

## PRODUCT BRIEF

# 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 E<sup>2</sup>S 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 I<sup>2</sup>C programmable no-clip feature with Clip Controls and speaker protection. The E<sup>2</sup>S (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 loud-speaker and headphone inputs. Mode selection, shutdown control, and volume are controlled through an I<sup>2</sup>C 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

<ul style="list-style-type: none"> <li>■ Output power at <math>V_{DD} = 3.3V</math> THD+N ≤ 1%</li> </ul>	
LS Mode, $R_L = 8\Omega$	520mW (typ)
HP Mode, $R_L = 32\Omega$	40mW (typ)
<ul style="list-style-type: none"> <li>■ Output power at <math>V_{DD} = 5V</math> THD+N ≤ 1%</li> </ul>	
LS Mode, $R_L = 8\Omega$	1.25W (typ)
HP Mode, $R_L = 32\Omega$	42mW (typ)
<ul style="list-style-type: none"> <li>■ Output Offset</li> </ul>	
LS Mode 15	6mV (typ)
HP Mode 15	2mV (typ)

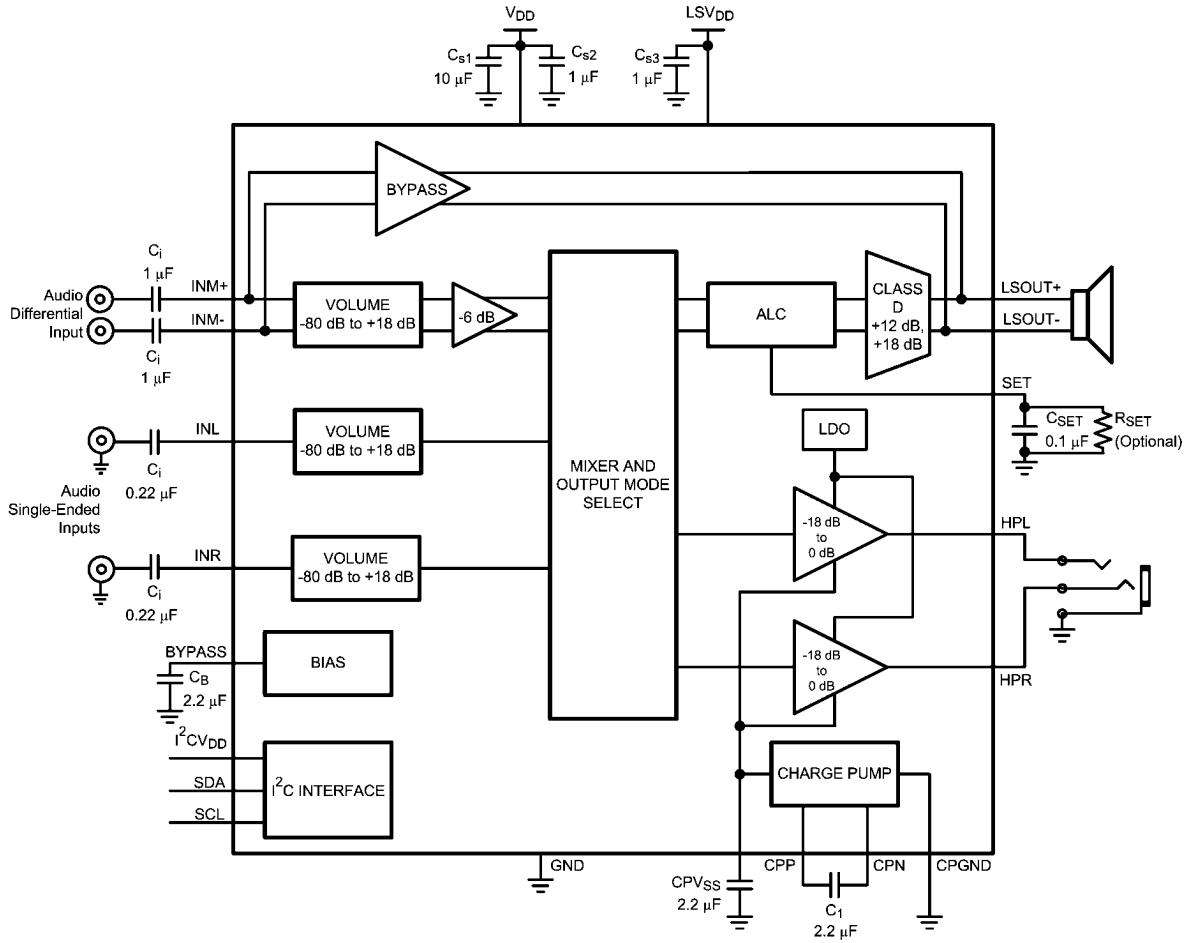
### Features

- E<sup>2</sup>S class D amplifier
- Ground referenced outputs — eliminates output coupling capacitors
- I<sup>2</sup>C programmable No Clip Function with Clip Control
- Voltage limiter speaker protection
- I<sup>2</sup>C 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

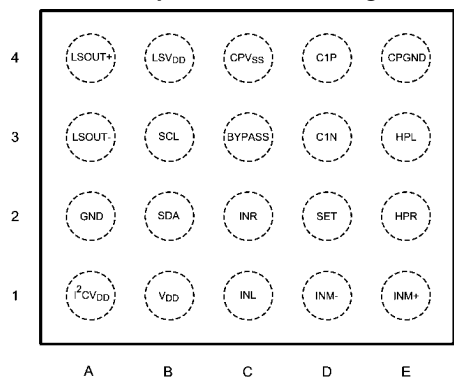


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FIGURE 1. Typical Audio Amplifier Application Circuit

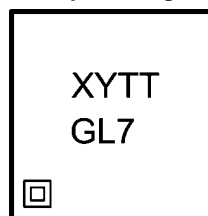
## Connection Diagrams

20 Bump micro SMD Package



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

Top Markings



30092515  
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 <sup>2</sup> CV <sub>DD</sub>	I <sup>2</sup> C Power Supply
A2	GND	Ground
A3	LSOUT-	Inverting Loudspeaker Output
A4	LSOUT+	Non-Inverting Loudspeaker Output
B1	V <sub>DD</sub>	Analog Power Supply
B2	SDA	I <sup>2</sup> C Data Input
B3	SCL	I <sup>2</sup> C Clock Input
B4	LSV <sub>DD</sub>	Loudspeaker Power Supply
C1	INL	Left Channel Input
C2	INR	Right Channel Input
C3	BYPASS	Mid-Rail Supply Bypass
C4	CPV <sub>SS</sub>	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

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Interface	<a href="http://www.national.com/interface">www.national.com/interface</a>	Eval Boards	<a href="http://www.national.com/evalboards">www.national.com/evalboards</a>
LVDS	<a href="http://www.national.com/lvds">www.national.com/lvds</a>	Packaging	<a href="http://www.national.com/packaging">www.national.com/packaging</a>
Power Management	<a href="http://www.national.com/power">www.national.com/power</a>	Green Compliance	<a href="http://www.national.com/quality/green">www.national.com/quality/green</a>
Switching Regulators	<a href="http://www.national.com/switchers">www.national.com/switchers</a>	Distributors	<a href="http://www.national.com/contacts">www.national.com/contacts</a>
LDOs	<a href="http://www.national.com/ldo">www.national.com/ldo</a>	Quality and Reliability	<a href="http://www.national.com/quality">www.national.com/quality</a>
LED Lighting	<a href="http://www.national.com/led">www.national.com/led</a>	Feedback/Support	<a href="http://www.national.com/feedback">www.national.com/feedback</a>
Voltage Reference	<a href="http://www.national.com/vref">www.national.com/vref</a>	Design Made Easy	<a href="http://www.national.com/easy">www.national.com/easy</a>
PowerWise® Solutions	<a href="http://www.national.com/powerwise">www.national.com/powerwise</a>	Solutions	<a href="http://www.national.com/solutions">www.national.com/solutions</a>
Serial Digital Interface (SDI)	<a href="http://www.national.com/sdi">www.national.com/sdi</a>	Mil/Aero	<a href="http://www.national.com/milaero">www.national.com/milaero</a>
Temperature Sensors	<a href="http://www.national.com/tempsensors">www.national.com/tempsensors</a>	SolarMagic™	<a href="http://www.national.com/solarmagic">www.national.com/solarmagic</a>
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