September 5, 2008

National Semiconductor

LM4951A Boomer® Audio Power Amplifier Series
Wide Voltage Range 1.8 Watt Audio Amplifier With Short Circuit Protection

General Description

The LM4951A is an audio power amplifier designed for applications with supply voltages ranging from 2.7V up to 9V. The LM4951A is capable of delivering 1.8W continuous average power with less than 1% THD+N into a bridge connected 8Ω load when operating from a 7.5VDC power supply.

Boomer audio power amplifiers were designed specifically to provide high quality output power with a minimal amount of external components. The LM4951A does not require bootstrap capacitors, or snubber circuits.

The LM4951A features a low-power consumption active-low shutdown mode. Additionally, the LM4951A features an internal thermal shutdown protection mechanism and short circuit protection.

The LM4951A contains advanced pop & click circuitry that eliminates noises which would otherwise occur during turn-on and turn-off transitions.

The LM4951A is unity-gain stable and can be configured by external gain-setting resistors.

Key Specifications

■ Wide Voltage Range	2.7V to 9V
■ Quiescent Power Supply Current (V_{DD} = 7.5V)	2.5mA (typ)
■ Power Output BTL at 7.5V, 1% THD	1.8W (typ)
■ Shutdown Current	0.01µA (typ)
■ Fast Turn on Time	25ms (typ)

Features

- Pop & click circuitry eliminates noise during turn-on and turn-off transitions
- Wide supply voltage range: 2.7V to 9V
- Low current, active-low shutdown mode
- Low quiescent current
- Thermal shutdown protection
- Short circuit protection
- Unity-gain stable
- External gain configuration capability

Applications

- Portable devices
- Cell phones
- Laptop computers
- Computer speaker systems
- MP3 player speakers

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Typical Application

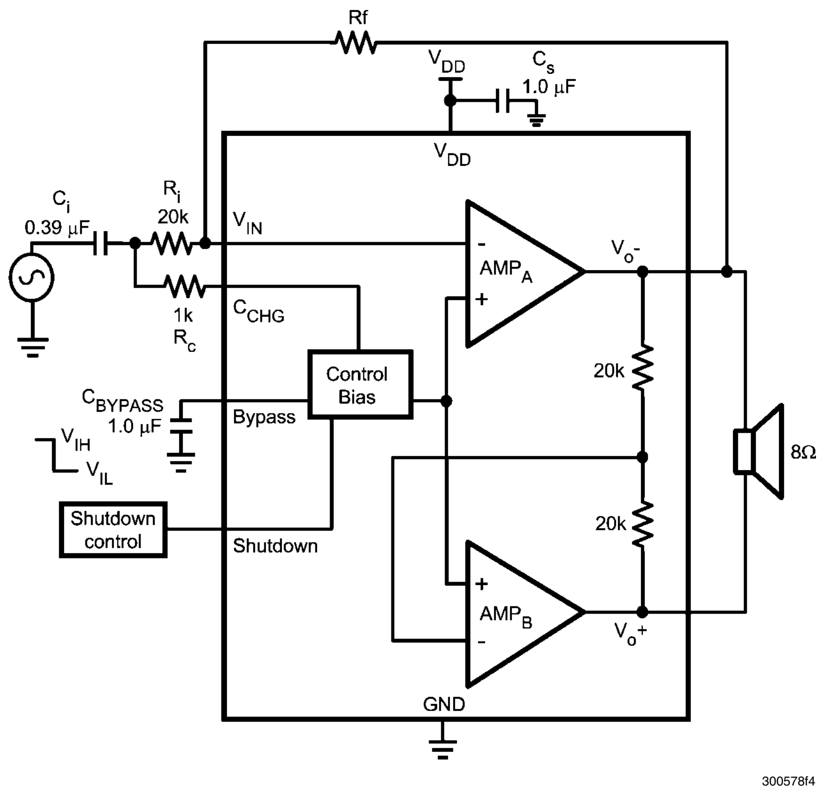
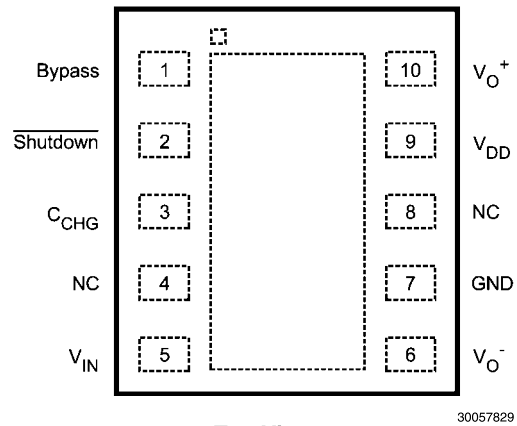


FIGURE 1. Typical Bridge-Tied-Load (BTL) Audio Amplifier Application Circuit

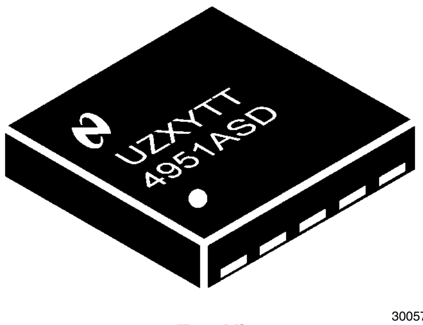
Connection Diagrams

SD Package



Top View
Order Number LM4951ASD
See NS Package Number SDC10A

SD Package Marking



Top View
U = Fab site code
Z = Assembly plant code
XY = Date code
TT = Die traceability
4951A = LM4951A
SD = Package code

Ordering Information

Order Number	Package	Package DWG #	Transport Media	MSL Level	Green Status	Features
LM4951ASD	10 Lead LLP	SDC10A	1000 units in Tape and Reel	1	RoH and no Sb/Br	
LM4951ASDX	10 Lead LLP	SDC10A	4500 units in Tape and Reel	1	RoH and no Sb/Br	

TABLE 1. Pin Name and Function

Pin Number	Name	Function	Type
1	Bypass	½ supply reference voltage bypass output. See sections **POWER SUPPLY BYPASSING** and **SELECTING EXTERNAL COMPONENTS** for more information.	Analog Output
2	Shutdown	Shutdown control active low signal. A logic low voltage will put the LM4951A into Shutdown mode.	Digital Input
3	C_{CHG}	Input capacitor charge to decrease turn on time. See section **Selecting A Value for R_C** for more information.	Analog Output
4	NC	No connection to die. Pin can be connected to any potential.	No Connect
5	V_{IN}	Single-ended signal input pin.	Analog Input
6	V_O-	Inverting output of amplifier.	Analog Output
7	GND	Ground connection.	Ground
8	NC	No connection to die. Pin can be connected to any potential.	No Connect
9	V_{DD}	Power supply.	Power
10	V_O+	Non-Inverting output of amplifier.	Analog Output
Exposed DAP	NC	No connect. Pin must be electrically isolated (floating) or connected to GND.	No Connect

Absolute Maximum Ratings (Notes 1, 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Supply Voltage	9.5V
Storage Temperature	−65°C to +150°C
Input Voltage	−0.3V to V_{DD} + 0.3V
Power Dissipation (Note 3)	Internally limited
ESD Rating (Note 4)	2000V
ESD Rating (Note 5)	200V
Junction Temperature (T_{JMAX})	150°C

Thermal Resistance

θ_{JA} (LLP) (Note 3) 73°C/W

Soldering Information

See AN-1187 'Leadless Leadframe Packaging (LLP).'

Operating Ratings (Notes 1, 2)

Temperature Range	
$T_{MIN} \le T_A \le T_{MAX}$	−40°C ≤ T_A ≤ +85°C
Supply Voltage	2.7V ≤ V_{DD} ≤ 9V

Electrical Characteristics V_{DD} = 7.5V (Notes 1, 2)

The following specifications apply for V_{DD} = 7.5V, $A_{V\text{-}BTL}$ = 6dB, R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25°C.

Symbol	Parameter	Conditions	LM4951A		Units (Limits)
			Typical (Note 6)	Limit (Note 7)	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, I_O = 0A, R_L = 8Ω BTL	2.5	4.5	mA (max)
I_{SD}	Shutdown Current	V_{SD} = GND (Note 8)	0.01	5	µA (max)
V_{OS}	Output Offset Voltage		5	30	mV (max)
V_{SDIH}	Shutdown Voltage Input High			1.2	V (min)
V_{SDIL}	Shutdown Voltage Input Low			0.4	V (max)
$R_{PULLDOWN}$	Pull-down Resistor on SD pin		75	45	kΩ (min)
T_{WU}	Wake-up Time	C_B = 1.0µF	25	35	ms (max)
T_{SD}	Shutdown time	C_B = 1.0µF		10	ms (max)
TSD	Thermal Shutdown Temperature		170	150 190	°C (min) °C (max)
P_O	Output Power	THD = 1% (max); f = 1kHz R_L = 8Ω Mono BTL	1.8	1.5	W (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 600mW$_{RMS}$; f = 1kHz $A_{V\text{-}BTL}$ = 6dB	0.07	0.5	% (max)
		P_O = 600mW$_{RMS}$; f = 1kHz $A_{V\text{-}BTL}$ = 26dB	0.35		%
ε_{OS}	Output Noise	A-Weighted Filter, R_i = R_f = 20kΩ Input Referred (Note 9)	10		µV
PSRR	Power Supply Rejection Ratio	V_{RIPPLE} = 200mV$_{p\text{-}p}$, f = 217Hz, C_B = 1.0µF, Input Referred	66	56	dB (min)

Electrical Characteristics V_{DD} = 3.3V (Notes 1, 2)

The following specifications apply for V_{DD} = 3.3V, $A_{V\text{-}BTL}$ = 6dB, R_L = 8Ω unless otherwise specified. Limits apply for T_A = 25°C.

Symbol	Parameter	Conditions	LM4951A		Units (Limits)
			Typical (Note 6)	Limit (Note 7)	
I_{DD}	Quiescent Power Supply Current	V_{IN} = 0V, I_O = 0A, R_L = 8Ω BTL	2.5	4.5	mA (max)
I_{SD}	Shutdown Current	$V_{SHUTDOWN}$ = GND (Note 8)	0.01	2	µA (max)
V_{OS}	Output Offset Voltage		3	30	mV (max)
V_{SDIH}	Shutdown Voltage Input High			1.2	V (min)
V_{SDIL}	Shutdown Voltage Input Low			0.4	V (max)
T_{WU}	Wake-up Time	C_B = 1.0µF	25		ms
T_{SD}	Shutdown time	C_B = 1.0µF		10	ms (max)

Symbol	Parameter	Conditions	LM4951A		Units (Limits)
			Typical (Note 6)	Limit (Note 7)	
P_O	Output Power	THD = 1% (max); f = 1kHz R_L = 8Ω Mono BTL	280	230	mW (min)
THD+N	Total Harmonic Distortion + Noise	P_O = 100mW_{RMS} = 1kHz $A_{V\text{-}BTL}$ = 6dB	0.07	0.5	% (max)
		P_O = 100mW_{RMS}; f = 1kHz $A_{V\text{-}BTL}$ = 26dB	0.35		%
ε_{OS}	Output Noise	A-Weighted Filter, $R_i = R_f$ = 20kΩ Input Referred, (Note 9)	10		μV
PSRR	Power Supply Rejection Ratio	V_{RIPPLE} = 200m$V_{p\text{-}p}$, f = 217Hz, C_B = 1μF, Input Referred	71	61	dB (min)

Note 1: "*Absolute Maximum Ratings*" indicate limits beyond which damage to the device may occur, including inoperability and degradation of device reliability and/or performance. Functional operation of the device and/or non-degradation at the *s* or other conditions beyond those indicated in the *Recommended Operating Conditions* is not implied. The *Recommended Operating Conditions*indicate conditions at which the device is functional and the device should not be operated beyond such conditions. All voltages are measured with respect to the ground pin, unless otherwise specified.

Note 2: The *Electrical Characteristics* tables list guaranteed specifications under the listed *Recommended Operating Conditions* except as otherwise modified or specified by the *Electrical Characteristics Conditions* and/or Notes. Typical specifications are estimations only and are not guaranteed.

Note 3: The maximum power dissipation must be derated at elevated temperatures and is dictated by T_{JMAX}, θ_{JA}, and the ambient temperature, T_A. The maximum allowable power dissipation is $P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA}$ or the number given in *Absolute Maximum Ratings*, whichever is lower. For the LM4951A typical application (shown in Figure 1) with V_{DD} = 7.5V, R_L = 8Ω mono-BTL operation the max power dissipation is 1.42W. θ_{JA} = 73ºC/W.

Note 4: Human body model, applicable std. JESD22-A114C.

Note 5: Machine model, applicable std. JESD22-A115-A.

Note 6: Typical values represent most likely parametric norms at T_A = +25ºC, and at the *Recommended Operation Conditions* at the time of product characterization and are not guaranteed.

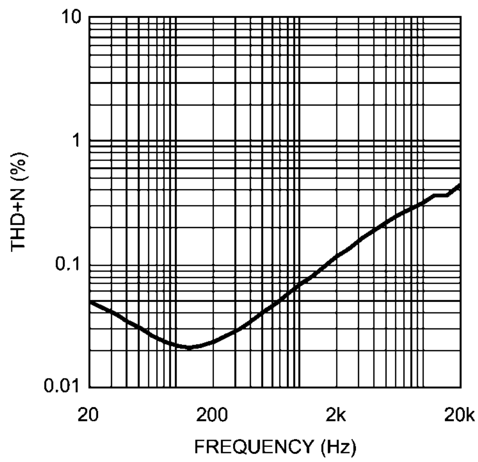
Note 7: Datasheet min/max specification limits are guaranteed by test or statistical analysis.

Note 8: Shutdown current is measured in a normal room environment. The Shutdown pin should be driven as close as possible to GND for minimum shutdown current.

Note 9: Noise measurements are dependent on the absolute values of the closed loop gain setting resistors (input and feedback resistors).

Typical Performance Characteristics

THD+N vs Frequency
V_{DD} = 3.3V, P_O = 100mW, A_V = 6dB



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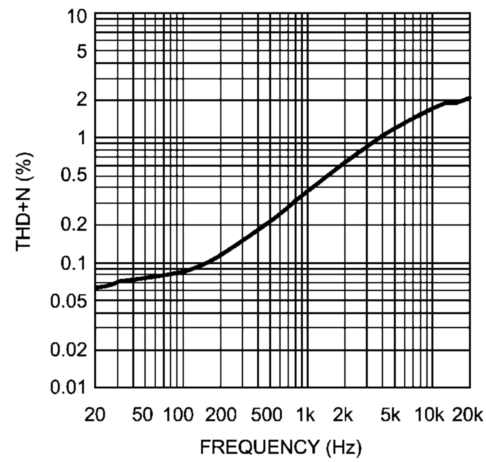
THD+N vs Frequency
V_{DD} = 3.3V, P_O = 100mW, A_V = 26dB



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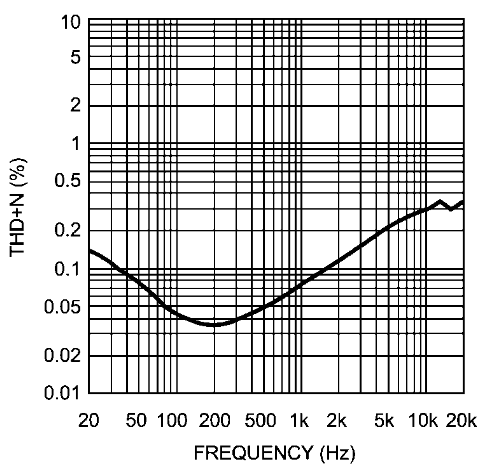
THD+N vs Frequency
V_{DD} = 5V, P_O = 400mW, A_V = 6dB



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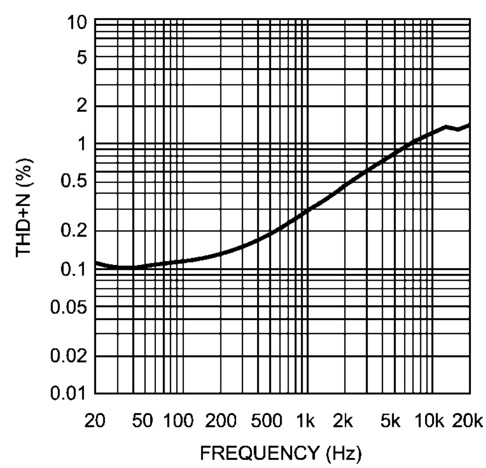
THD+N vs Frequency
V_{DD} = 5V, P_O = 400mW, A_V = 26dB



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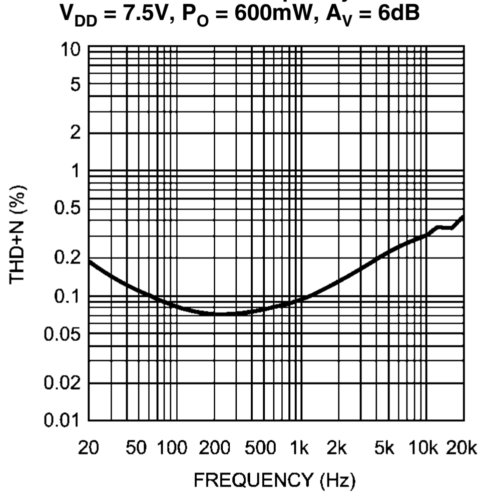
THD+N vs Frequency
V_{DD} = 7.5V, P_O = 600mW, A_V = 6dB



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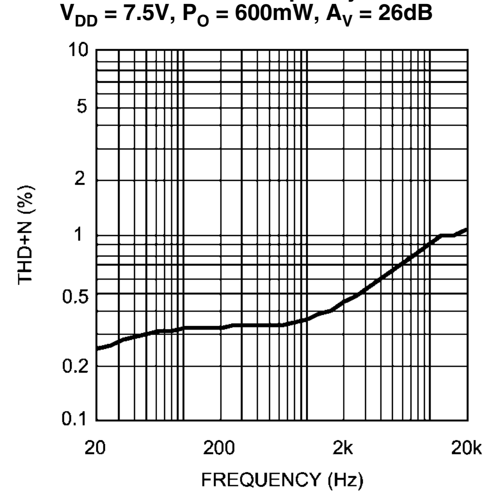
THD+N vs Frequency
V_{DD} = 7.5V, P_O = 600mW, A_V = 26dB



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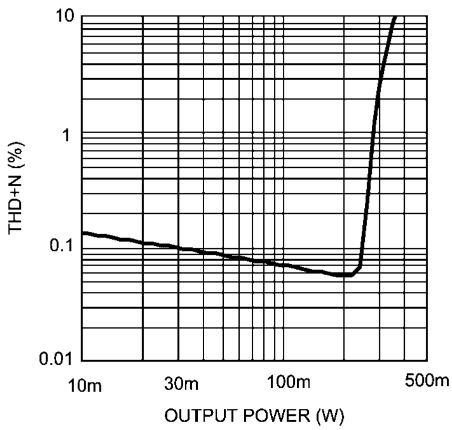
THD+N vs Output Power
V_{DD} = 3.3V, f = 1kHz, A_V = 6dB



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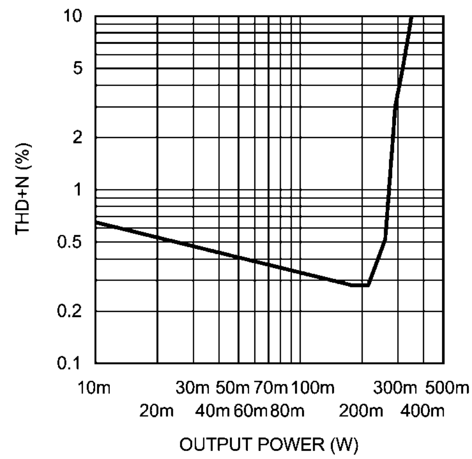
THD+N vs Output Power
V_{DD} = 3.3V, f = 1kHz, A_V = 26dB



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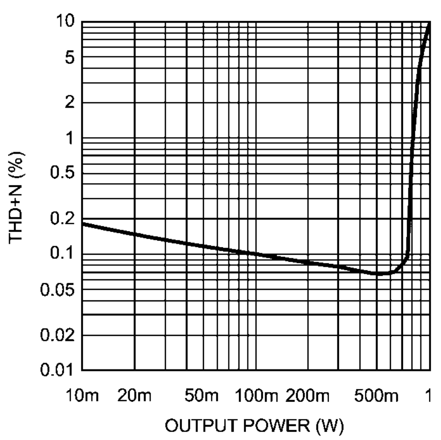
THD+N vs Output Power
V_{DD} = 5V, f = 1kHz, A_V = 6dB



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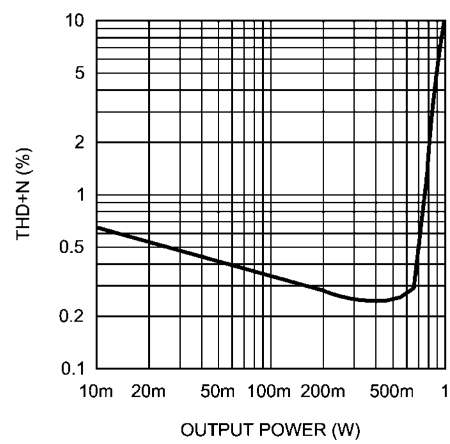
THD+N vs Output Power
V_{DD} = 5V, f = 1kHz, A_V = 26dB



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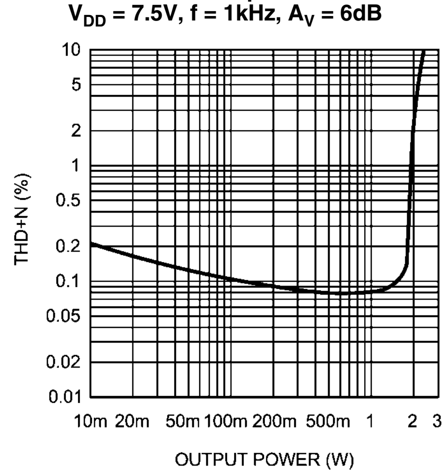
THD+N vs Output Power
V_{DD} = 7.5V, f = 1kHz, A_V = 6dB



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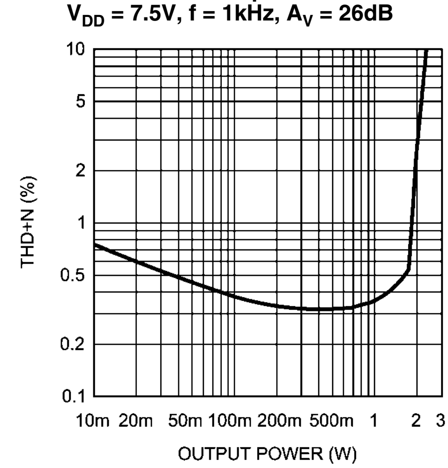
THD+N vs Output Power
V_{DD} = 7.5V, f = 1kHz, A_V = 26dB



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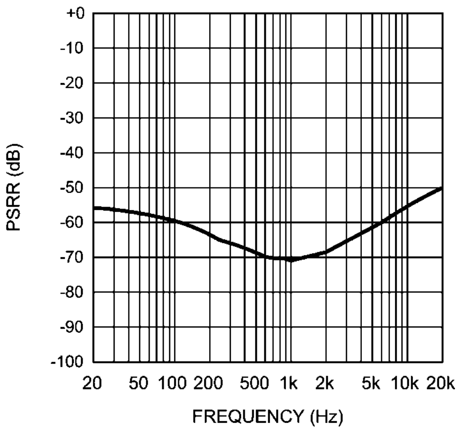
Power Supply Rejection vs Frequency
V_{DD} = 3.3V, A_V = 6dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



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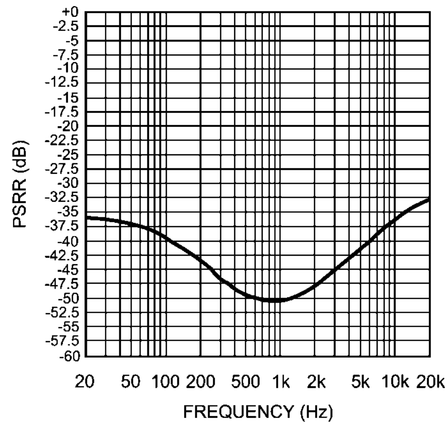
Power Supply Rejection vs Frequency
V_{DD} = 3.3V, A_V = 26dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



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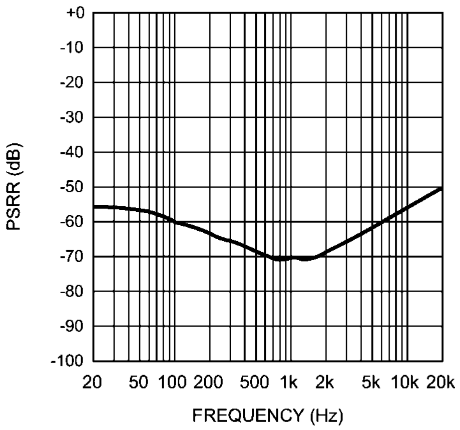
Power Supply Rejection vs Frequency
V_{DD} = 5V, A_V = 6dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



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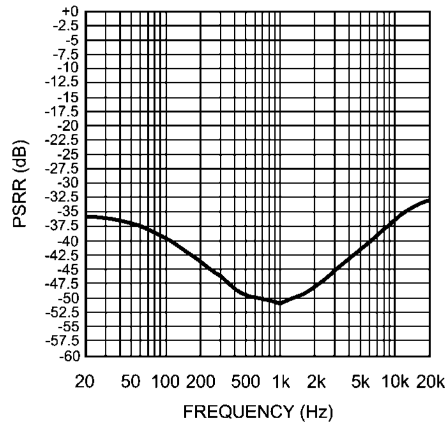
Power Supply Rejection vs Frequency
V_{DD} = 5V, A_V = 26dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



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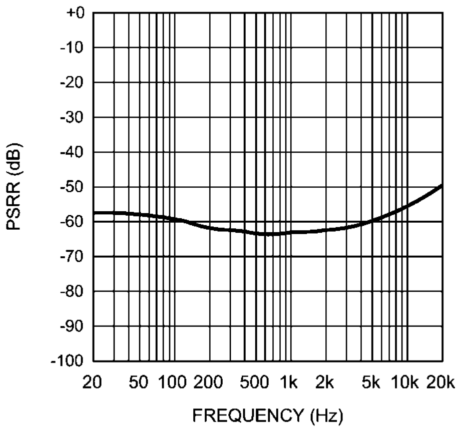
Power Supply Rejection vs Frequency
V_{DD} = 7.5V, A_V = 6dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



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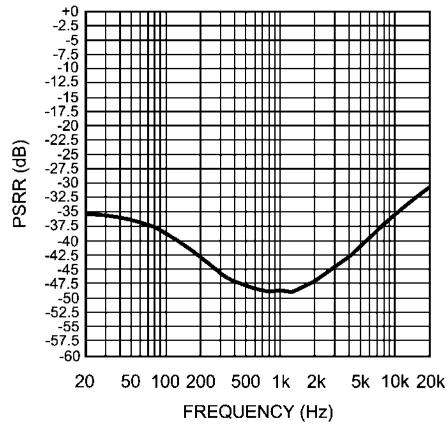
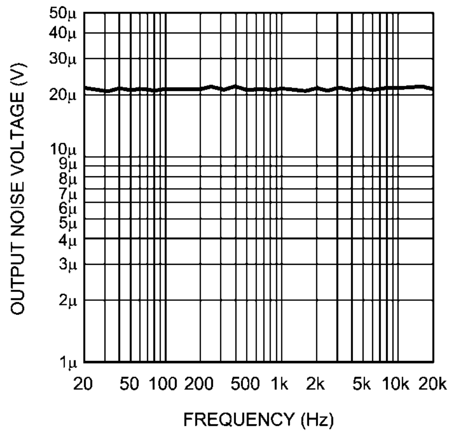
Power Supply Rejection vs Frequency
V_{DD} = 7.5V, A_V = 26dB, V_{RIPPLE} = 200mV_{P-P}
Input Terminated into 10Ω



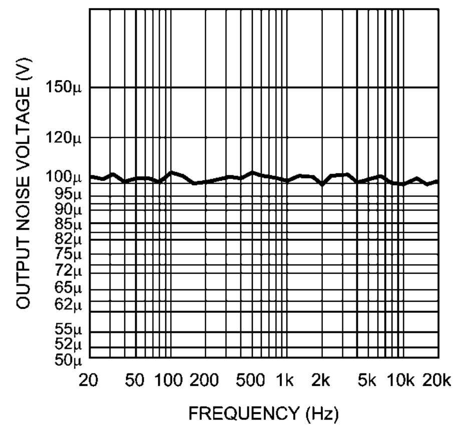
30057818

Noise Floor
V_{DD} = 3.3V, A_V = 6dB, R_i = R_f = 20kΩ
BW < 80kHz, A-weighted



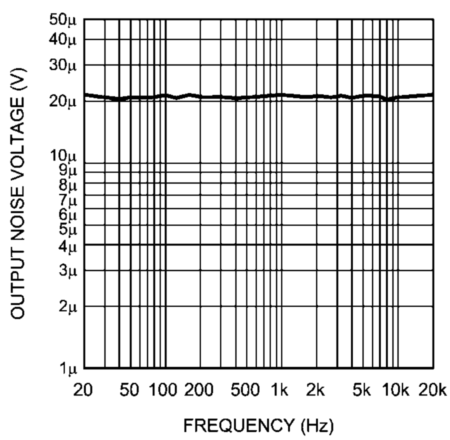
30057819

Noise Floor
V_{DD} = 3V, A_V = 26dB, R_i = 20kΩ, R_f = 200kΩ
BW < 80kHz, A-weighted



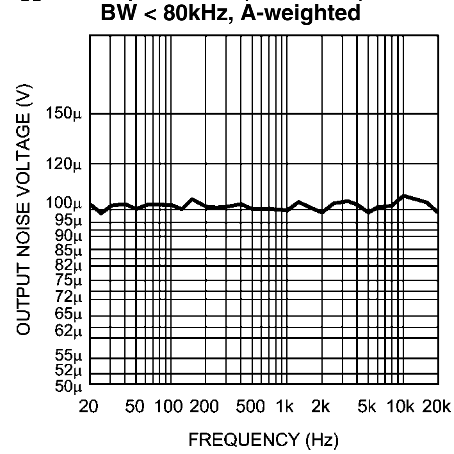
30057820

Noise Floor
V_{DD} = 5V, A_V = 6dB, R_i = R_f = 20kΩ
BW < 80kHz, A-weighted



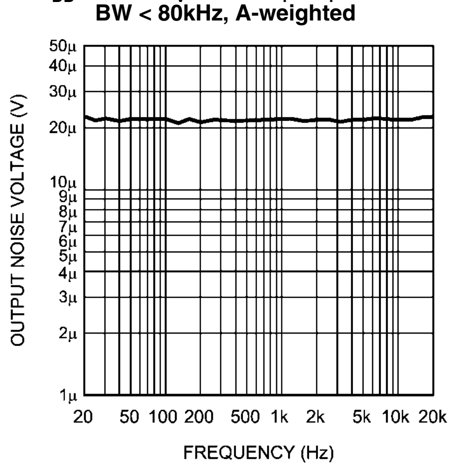
30057821

Noise Floor
V_{DD} = 5V, A_V = 26dB, R_i = 20kΩ, R_f = 200kΩ
BW < 80kHz, A-weighted



30057822

Noise Floor
V_{DD} = 7.5V, A_V = 6dB, R_i = R_f = 20kΩ
BW < 80kHz, A-weighted



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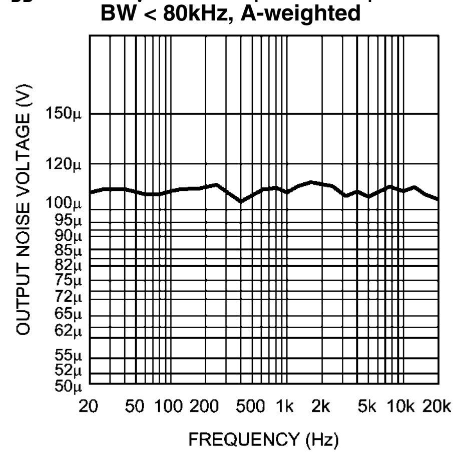
Noise Floor
V_{DD} = 7.5V, A_V = 26dB, R_i = 20kΩ, R_f = 200kΩ
BW < 80kHz, A-weighted



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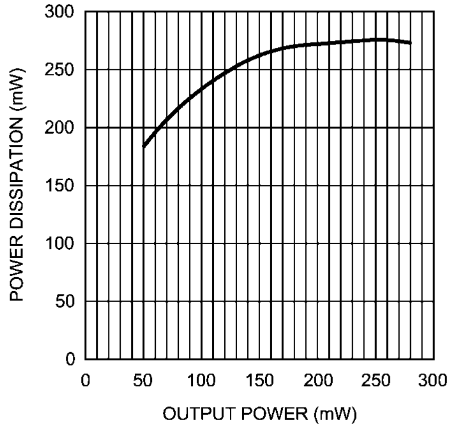
Power Dissipation
vs Output Power
V_{DD} = 3.3V, R_L = 8Ω, f = 1kHz



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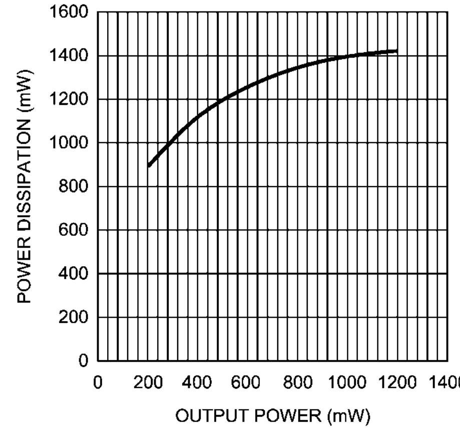
Power Dissipation
vs Output Power
V_{DD} = 7.5V, R_L = 8Ω, f = 1kHz



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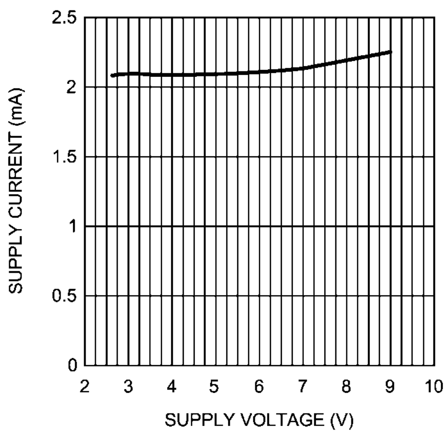
Supply Current
vs Supply Voltage
R_L = 8Ω, V_{IN} = 0V, R_{source} = 50Ω



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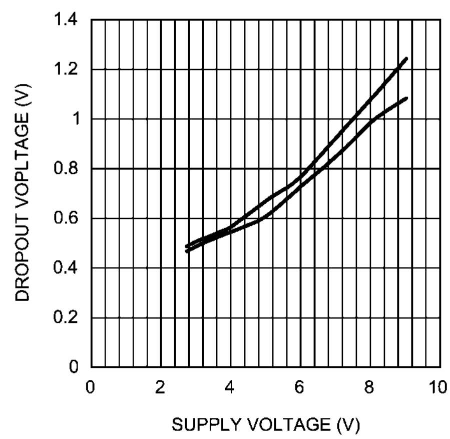
Clipping Voltage vs Supply Voltage
R_L = 8Ω,
from top to bottom: Negative Voltage Swing; Positive Voltage Swing



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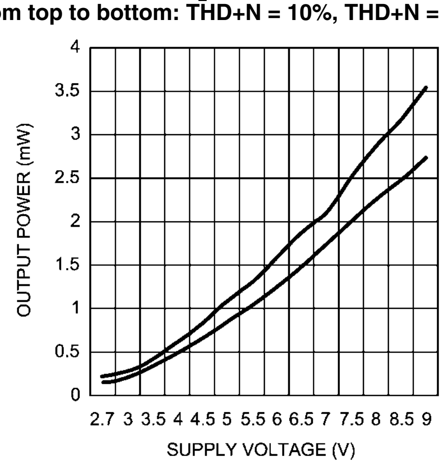
Output Power vs Supply Voltage
R_L = 8Ω,
from top to bottom: THD+N = 10%, THD+N = 1%



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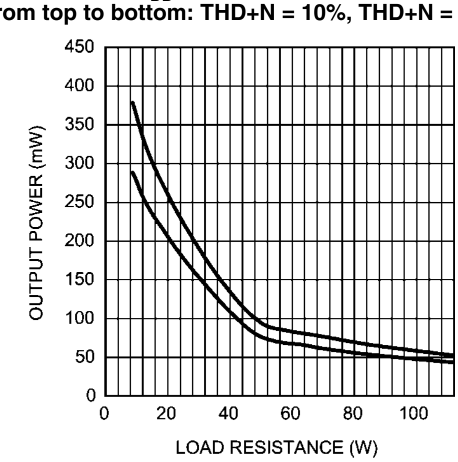
Output Power vs Load Resistance
V_{DD} = 3.3V, f = 1kHz
from top to bottom: THD+N = 10%, THD+N = 1%



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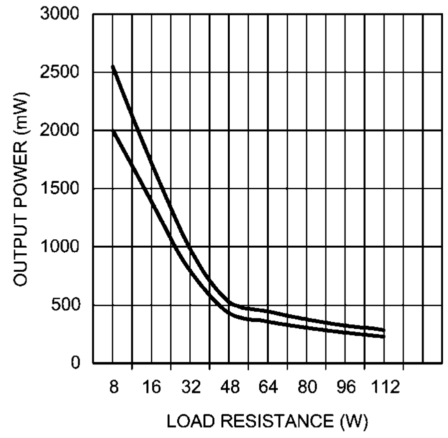
Output Power vs Load Resistance
V_{DD} = 7.5V, f = 1kHz
from top to bottom: THD+N = 10%, THD+N = 1%



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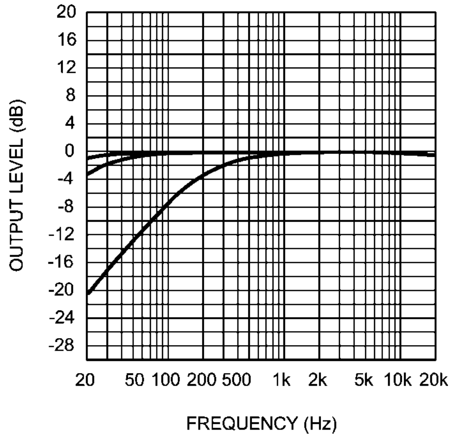
Frequency Response vs Input Capacitor Size
R_L = 8Ω
from top to bottom: C_i = 1.0µF, C_i = 0.39µF, C_i = 0.039µF



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Application Information

BRIDGE CONFIGURATION EXPLANATION

As shown in Figure 1, the LM4951A consists of two operational amplifiers that drive a speaker connected between their outputs. The value of input and feedback resistors determine the gain of each amplifier. External resistors R_i and R_f set the closed-loop gain of AMP_A, whereas two 20kΩ internal resistors set AMP_B's gain to -1. Figure 1 shows that AMP_A's output serves as AMP_B's input. This results in both amplifiers producing signals identical in magnitude, but 180° out of phase. Taking advantage of this phase difference, a load is placed between AMP_A and AMP_B and driven differentially (commonly referred to as "bridge-tied load"). This results in a differential, or BTL, gain of:

$$A_{VD} = 2(R_f / R_i) \quad (V/V) \qquad (1)$$

Bridge mode amplifiers are different from single-ended amplifiers that drive loads connected between a single amplifier's output and ground. For a given supply voltage, bridge mode has an advantage over the single-ended configuration: its differential output doubles the voltage swing across the load. Theoretically, this produces four times the output power when compared to a single-ended amplifier under the same conditions. This increase in attainable output power assumes that the amplifier is not current limited and that the output signal is not clipped. Under rare conditions, with unique combinations of high power supply voltage and high closed loop gain settings, the LM4951A may exhibit low frequency oscillations.

Another advantage of the differential bridge output is no net DC voltage across the load. This is accomplished by biasing AMP1's and AMP2's outputs at half-supply. This eliminates the coupling capacitor that single supply, single-ended amplifiers require. Eliminating an output coupling capacitor in a typical single-ended configuration forces a single-supply amplifier's half-supply bias voltage across the load. This increases internal IC power dissipation and may permanently damage loads such as speakers.

POWER DISSIPATION

The LM4951A's dissipation when driving a BTL load is given by Equation (2). For a 7.5V supply and a single 8Ω BTL load, the dissipation is 1.42W.

$$P_{DMAX-MONOBTL} = 4(V_{DD})^2 / 2\pi^2 R_L \quad (W) \qquad (2)$$

The maximum power dissipation point given by Equation (2) must not exceed the power dissipation given by Equation (3):

$$P_{DMAX} = (T_{JMAX} - T_A) / \theta_{JA} \qquad (3)$$

The LM4951A's T_{JMAX} = 150°C. In the SD package, the LM4951A's θ_{JA} is 73°C/W when the metal tab is soldered to a copper plane of at least 1in^2. This plane can be split between the top and bottom layers of a two-sided PCB. Connect the two layers together under the tab with an array of vias. At any given ambient temperature T_A, use Equation (3) to find the maximum internal power dissipation supported by the IC packaging. Rearranging Equation (3) and substituting P_{DMAX} for P_{DMAX}' results in Equation (4). This equation gives the maximum ambient temperature that still allows maximum stereo power dissipation without violating the LM4951A's maximum junction temperature.

$$T_A = T_{JMAX} - P_{DMAX-MONOBTL}\theta_{JA} \quad (°C) \qquad (4)$$

For a typical application with a 7.5V power supply and a BTL 8Ω load, the maximum ambient temperature that allows maximum stereo power dissipation without exceeding the maximum junction temperature is 46°C for the SD package.

$$T_{JMAX} = P_{DMAX-MONOBTL}\theta_{JA} + T_A \quad (°C) \qquad (5)$$

Equation (5) gives the maximum junction temperature T_{JMAX}. If the result violates the LM4951A's maximum junction temperature of 150°C, reduce the maximum junction temperature by reducing the power supply voltage or increasing the load resistance. Further allowance should be made for increased ambient temperatures.

The above examples assume that a device is operating around the maximum power dissipation point. Since internal power dissipation is a function of output power, higher ambient temperatures are allowed as output power or duty cycle decreases.

If the result of Equation (2) is greater than that of Equation (3), then decrease the supply voltage, increase the load impedance, or reduce the ambient temperature. Further, ensure that speakers rated at a nominal 8Ω do not fall below 6Ω. If these measures are insufficient, a heat sink can be added to reduce θ_{JA}. The heat sink can be created using additional copper area around the package, with connections to the ground pins, supply pin and amplifier output pins. Refer to the **Typical Performance Characteristics** curves for power dissipation information at lower output power levels.

POWER SUPPLY BYPASSING

As with any power amplifier, proper supply bypassing is critical for low noise performance and high power supply rejection. Applications that employ a voltage regulator typically use a 10μF in parallel with a 0.1μF filter capacitors to stabilize the regulator's output, reduce noise on the supply line, and improve the supply's transient response. However, their presence does not eliminate the need for a local 1.0μF tantalum bypass capacitance connected between the LM4951A's supply pins and ground. Do not substitute a ceramic capacitor for the tantalum. Doing so may cause oscillation. Keep the length of leads and traces that connect capacitors between the LM4951A's power supply pin and ground as short as possible. Connecting a larger capacitor, C_{BYPASS}, between the BYPASS pin and ground improves the internal bias voltage's stability and improves the amplifier's PSRR. The PSRR improvements increase as the bypass pin capacitor value increases. Too large, however, increases turn-on time and can compromise the amplifier's click and pop performance. The selection of bypass capacitor values, especially C_{BYPASS}, depends on desired PSRR requirements, click and pop performance, system cost, and size constraints.

MICRO-POWER SHUTDOWN

The LM4951A features an active-low micro-power shutdown mode. When active, the LM4951A's micro-power shutdown feature turns off the amplifier's bias circuitry, reducing the supply current. The low 0.01µA typical shutdown current is achieved by applying a voltage to the SHUTDOWN pin that is as near to GND as possible. A voltage that is greater than GND may increase the shutdown current.

SELECTING EXTERNAL COMPONENTS

Input Capacitor Value Selection

Two quantities determine the value of the input coupling capacitor: the lowest audio frequency that requires amplification and desired output transient suppression.

As shown in Figure 1, the input resistor (R_i) and the input capacitor (C_i) create a high-pass filter. The cutoff frequency can be found using Equation (6).

$$f_c = 1/2\pi R_i C_i \quad \text{(Hz)} \tag{6}$$

As an example when using a speaker with a low frequency limit of 50Hz, C_i, using Equation (6) is 0.159µF with R_i set to 20kΩ. The values for C_i and R_i shown in Figure 1 allow the LM4951A to drive a high efficiency, full range speaker whose response extends down to 20Hz.

Selecting Value A For R_C

The LM4951A is designed for very fast turn on time. The C_{CHG} pin allows the input capacitor to charge quickly to improve click/pop performance. R_C protects the C_{CHG} pin from any over/under voltage conditions caused by excessive input signal or an active input signal when the device is in shutdown. The recommended value for R_C is 1kΩ. If the input signal is less than V_{DD}+0.3V and greater than -0.3V, and if the input signal is disabled when in shutdown mode, R_C may be shorted out.

OPTIMIZING CLICK AND POP REDUCTION PERFORMANCE

The LM4951A contains circuitry that eliminates turn-on and shutdown transients ("clicks and pops"). For this discussion, turn-on refers to either applying the power supply voltage or when the micro-power shutdown mode is deactivated.

As the V_{DD}/2 voltage present at the BYPASS pin ramps to its final value, the LM4951A's internal amplifiers are configured as unity gain buffers. An internal current source charges the capacitor connected between the BYPASS pin and GND in a controlled manner. Ideally, the input and outputs track the voltage applied to the BYPASS pin.

The gain of the internal amplifiers remains unity until the voltage on the bypass pin reaches V_{DD}/2. As soon as the voltage on the bypass pin is stable, there is a delay to prevent undesirable output transients ("click and pops"). After this delay, the device becomes fully functional.

THERMAL SHUTDOWN AND SHORT CIRCUIT PROTECTION

The LM4951A has thermal shutdown and short circuit protection to fully protect the device. The thermal shutdown circuit is activated when the die temperature exceeds a safe temperature. The short circuit protection circuitry senses the output current. When the output current exceeds the threshold under a short condition, a short will be detected and the output deactivated until the short condition is removed. If the output current is lower than the threshold then a short will not be detected and the outputs will not be deactivated. Under such conditions the die temperature will increase and, if the condition persist to raise the die temperature to the thermal shutdown threshold, initiate a thermal shutdown response. Once the die cools the outputs will become active.

RECOMMENDED PRINTED CIRCUIT BOARD LAYOUT

Figures 2–4 show the recommended two-layer PC board layout that is optimized for the SD10A. This circuit is designed for use with an external 7.5V supply 8Ω (min) speakers.

Demonstration Board Circuit

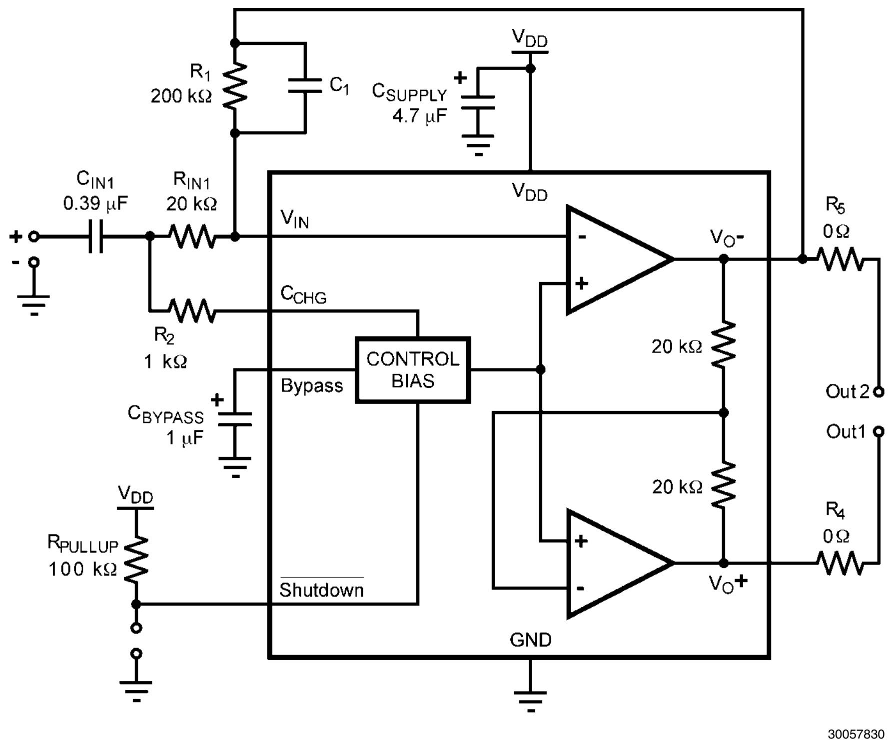

FIGURE 2. Demo Board Circuit

Demonstration Board Layout

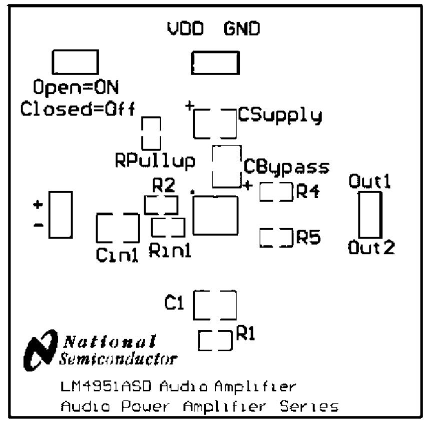

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FIGURE 3. Top Silkscreen

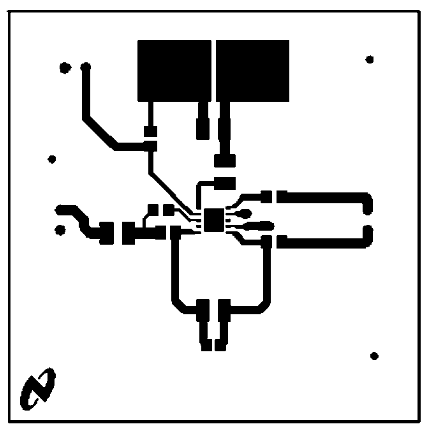

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FIGURE 4. Top Layer

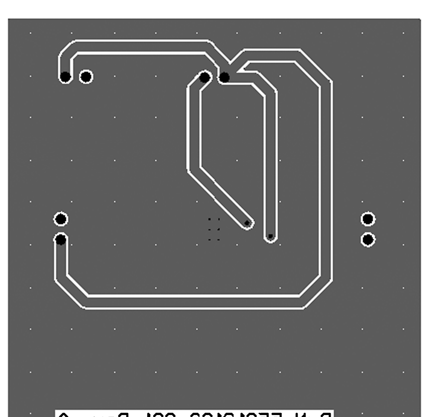

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FIGURE 5. Bottom Layer

Bill Of Materials

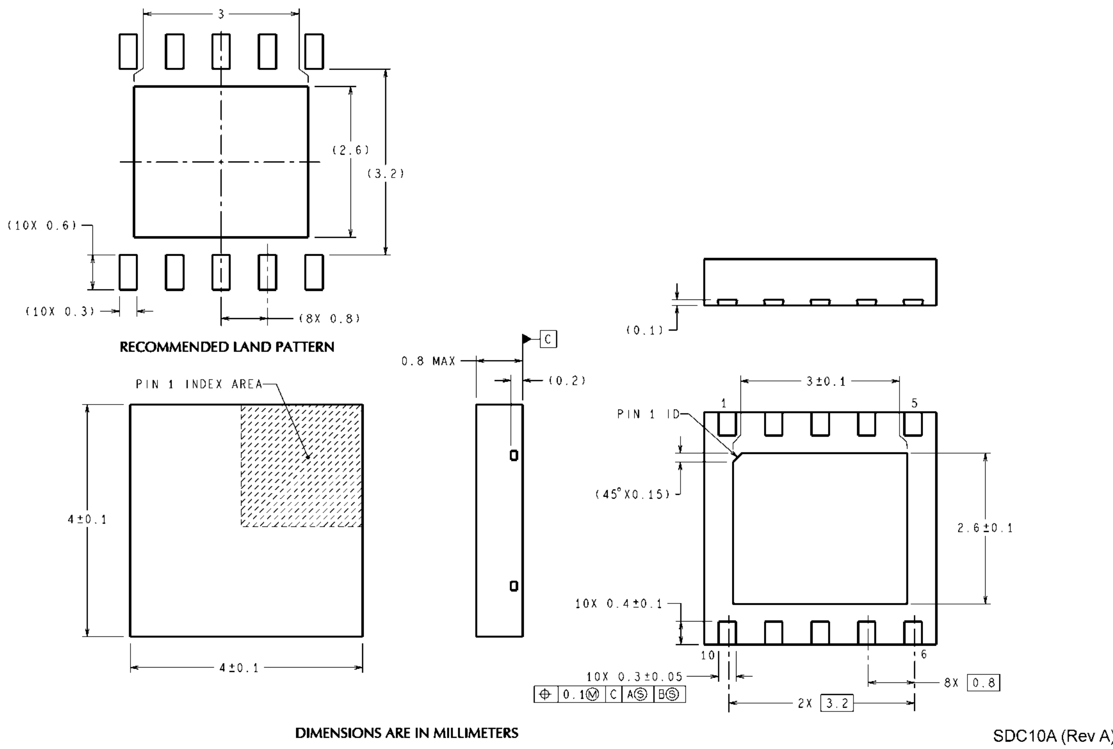
TABLE 2. Bill Of Materials

Designator	Value	Tolerance	Part Description	Comments
R_{IN1}	20kΩ	1%	1/8W, 0805 Resistor	
R_1	200kΩ	1%	1/8W, 0805 Resistor	
R_{PULLUP}	100kΩ	1%	1/8W, 0805 Resistor	
R_2	1kΩ	1%	1/8W, 0805 Resistor	
R_4, R_5	0Ω	1%	1/8W, 0805 Resistor	
C_{IN1}	0.39µF	10%	Ceramic Capacitor, 25V, Size 1206	
C_{SUPPLY}	4.7µF	10%	16V Tantalum Capacitor, Size A	
C_{BYPASS}	1µF	10%	16V Tantalum Capacitor, Size A	
C_1				Not Used
			0.100” 1x2 header, vertical mount	Input, Output, Vdd/GND Shutdown
U_1			LM4951A, Mono, 1.8W, Audio Amplifier	SDC10A package

Revision History

Rev	Date	Description
1.0	08/13/08	Initial release.
1.01	09/05/08	Text edits.

Physical Dimensions inches (millimeters) unless otherwise noted



SDC10A (Rev A)

Order Number LM4951ASD
NS Package Number SDC10A

Notes

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