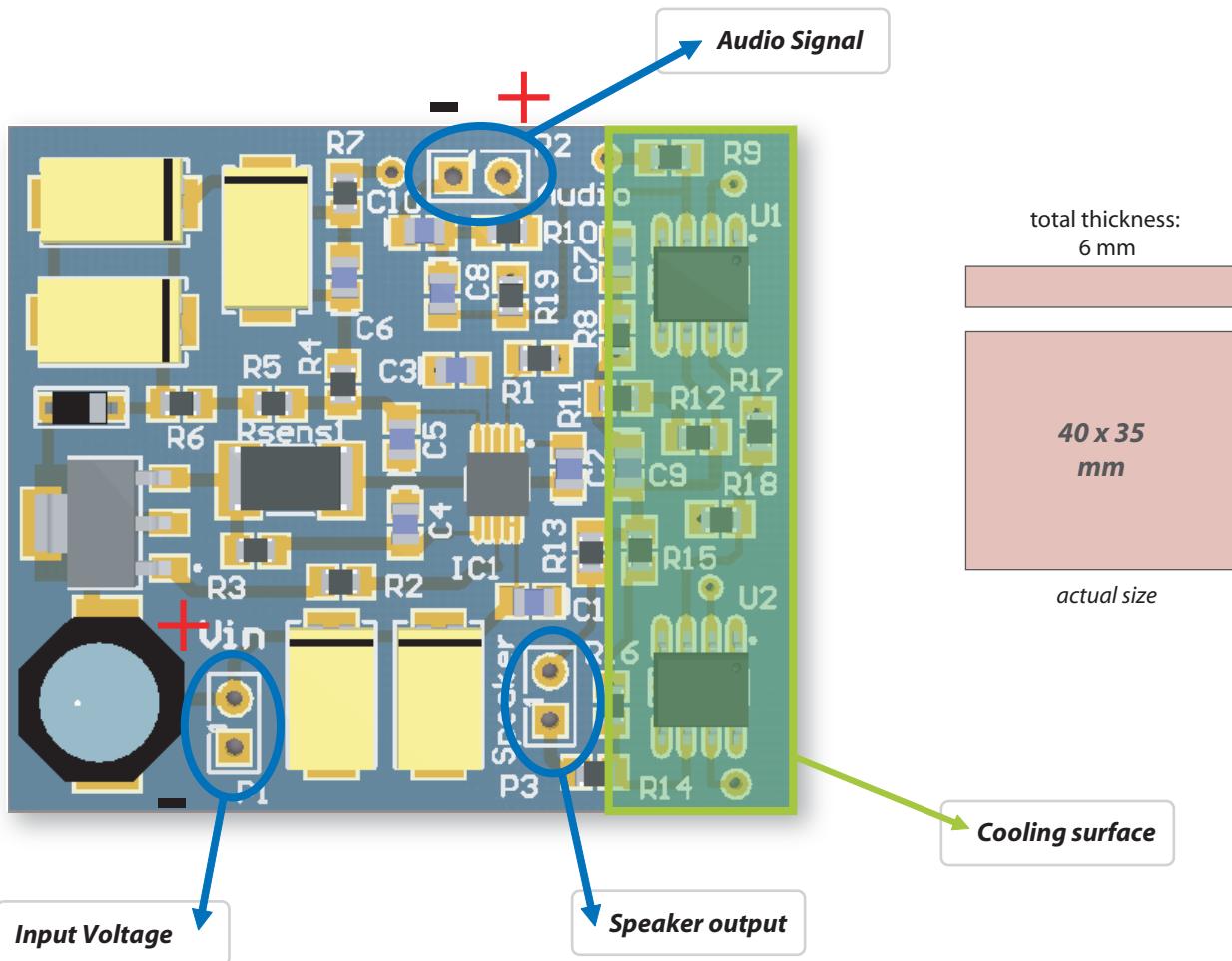
Total amplification of input signal that the load will see is:

$$A_{tot} = \overbrace{1 + \frac{R_F}{R_{in}}}^A - (-A)$$

Values in the design: $R_f = 2M$ and $R_{in} = 43K \Rightarrow A = 46,51$

Total amplification ratio is set by +/-90°

Dimensions



Controlling Power dissipation

The end amplifier IC's can become hot if the Piezo Audio Amplifier is used for a long time at 60Vpp or in saturation mode. A proper cooling has to be foreseen in such cases.

A Small band of the "Gap Pad VO Soft" 1.5 mm thickness from The Bergquist Company can be used to cool down the Integrated Circuits.

http://www.bergquistcompany.com/thermal_materials/gap_pad/gap-pad-VOSoft.htm

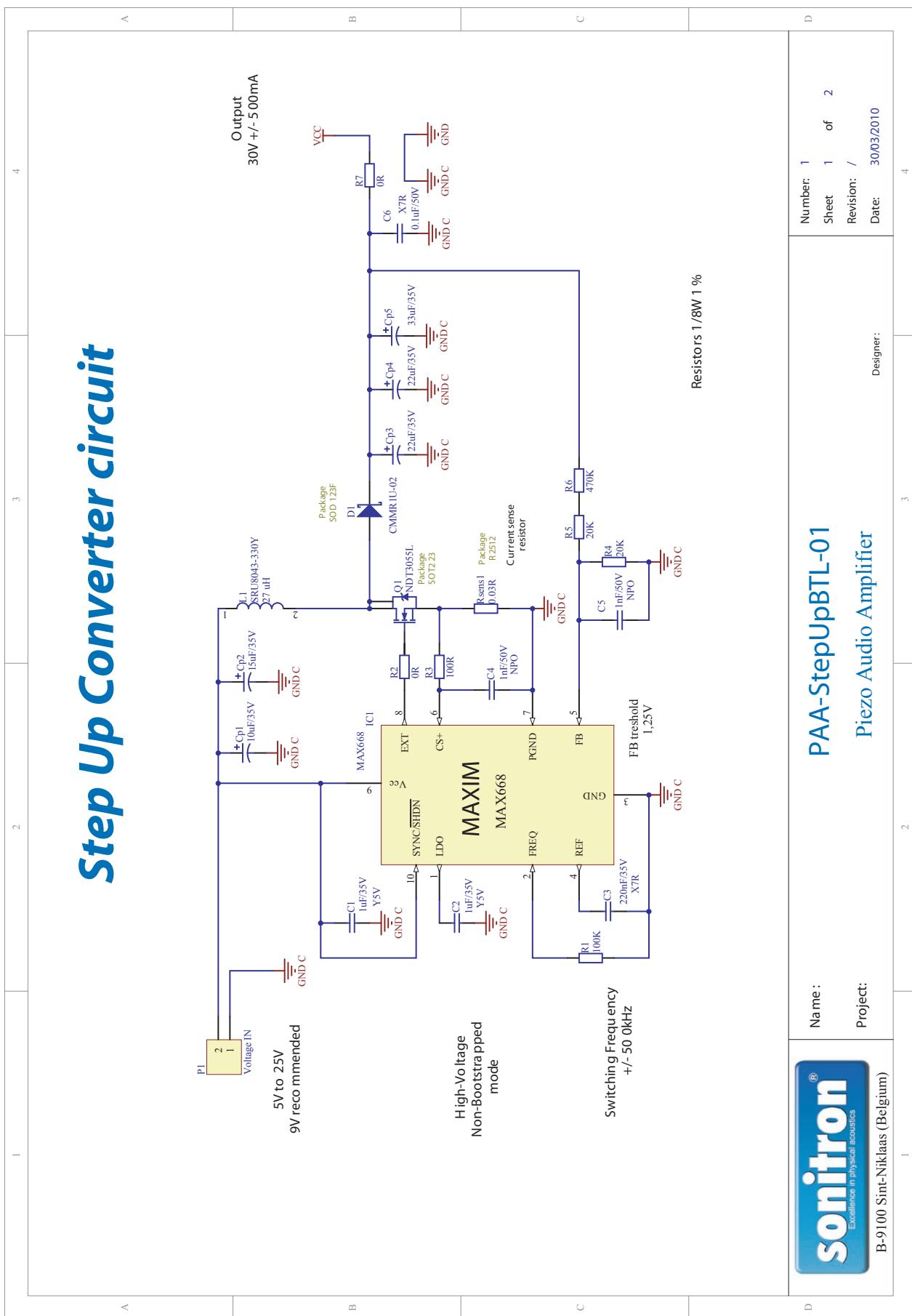
Recommendations

Input voltage of 9 Vdc and an output voltage swing of 40Vpp.

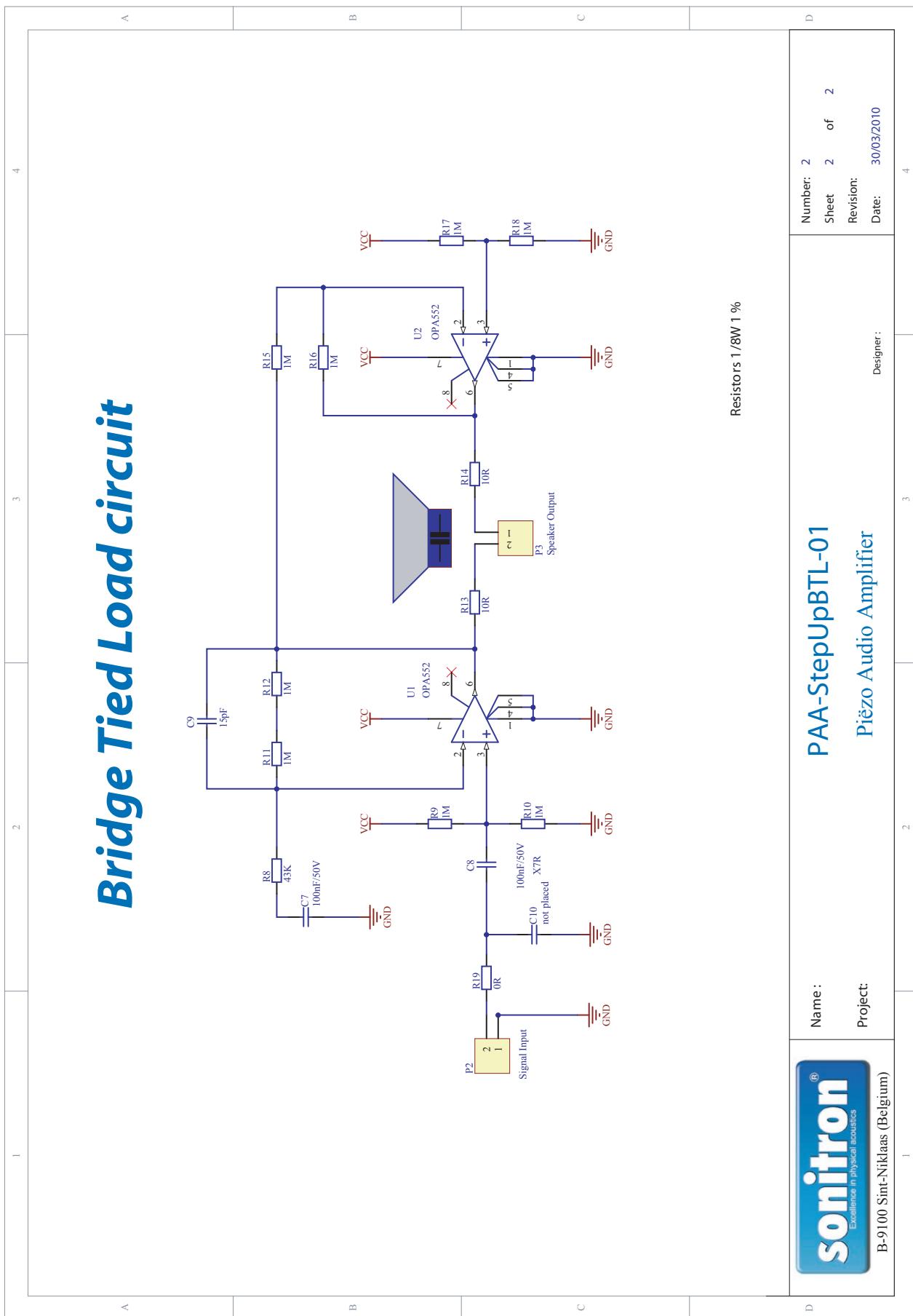
The output voltage swing is controlled by the input audio signal. For an output of +/-40Vpp the input audio signal must be +/- 0,5Vpp.

Schematics

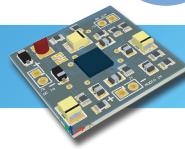
Step Up Converter circuit



Bridge Tied Load circuit



PIEZO AUDIO AMPLIFIERS



INTRODUCTION

The **Piezo Audio Amplifiers**-series are a total solution to drive piezoceramic sound components. A range of different PCB sizes, amplifier topologies and maximum voltage peak to peak outputs, cover a wide solution to piezo audio amplification.

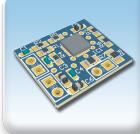
Piezo audio amplifiers are designed to handle capacitive loads and have the possibility to deliver large voltages peak to peak over the complete audio frequency range.

The heart of a piezo audio component is a ceramic piezo stone that interacts when it feels a certain voltage difference. An increase of a voltage peak to peak will have a larger piezo deformation and results in a larger sound output.

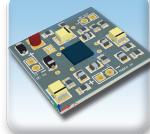
The PAA-series give a quality amplifier solution where a quality sound is needed.

GENERAL OVERVIEW PAA SERIES

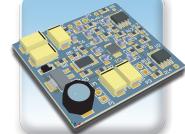
Model	PAA-MAX9788-01	PAA-LM4960-02	PAA-StepUpBTL-01
Measurements PCB(mm)	14x16.5mm	25x25mm	40x35mm
Voltage input (V)	5V	5V	5V-25V
MAX Capacitance Piezo Speaker	1µF	600nF	1µF
Max Voltage Output Vpp	20Vpp	24Vpp	60Vpp
Voltage Topology	Integrated step up converter	Integrated step up converter	Step up converter
Amplifier classification	Class G	Class AB	Class AB
Used amplifier configuration	Fully Differential	Bridge Tied Load	Bridge Tied Load
Average current consumption of speaker and amplifier (mA)	15mA	85mA	40mA-400mA (2 Watt)



PAA-MAX9788-01



PAA-LM4960-02



PAA-StepUpBTL-01

**For more information see the Sonitron Catalogue 2010
Piezo Audio Amplifiers Page 103 - 111 (or click the link below)**

<http://cde.cerosmedia.com/piezo-buzzer-transducer-alarm-siren-speaker-amplif/1N4bbf4084e44f9012.cde/page/102>

Piezo Speakers & Piezo Audio Amplifiers

sonitron®

