

LM380

2.5W Audio Power Amplifier

General Description

The LM380 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. The LM380N uses a copper lead frame. The center three pins on either side comprise a heat sink. This makes the device easy to use in standard PC layouts.

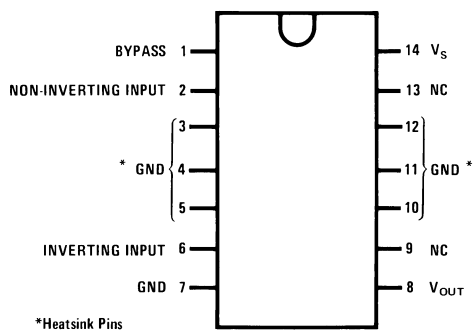
Uses include simple phonograph amplifiers, intercoms, line drivers, teaching machine outputs, alarms, ultrasonic drivers, TV sound systems, AM-FM radio, small servo drivers, power converters, etc.

A selected part for more power on higher supply voltages is available as the LM384. For more information see AN-69.

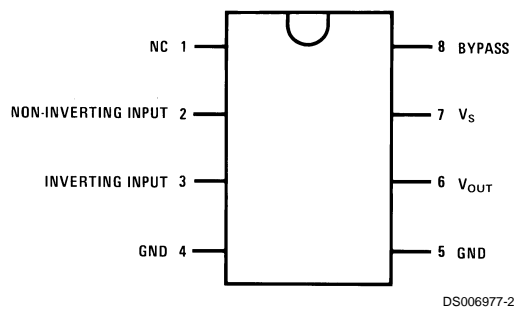
Features

- Wide supply voltage range: 10V-22V
- Low quiescent power drain: 0.13W ($V_S = 18V$)
- Voltage gain fixed at 50
- High peak current capability: 1.3A
- Input referenced to GND
- High input impedance: 150k Ω
- Low distortion
- Quiescent output voltage is at one-half of the supply voltage
- Standard dual-in-line package

Connection Diagrams (Dual-In-Line Packages, Top View)

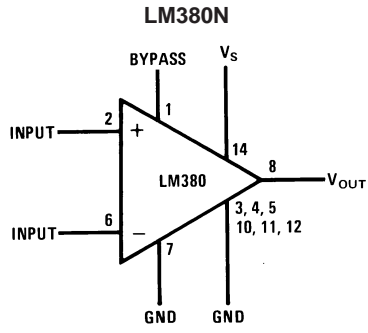


Order Number LM380N
See NS Package Number N14A

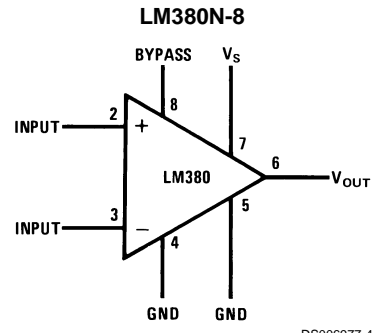


Order Number LM380N-8
See NS Package Number N08E

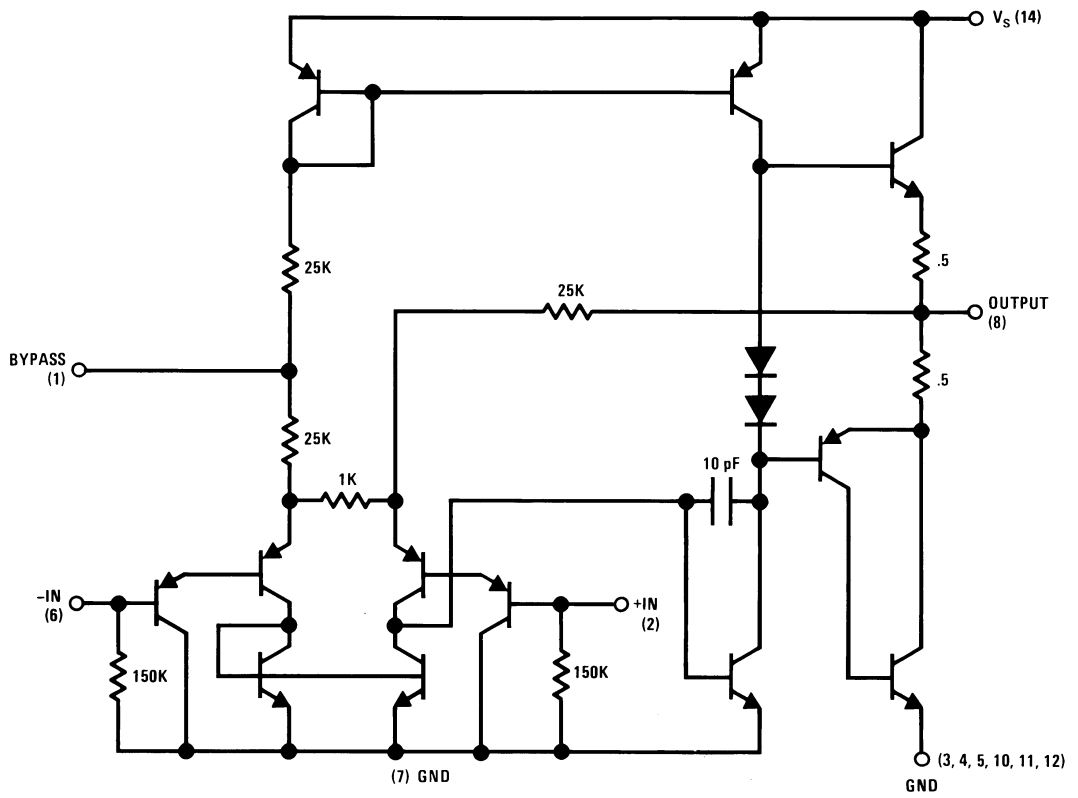
Block and Schematic Diagrams



DS006977-3



DS006977-4



DS006977-5

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 | 22V |
| Peak Current | 1.3A |
| Package Dissipation 14-Pin DIP (Note 7) | 8.3W |
| Package Dissipation 8-Pin DIP (Note 7) | 1.67W |
| Input Voltage | ±0.5V |
| Storage Temperature | -65°C to +150°C |

| | |
|---------------------------------------|--------------|
| Operating Temperature | 0°C to +70°C |
| Junction Temperature | +150°C |
| Lead Temperature (Soldering, 10 sec.) | +260°C |
| ESD rating to be determined | |
| Thermal Resistance | |
| θ_{JC} (14-Pin DIP) | 30°C/W |
| θ_{JC} (8-Pin DIP) | 37°C/W |
| θ_{JA} (14-Pin DIP) | 79°C/W |
| θ_{JA} (8-Pin DIP) | 107°C/W |

Electrical Characteristics (Note 2)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|----------------|------------------------------|---|-----|------|-----|-----------|
| $P_{OUT(RMS)}$ | Output Power | $R_L = 8\Omega$, THD = 3% (Notes 4, 5) | 2.5 | | | W |
| A_V | Gain | | 40 | 50 | 60 | V/V |
| V_{OUT} | Output Voltage Swing | $R_L = 8\Omega$ | | 14 | | V_{P-P} |
| Z_{IN} | Input Resistance | | | 150k | | Ω |
| THD | Total Harmonic Distortion | (Notes 5, 6) | | 0.2 | | % |
| PSRR | Power Supply Rejection Ratio | (Note 3) | | 38 | | dB |
| V_S | Supply Voltage | | 10 | | 22 | V |
| BW | Bandwidth | $P_{OUT} = 2W$, $R_L = 8\Omega$ | | 100k | | Hz |
| I_Q | Quiescent Supply Current | | | 7 | 25 | mA |
| V_{OUTQ} | Quiescent Output Voltage | | 8 | 9.0 | 10 | V |
| I_{BIAS} | Bias Current | Inputs Floating | | 100 | | nA |
| I_{SC} | Short Circuit Current | | | 1.3 | | A |

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.

Note 2: $V_S = 18V$ and $T_A = 25^\circ C$ unless otherwise specified.

Note 3: Rejection ratio referred to the output with $C_{BYPASS} = 5 \mu F$.

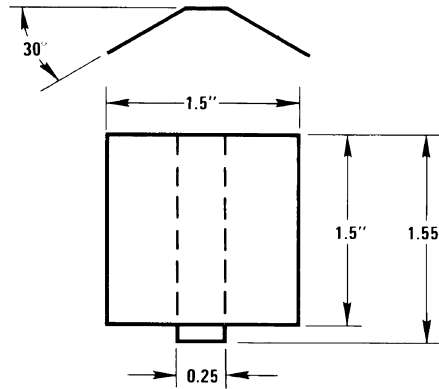
Note 4: With device Pins 3, 4, 5, 10, 11, 12 soldered into a 1/16" epoxy glass board with 2 ounce copper foil with a minimum surface of 6 square inches.

Note 5: $C_{BYPASS} = 0.47 \mu F$ on Pin 1.

Note 6: The maximum junction temperature of the LM380 is 150°C.

Note 7: The package is to be derated at 15°C/W junction to heat sink pins for 14-pin pkg; 75°C/W for 8-pin.

Heat Sink Dimensions

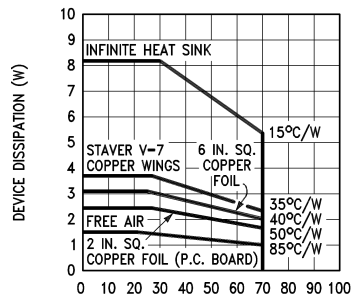


DS006977-6

Staver Heat Sink #V-7
 Staver Company
 41 Saxon Ave.
 P.O. Drawer H
 Bayshore, NY 11706
 Tel: (516) 666-8000
 Copper Wings
 2 Required
 Soldered to
 Pins 3, 4, 5,
 10, 11, 12
 Thickness 0.04
 Inches

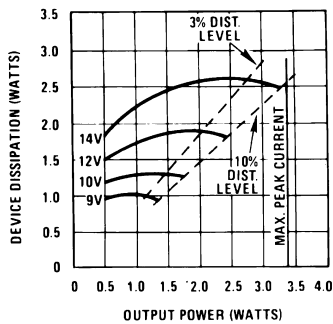
Typical Performance Characteristics

Maximum Device Dissipation vs Ambient Temperature



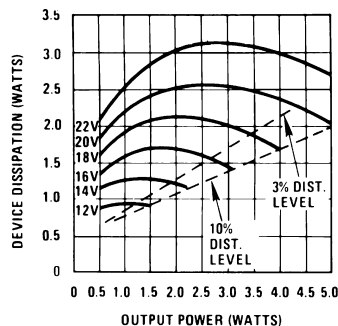
T_A - AMBIENT TEMPERATURE ($^{\circ}C$)
 Note: 2 oz. copper foil, single-sided PC board.
 DS006977-12

Device Dissipation vs Output Power — 4Ω Load



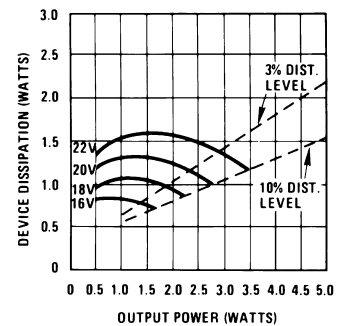
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Device Dissipation vs Output Power — 8Ω Load



DS006977-14

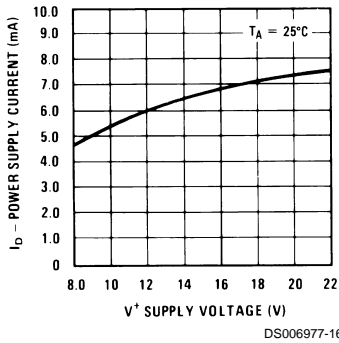
Device Dissipation vs Output Power — 16Ω Load



DS006977-15

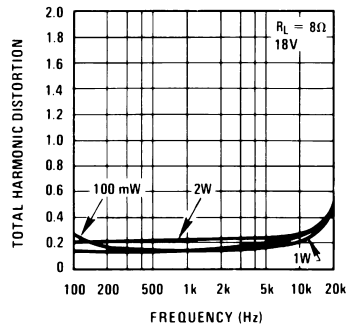
Typical Performance Characteristics (Continued)

Power Supply Current vs Supply Voltage



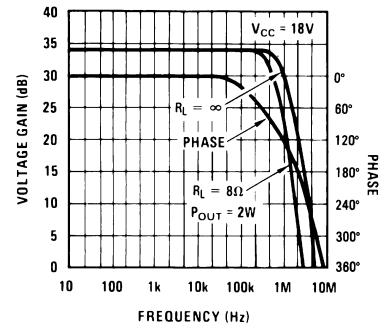
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Total Harmonic Distortion vs Frequency



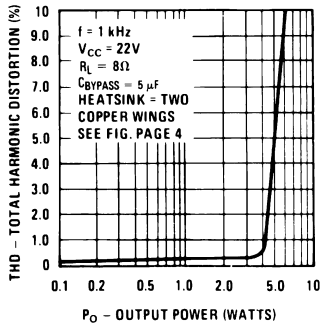
DS006977-17

Output Voltage Gain and Phase vs Frequency



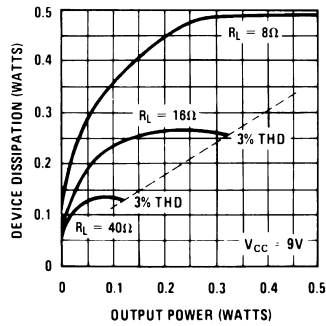
DS006977-18

Total Harmonic Distortion vs Output Power



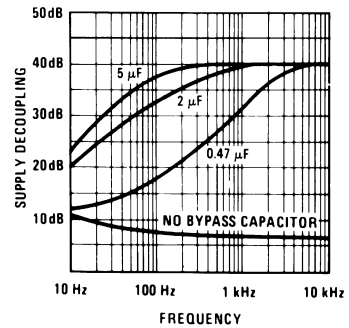
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Device Dissipation vs Output Power



DS006977-20

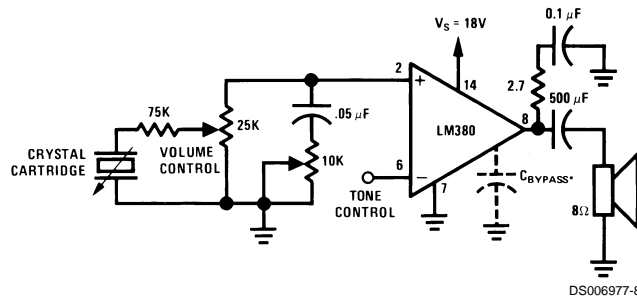
Supply Decoupling vs Frequency



DS006977-21

Typical Applications

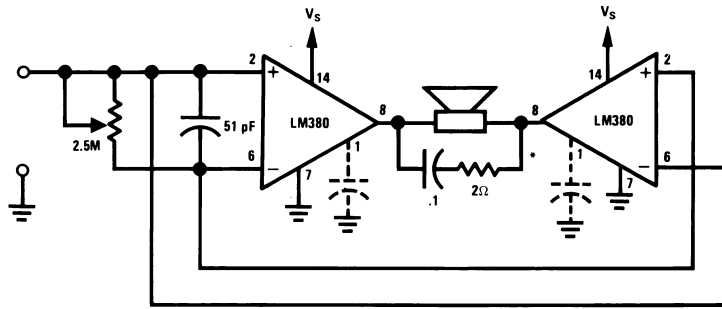
Phono Amplifier



DS006977-8

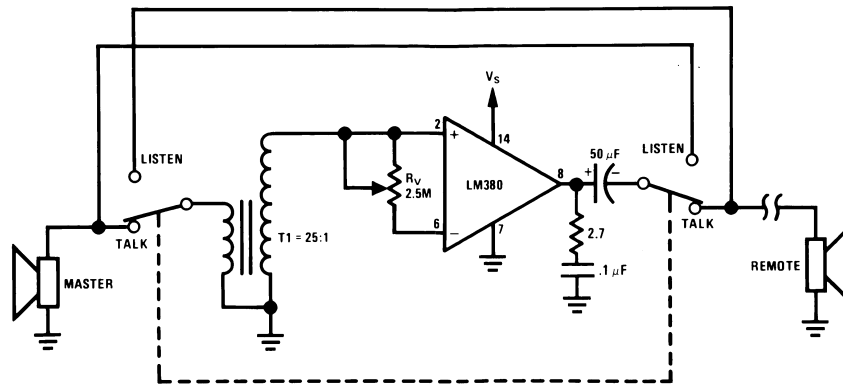
Typical Applications (Continued)

Bridge Amplifier



DS006977-9

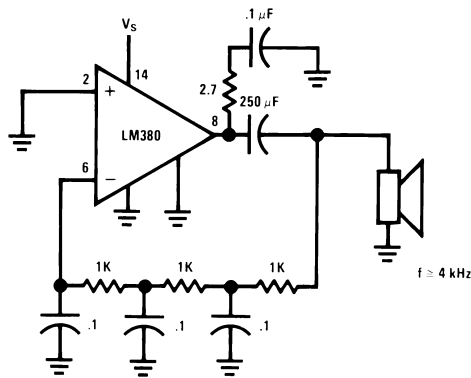
Intercom



*FOR STABILITY WITH HIGH CURRENT LOADS

DS006977-10

Phase Shift Oscillator

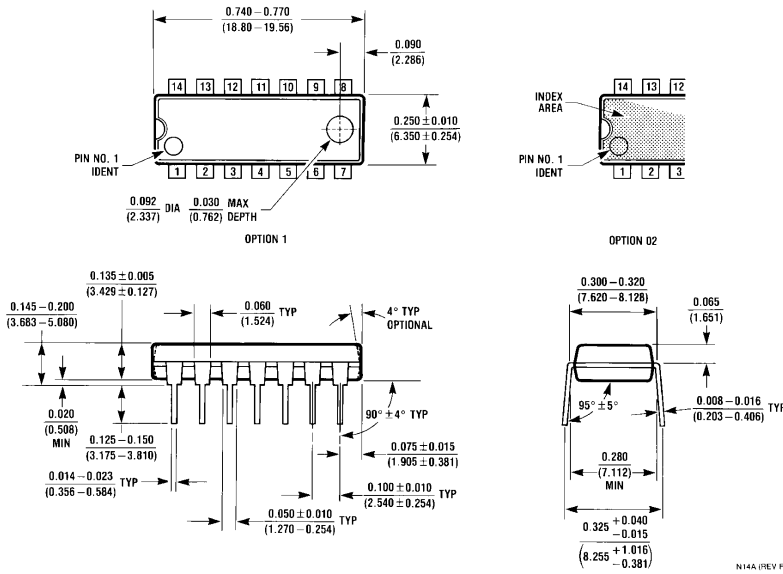


DS006977-11

Physical Dimensions inches (millimeters) unless otherwise noted



Molded Dual-In-Line Package (N)
Order Number LM380N-8
NS Package Number N08E



Molded Dual-In-Line Package (N)
Order Number LM380N
NS Package Number N14A

Notes

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