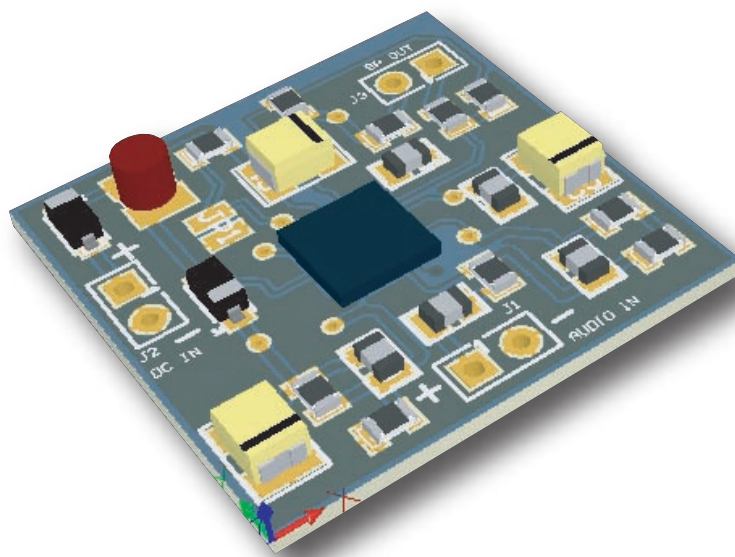


Piezo-Ceramic Audio Amplifiers
sonitron[®] PAA-LM4960SQ-02

Appnote PAA-LM4960SQ-02 Amplifier



October 2010

Sonitron n.v.
R&D department

Appnote PAA-LM4960SQ-02 Amplifier

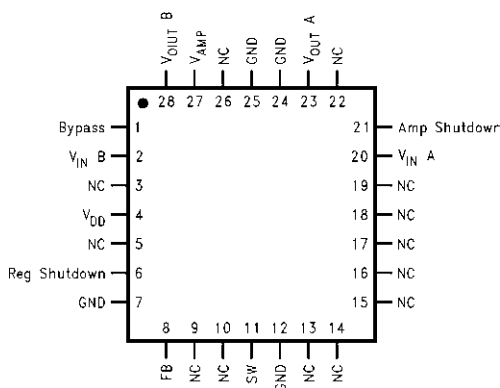
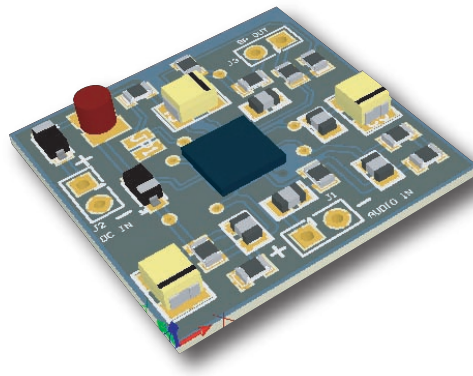
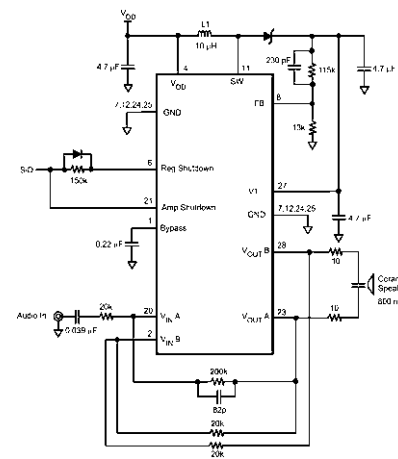
A perfect balance of a bridge tied load and step up converter on a small PCB, the "LM4960" IC of National Semiconductor reaches 24 Vpp for a load of 600nF. Small design and great sound output makes it very understandable.

Specifications:

- Integrated Step Up Converter
- Bridge tied load
- Very small inductor
- Up to 24Vpp
- 22 components

Fixed amplification ratio: +/- 74

Voltage input: 5V



PAA
Piezo Audio Amplifiers

Specifications

All the specifications of the National Semiconductor Piezo Audio Amplifiers can be found on there website. <http://www.national.com>

National Semiconductor

LM4960 Boomer® Audio Power Amplifier Series
Piezoelectric Speaker Driver

General Description
The LM4960 utilizes a switching regulator to drive a dual audio power amplifier. It delivers 24V_{p-p} mono-BTL to a ceramic speaker with less than 1.0% THD+N while operating on a 3.0V power supply.
The LM4960's switching regulator is a current-mode boost converter operating at a fixed frequency of 1.6MHz.
Boomer audio power amplifiers were designed specifically to provide high quality output power with a minimal amount of external components. The LM4960 does not require output coupling capacitors or bootstrap capacitors, and therefore is ideally suited for mobile phone and other low voltage applications where minimal power consumption is a primary requirement.
The LM4960 features a low-power consumption externally controlled micropower shutdown mode. Additionally, the LM4960 features and internal thermal shutdown protection mechanism along with a short circuit protection.
The LM4960 is unity-gain stable and can be configured by external gain-setting resistors.

Key Specifications
n $V_{OUT} @ V_{DD} = 3.0$ THD+N 1%
n Power supply range 24V_{p-p} (typ)
n Switching Frequency 3.0 to 7V
1.6MHz (typ)

Features
n Low current shutdown mode
n "Click and pop" suppression circuitry
n Low Quiescent current
n Unity-gain stable audio amplifiers
n External gain configuration capability
n Thermal shutdown protection circuitry
n Wide input voltage range (3.0V - 7V)
n 1.6MHz switching frequency

Applications
n Mobile phone
n PDA's

April 2005

LM4960 Piezoelectric Speaker Driver

Connection Diagram

Top View
Order Number LM4960S Q
See NS Package Number

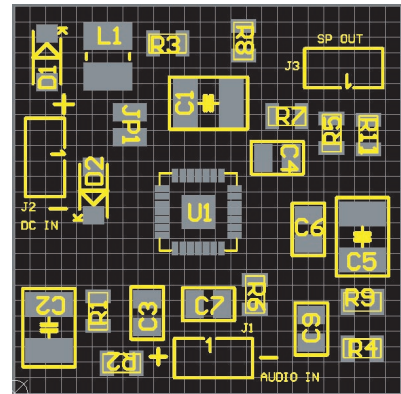
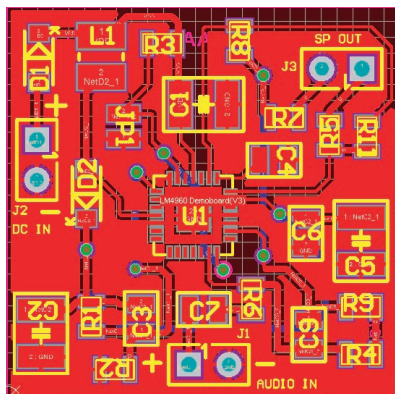
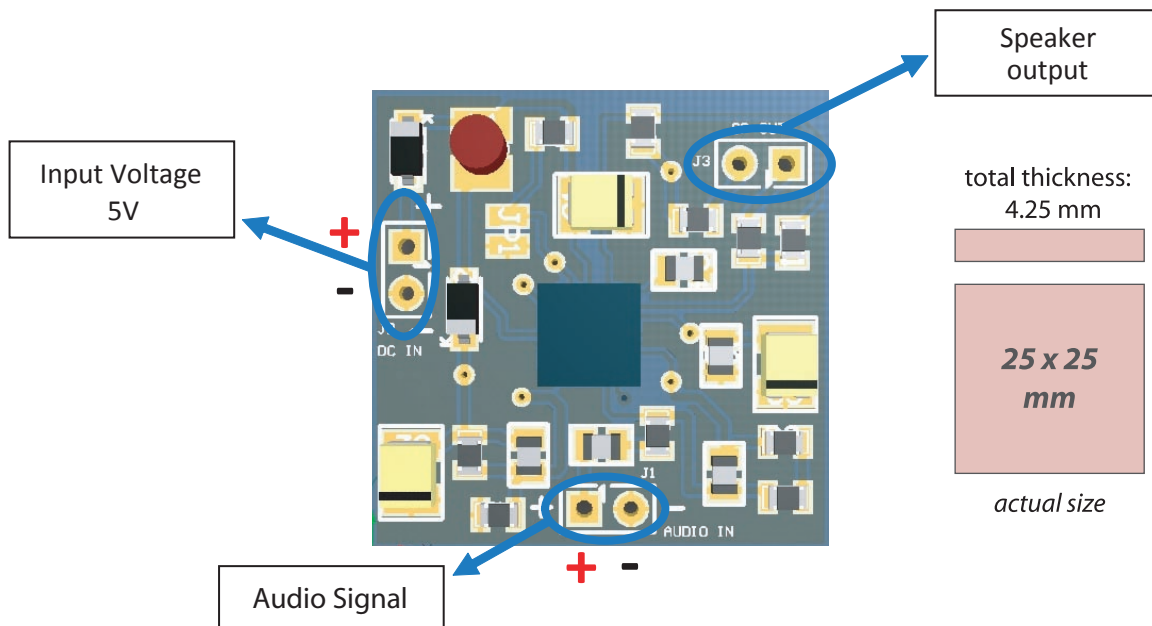
Boomer® is a registered trademark of National Semiconductor Corporation.
© 2005 National Semiconductor Corporation DS200765 www.national.com

<http://www.national.com/mpf/LM/LM4960.html#Overview>

Overview available Piezo Audio Amplifiers of National Semiconductor:

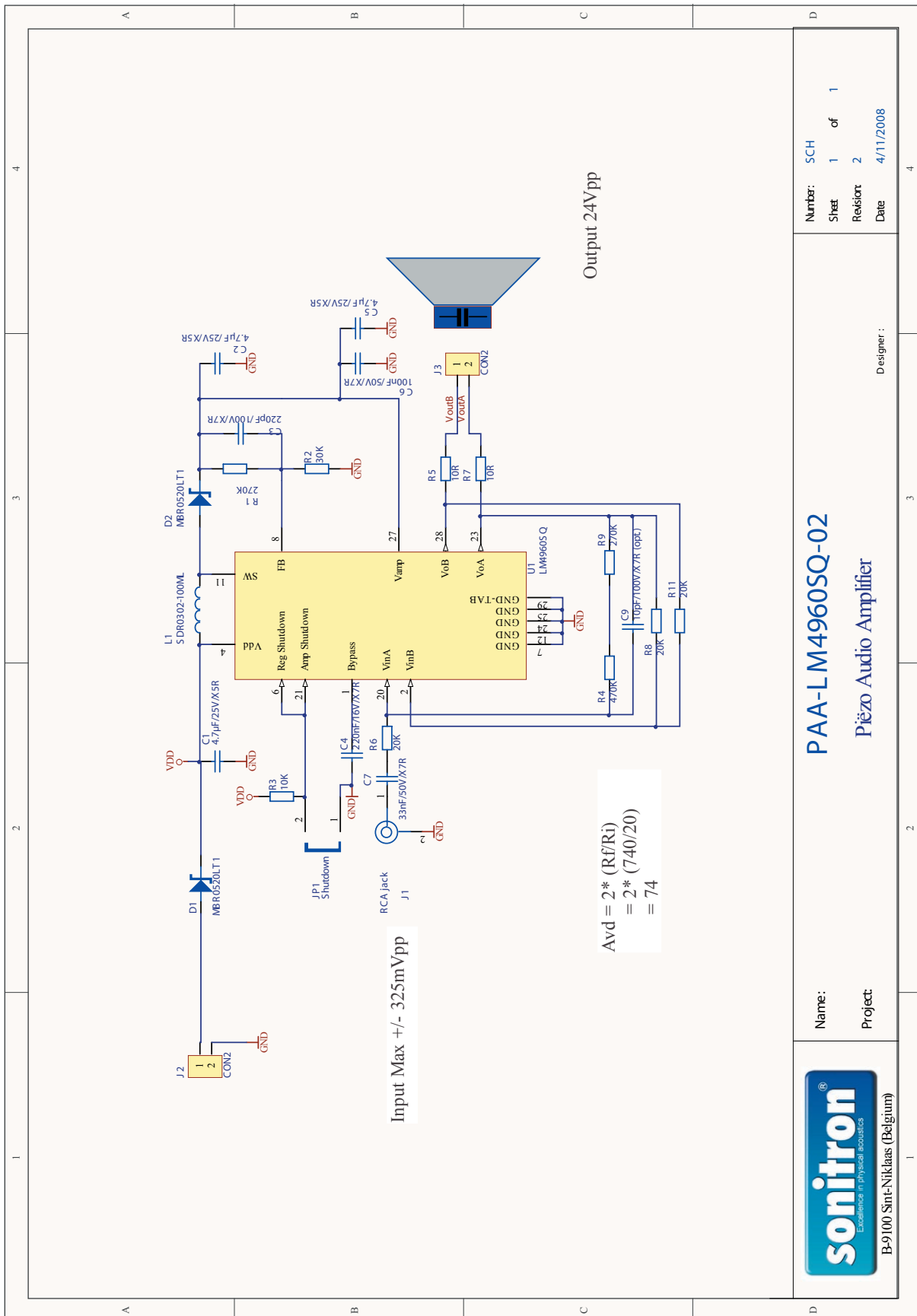
Product ID	Description
LM4802B	12 Vp-p boosted ceramic speaker driver
LM4953	12.6 Vp-p ceramic speaker driver with ground reference, ultra low noise, fixed gain
LM4960	24 Vp-p Piezoelectric speaker driver
LM4961	15 Vp-p ceramic speaker driver
LM4962	15 Vp-p ceramic speaker driver with band switch function, can drive LM4951 for stereo solution
LM48555	15.5 Vp-p ceramic speaker driver

Dimensions, components & control pins

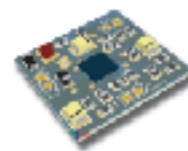


	Designator	Description	Package	Quantity
1	R1, R9	Chip Resistor 270k/5%	R0805	2
2	R2	Chip Resistor 30k/5%	R0805	1
3	R3	Chip Resistor 10k/5%	R0805	1
4	R4	Chip Resistor 470k/5%	R0805	1
5		Chip Resistor 10R/5%	R0805	2
6	R6, R8, R11	Chip Resistor 20k/5%	R0805	3
7	C1, C2, C5	Ceramic Capacitor 4.7µF/25V/X5R	C1210	3
8	C3	Ceramic Capacitor 220pF/100V/X7R	C0805	1
9	C4	Ceramic Capacitor 220nF/16V/X7R	C0805	1
10	C6	Ceramic Capacitor 100nF/50V/X7R	C0805	1
11	C7	Ceramic Capacitor 33nF/50V/X7R	C0805	1
12	C9	Ceramic Capacitor 10pF/100V/X7R (opt)	C0805	1
13	L1	SDR0302-100ML SMD Power Inductor	SDR0302	1
14	D1, D2	MBR0520LT1 20V, 0.5A shottky diode	SOD-123	2
12	U1	LM4960SQ Piezo Ceramic Speaker Amplifier	LLP28	1

Electronic Schematic of PAA-LM4960SQ-02



PIEZO AUDIO AMPLIFIERS



INTRODUCTION

The **P**iezo **A**udio **A**mplifiers-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.

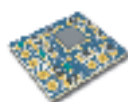
Piezo audio amplifiers are designed to handle capacitive loads and have the possibility to deliver large voltages peak to peak over the complete audio frequency range.

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.

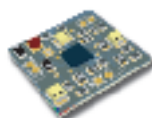
The PAA-series give a quality amplifier solution where a quality sound is needed.

GENERAL OVERVIEW PAA SERIES

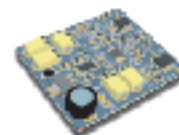
Model	PAA-MAX9788-01	PAA-LM4960-02	PAA-StepUpBTL-01
Measurements PCB(mm)	14x16.5mm	25x25mm	40x35mm
Voltage input (V)	5V	5V	5V-25V
MAX Capacitance Piezo Speaker	1µF	600nF	1µF
Max Voltage Output Vpp	20Vpp	24Vpp	60Vpp
Voltage Topology	Integrated step up converter	Integrated step up converter	Step up converter
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-LM4960SQ-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®

