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National Semiconductor

August 2000

# LM384
# 5W Audio Power Amplifier

## General Description

The LM384 is a power audio amplifier for consumer applications. In order to hold system cost to a minimum, gain is internally fixed at 34 dB. A unique input stage allows ground referenced input signals. The output automatically self-centers to one-half the supply voltage.

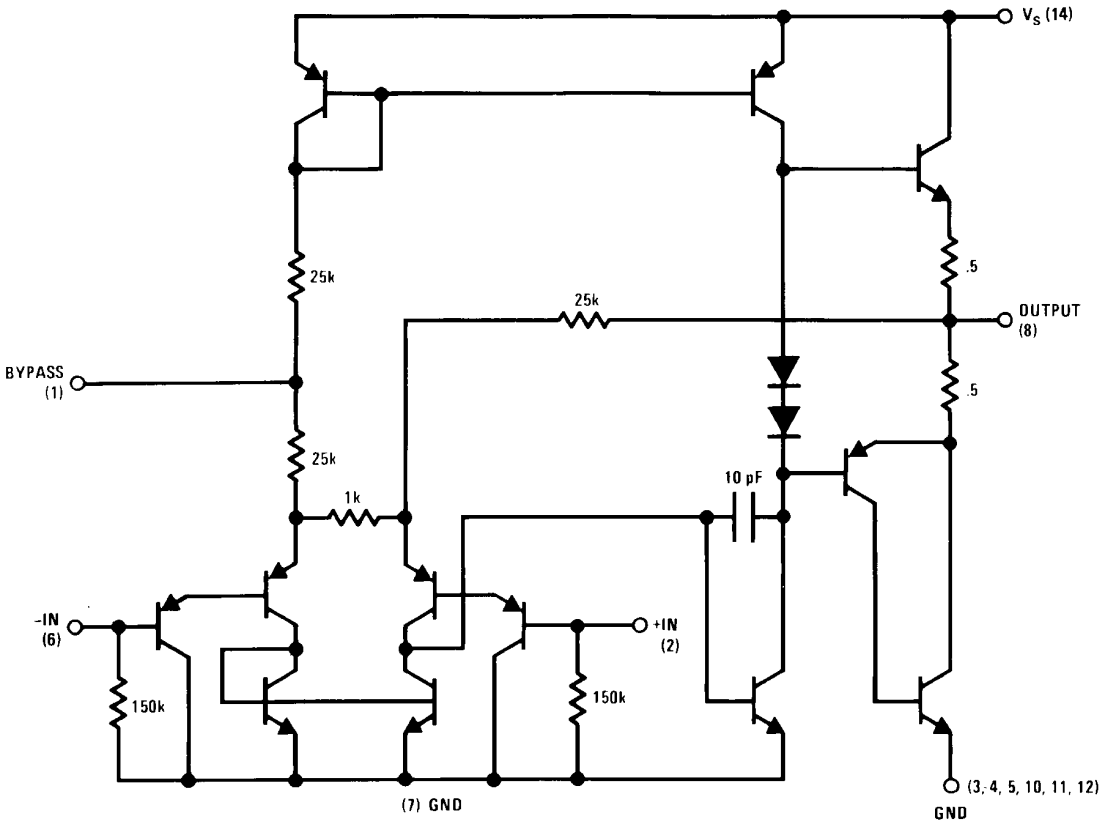
The output is short-circuit proof with internal thermal limiting. The package outline is standard dual-in-line. A copper lead frame is used with the center three pins on either side comprising a heat sink. This makes the device easy to use in standard p-c layout.

Uses include simple phonograph amplifiers, intercoms, line drivers, teaching machine outputs, alarms, ultrasonic drivers, TV sound systems, AM-FM radio, sound projector systems, etc. See AN-69 for circuit details.

## Features

- Wide supply voltage range: 12V to 26V
- Low quiescent power drain
- Voltage gain fixed at 50
- High peak current capability: 1.3A
- Input referenced to GND
- High input impedance: 150kΩ
- Low distortion: 0.25% ($P_O$=4W, $R_L$=8Ω)
- Quiescent output voltage is at one half of the supply voltage
- Standard dual-in-line package

## Schematic Diagram

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## Absolute Maximum Ratings (Note 1)

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

| | |
|---|---|
| Supply Voltage | 28V |
| Peak Current | 1.3A |
| Power Dissipation (See (Notes 4, 5)) | 1.67W |
| Input Voltage | ±0.5V |
| Storage Temperature | −65˚C to +150˚C |
| Operating Temperature | 0˚C to +70˚C |
| Lead Temperature (Soldering, 10 sec.) | 260˚C |
| Thermal Resistance | |
| $\theta_{JC}$ | 30˚C/W |
| $\theta_{JA}$ | 79˚C/W |

**Note 1:** Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits.

## Electrical Characteristics (Note 2)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| $Z_{IN}$ | Input Resistance | | | 150 | | kΩ |
| $I_{BIAS}$ | Bias Current | Inputs Floating | | 100 | | nA |
| $A_V$ | Gain | | 40 | 50 | 60 | V/V |
| $P_{OUT}$ | Output Power | THD = 10%, $R_L$ = 8Ω | 5 | 5.5 | | W |
| $I_Q$ | Quiescent Supply Current | | | 8.5 | 25 | mA |
| $V_{OUT\ Q}$ | Quiescent Output Voltage | | | 11 | | V |
| BW | Bandwidth | $P_{OUT}$ = 2W, $R_L$ = 8Ω | | 450 | | kHz |
| $V^+$ | Supply Voltage | | 12 | | 26 | V |
| $I_{SC}$ | Short Circuit Current (Note 6) | | | 1.3 | | A |
| $PSRR_{RTO}$ | Power Supply Rejection Ratio (Note 3) ) | | | 31 | | dB |
| THD | Total Harmonic Distortion | $P_{OUT}$ = 4W, $R_L$ = 8Ω | | 0.25 | 1.0 | % |

**Note 2:** $V^+$ = 22V and $T_A$ = 25˚C operating with a Staver V7 heat sink for 30 seconds.

**Note 3:** Rejection ratio referred to the output with $C_{BYPASS}$ = 5 µF, freq = 120 Hz.

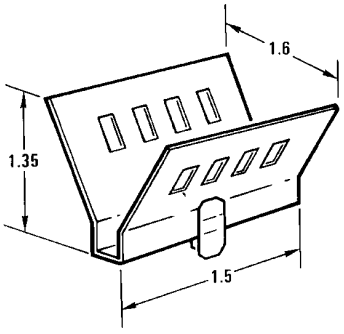
**Note 4:** The maximum junction temperature of the LM384 is 150˚C.

**Note 5:** The package is to be derated at 15˚C/W junction to heat sink pins.

**Note 6:** Output is fully protected against a shorted speaker condition at all voltages up to 22V.

## Heat Sink Dimensions

**Staver "V7" Heat Sink**

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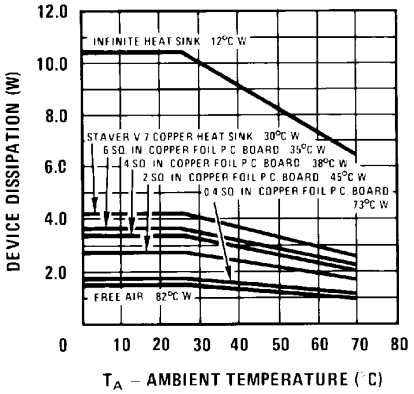
Staver Company
41 Saxon Ave.
P.O. Drawer H
Bay Shore, N.Y.
Tel: (516) 666-8000

# Typical Performance Characteristics

**Device Dissipation vs Ambient Temperature**

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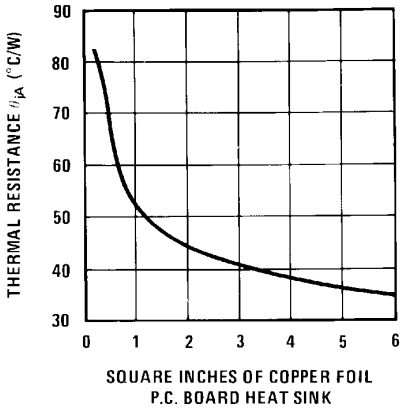
**Thermal Resistance vs Square Inches**

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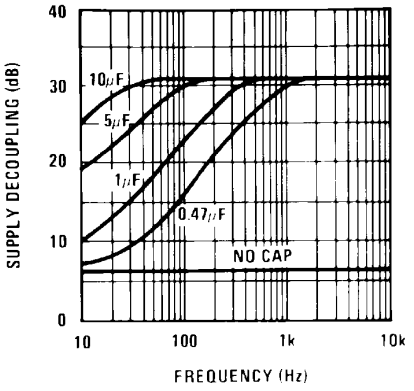
**Supply Decoupling vs Frequency**

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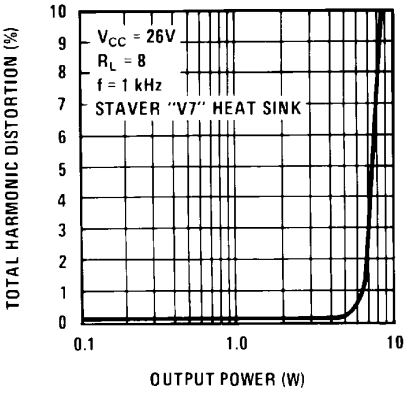
**Total Harmonic Distortion vs Output Power**

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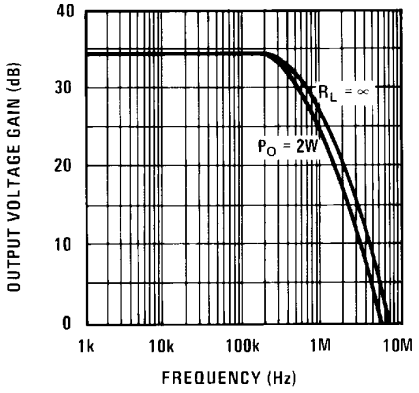
**Output Voltage Gain vs Frequency**

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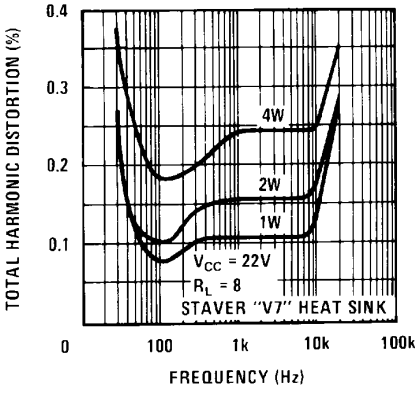
**Total Harmonic Distortion vs Frequency**

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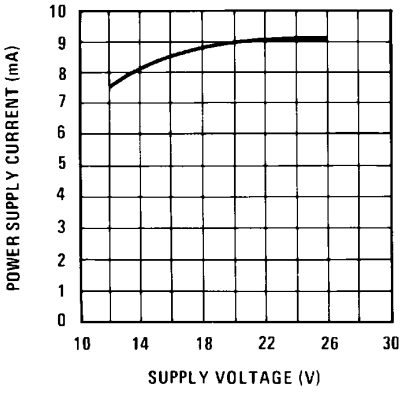
## Typical Performance Characteristics (Continued)

**Power Supply Current vs Supply Voltage**

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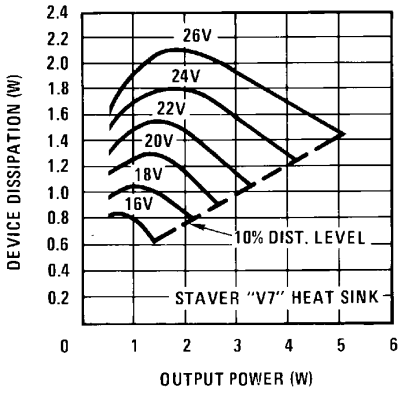
**Device Dissipation vs Output Power—16Ω Load**

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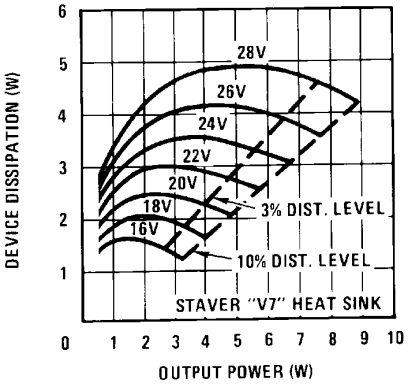
**Device Dissipation vs Output Power—8Ω Load**

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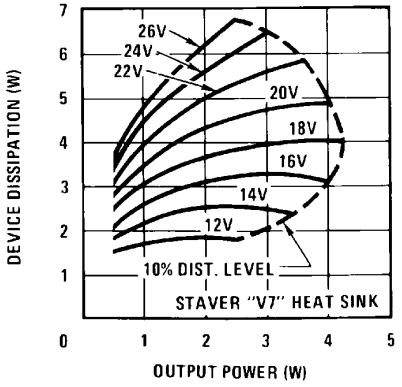
**Device Dissipation vs Output Power—4Ω Load**

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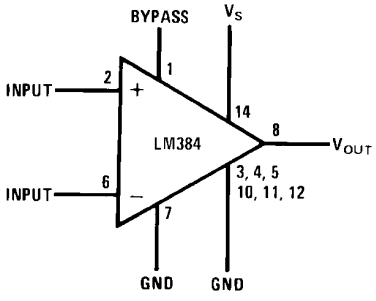
## Block and Connection Diagrams

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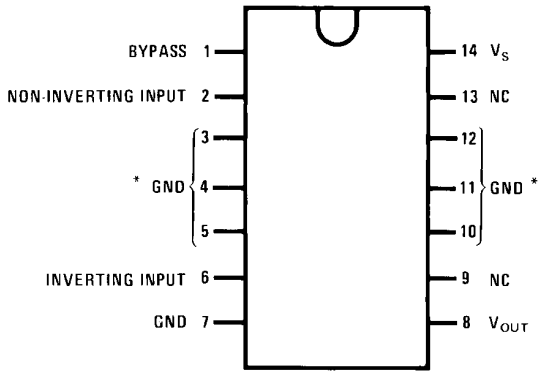
**Dual-In-Line Package**

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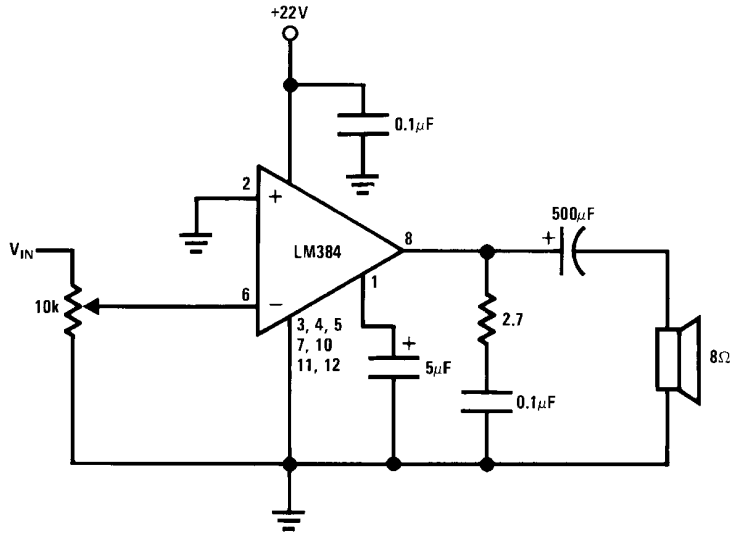
**Note 7:** Heatsink Pins

**Top View Order Number LM384NSee NS Package Number N14A**

# Typical Applications

**Typical 5W Amplifier**

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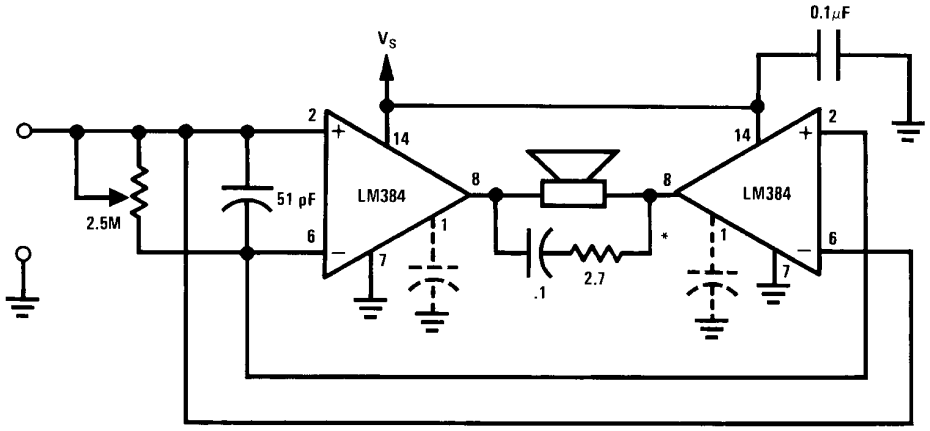
**Bridge Amplifier**

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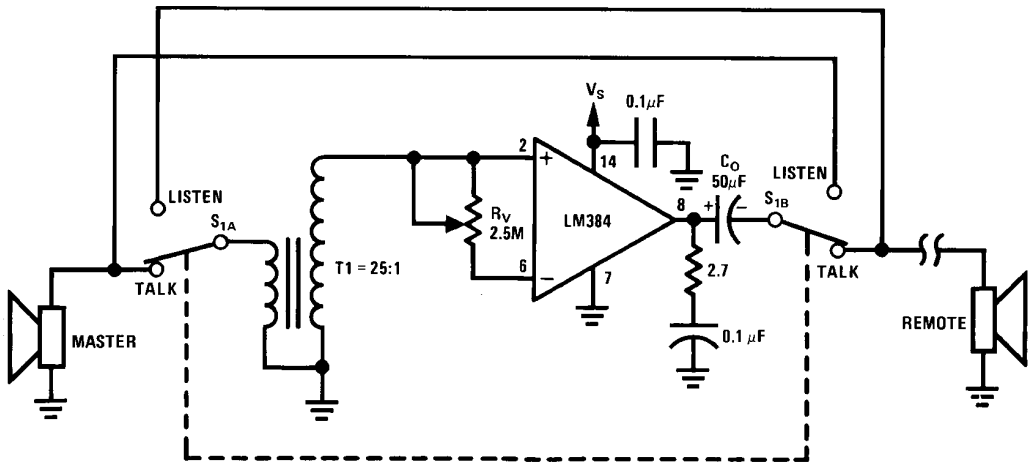
**Intercom**

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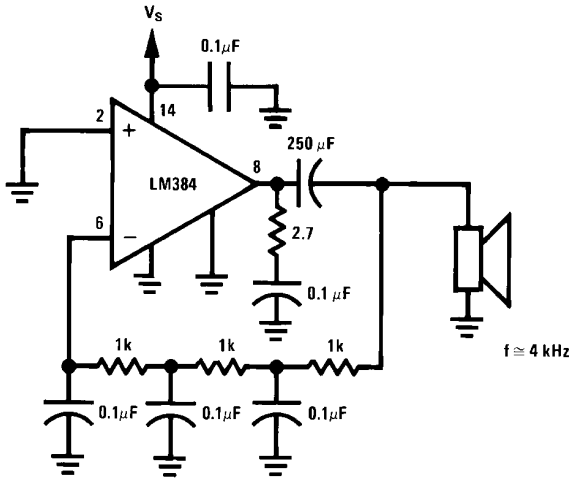
*For stability with high current loads

## Typical Applications (Continued)

**Phase Shift Oscillator**

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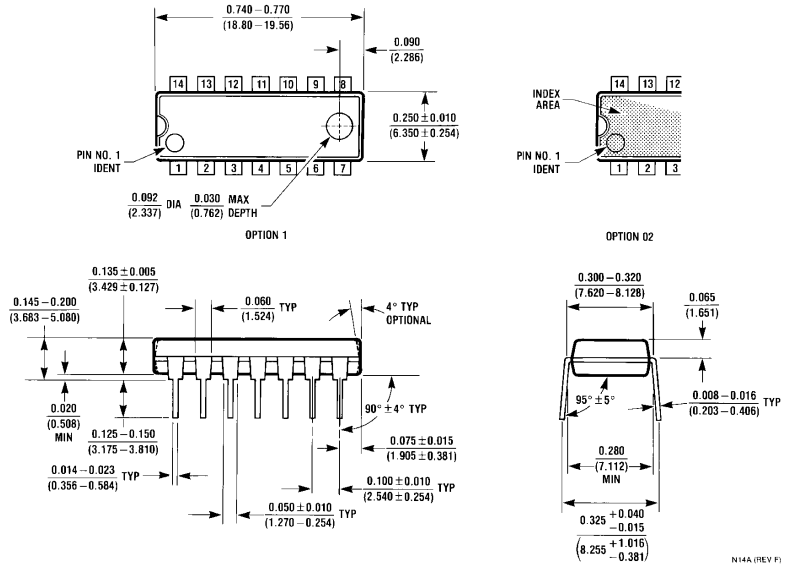
## Physical Dimensions inches (millimeters) unless otherwise noted




**Molded Dual-In-Line Package (N)**
**Order Number LM384N**
**NS Package Number N14A**



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