National Semiconductor

LM49151

Boomer® Audio Power Amplifier Series

PRODUCT BRIEF

PRELIMINARY
April 16, 2009

Mono Class D Audio Subsystem with Earpiece Driver, Ground Referenced Headphone Amplifiers, Speaker Protection and No Clip with Clip Control

General Description

The LM49151 is a fully integrated audio subsystem designed for portable handheld applications such as cellular phones. The LM49151 combines a 1.25W mono E²S class D amplifier, 125mW Class AB earpiece driver, 42mW/channel stereo ground referenced headphone drivers, volume control, input mixer/multiplexer, and speaker protection into a single device.

The LM49151 class D speaker amplifier features National's unique Automatic Level Control (ALC) that provides both a I²C programmable no-clip feature with Clip Controls and speaker protection. The E²S (Enhanced Emission Suppression) class D amplifier features a patented, ultra low EMI PWM architecture that significantly reduces RF emissions while preserving audio quality and efficiency while delivering 1.25W into an 8Ω load with <1% THD+N with a 5V supply. The 42mW/channel headphone drivers feature National's ground referenced architecture that creates a ground-referenced output from a single supply, eliminating the need for bulky and expensive DC-blocking capacitors, saving space and minimizing system cost.

The LM49151 features separate volume controls for the loudspeaker and headphone inputs. Mode selection, shutdown control, and volume are controlled through an I²C compatible interface. The LM49151's superior click and pop suppression eliminates audible transients on power-up/down and during shutdown.

Notice: This document is not a full datasheet. For more information regarding this product or to order samples please contact your local National Semiconductor sales office or visit http://www.national.com/support/dir.html

Key Specifications

- Output power at V_{DD} = 3.3V
  THD+N ≤ 1%
  - LS Mode, R_L = 8Ω — 520mW (typ)
  - HP Mode, R_L = 32Ω — 40mW (typ)
- Output power at V_{DD} = 5V
  THD+N ≤ 1%
  - LS Mode, R_L = 8Ω — 1.25W (typ)
  - HP Mode, R_L = 32Ω — 42mW (typ)
- Output Offset
  - LS Mode 15 — 6mV (typ)
  - HP Mode 15 — 2mV (typ)

Features

- E²S class D amplifier
- Ground referenced outputs — eliminates output coupling capacitors
- I²C programmable No Clip Function with Clip Control
- Voltage limiter speaker protection
- I²C volume and mode Control
- Ear Piece Amplifier
- Advanced click-and-pop suppression
- Low supply current
- Micro-power shutdown
- 20-bump micro SMD package

Applications

- Mobile Phones
- PDAs
- Notebook PCs
- Portable Electronics Devices
- MP3 Players

Typical Application

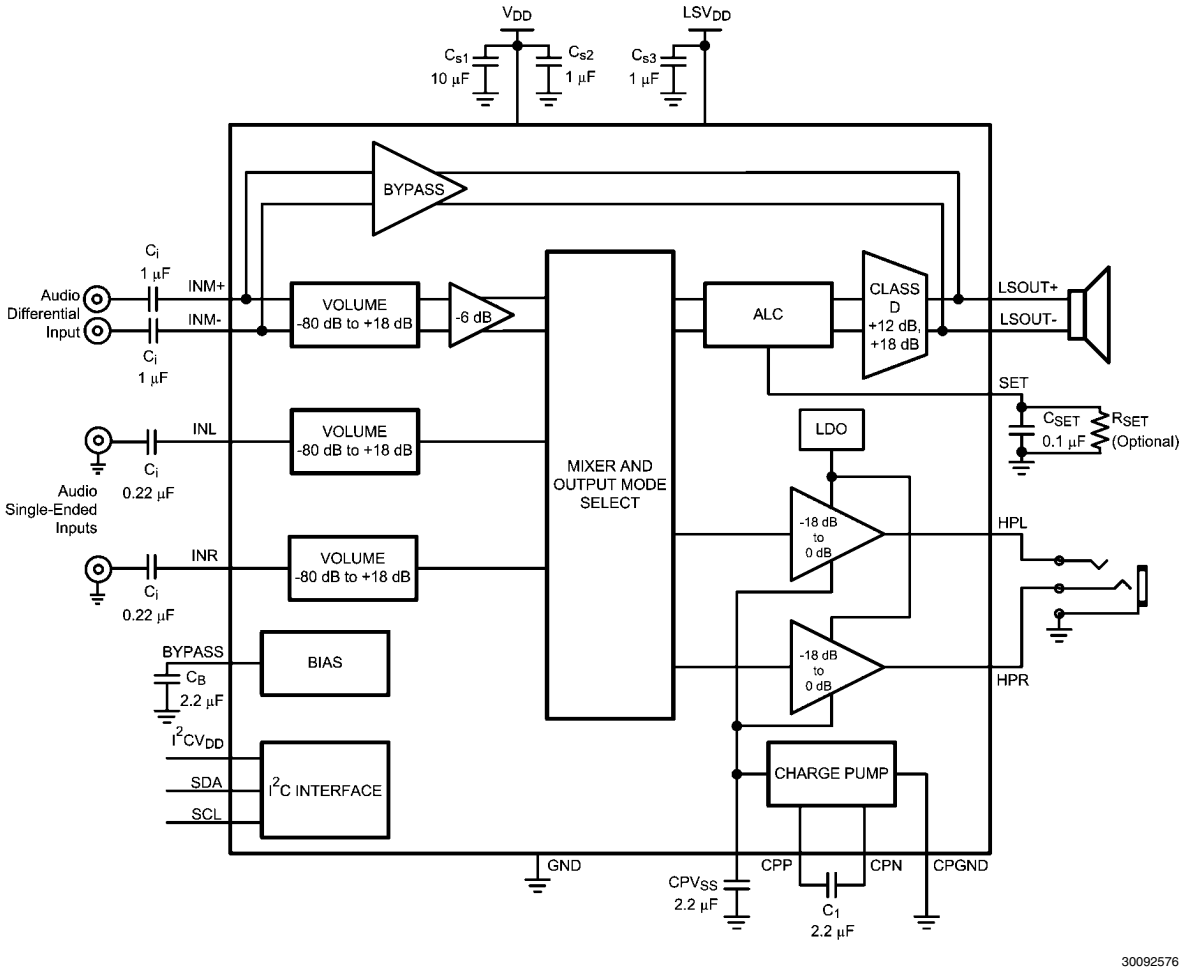
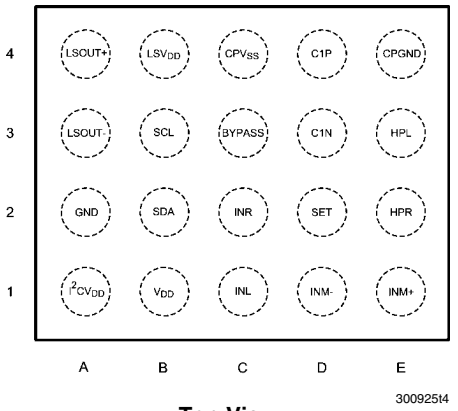


FIGURE 1. Typical Audio Amplifier Application Circuit

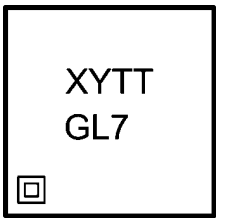
Connection Diagrams

20 Bump micro SMD Package



Top View
Order Number LM49151TL
(See NS Package Number TLA20GDA)

Top Markings



Top View
XY - Date Code
TT - Die Traceability
G- Boomer
L7 - LM49151TL

Ordering Information

Order Number	Package	Package DWG #	Transport Media	MSL Level	Green Status
LM49151TL	20 Bump micro SMD	TLA20GDA	250 units on tape and reel	1	RoHS and no sB/Br
LM49151TLX	20 Bump micro SMD	TLA20GDA	3000 units on tape and reel	1	RoHS and no sB/Br

Bump Descriptions

Bump	Name	Description
A1	I^2CV_{DD}	I²C Power Supply
A2	GND	Ground
A3	LSOUT-	Inverting Loudspeaker Output
A4	LSOUT+	Non-Inverting Loudspeaker Output
B1	V_{DD}	Analog Power Supply
B2	SDA	I²C Data Input
B3	SCL	I²C Clock Input
B4	LSV_{DD}	Loudspeaker Power Supply
C1	INL	Left Channel Input
C2	INR	Right Channel Input
C3	BYPASS	Mid-Rail Supply Bypass
C4	CPV_{SS}	Charge Pump Output
D1	INM-	Mono Channel Inverting Input
D2	SET	ALC Timing Control
D3	CPN	Charge Pump Flying Capacitor - Negative Terminal
D4	CPP	Charge Pump Flying Capacitor - Positive Terminal
E1	INM+	Mono Channel Non-Inverting Input
E2	HPR	Right Channel Headphone Amplifier Output
E3	HPL	Left Channel Headphone Amplifier Output
E4	CPGND	Charge Pump Ground

Notes

For more National Semiconductor product information and proven design tools, visit the following Web sites at:

Products		Design Support	
Amplifiers	www.national.com/amplifiers	WEBENCH® Tools	www.national.com/webench
Audio	www.national.com/audio	App Notes	www.national.com/appnotes
Clock and Timing	www.national.com/timing	Reference Designs	www.national.com/refdesigns
Data Converters	www.national.com/adc	Samples	www.national.com/samples
Interface	www.national.com/interface	Eval Boards	www.national.com/evalboards
LVDS	www.national.com/lvds	Packaging	www.national.com/packaging
Power Management	www.national.com/power	Green Compliance	www.national.com/quality/green
Switching Regulators	www.national.com/switchers	Distributors	www.national.com/contacts
LDOs	www.national.com/ldo	Quality and Reliability	www.national.com/quality
LED Lighting	www.national.com/led	Feedback/Support	www.national.com/feedback
Voltage Reference	www.national.com/vref	Design Made Easy	www.national.com/easy
PowerWise® Solutions	www.national.com/powerwise	Solutions	www.national.com/solutions
Serial Digital Interface (SDI)	www.national.com/sdi	Mil/Aero	www.national.com/milaero
Temperature Sensors	www.national.com/tempsensors	SolarMagic™	www.national.com/solarmagic
Wireless (PLL/VCO)	www.national.com/wireless	Analog University®	www.national.com/AU

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