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.

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: 150kΩ
- Low distortion
- Quiescent output voltage is at one-half of the supply voltage
- Standard dual-in-line package

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

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

LM380N
BYPASS  V_S
1  14  V_OUT
INPUT
2 +  14  V_OUT
LM380
INPUT
6 -  5  10, 11, 12
GND  GND

LM380N-8
BYPASS  V_S
2 +  8  V_OUT
INPUT
3 -  6  V_OUT
LM380
INPUT
4 -  5
GND  GND

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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 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
θJC (14-Pin DIP) 30˚C/W
θJC (8-Pin DIP) 37˚C/W
θJA (14-Pin DIP) 79˚C/W
θJA (8-Pin DIP) 107˚C/W

Electrical Characteristics (Note 2)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>POUT(RMS)</td>
<td>Output Power</td>
<td>R_L = 8Ω, THD = 3% (Notes 4, 5)</td>
<td>2.5</td>
<td></td>
<td></td>
<td>W</td>
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<tr>
<td>AV</td>
<td>Gain</td>
<td></td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>V/V</td>
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<tr>
<td>VOUT</td>
<td>Output Voltage Swing</td>
<td>R_L = 8Ω</td>
<td>14</td>
<td></td>
<td></td>
<td>V_p-p</td>
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<tr>
<td>ZIN</td>
<td>Input Resistance</td>
<td></td>
<td>150k</td>
<td></td>
<td></td>
<td>Ω</td>
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<tr>
<td>THD</td>
<td>Total Harmonic Distortion</td>
<td>(Notes 5, 6)</td>
<td>0.2</td>
<td></td>
<td></td>
<td>%</td>
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<tr>
<td>PSRR</td>
<td>Power Supply Rejection Ratio</td>
<td>(Note 3)</td>
<td>38</td>
<td></td>
<td></td>
<td>dB</td>
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<tr>
<td>V_S</td>
<td>Supply Voltage</td>
<td></td>
<td>10</td>
<td>22</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>BW</td>
<td>Bandwidth</td>
<td>P_OUT = 2W, R_L = 8Ω</td>
<td>100k</td>
<td></td>
<td></td>
<td>Hz</td>
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<tr>
<td>IO</td>
<td>Quiescent Supply Current</td>
<td></td>
<td>7</td>
<td>25</td>
<td></td>
<td>mA</td>
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<tr>
<td>VOUTQ</td>
<td>Quiescent Output Voltage</td>
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<td>8</td>
<td>9.0</td>
<td>10</td>
<td>V</td>
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<tr>
<td>I_BIAS</td>
<td>Bias Current</td>
<td>Inputs Floating</td>
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<td>nA</td>
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<td>ISC</td>
<td>Short Circuit Current</td>
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<td>1.3</td>
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<td></td>
<td>A</td>
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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: VS = 18V and TA = 25˚C unless otherwise specified.

Note 3: Rejection ratio referred to the output with CBYPASS = 5 µF.

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: CBYPASS = 0.47 µfd 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

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

- Infinite Heat Sink
- Staver #V-7
- 6 in. Sq. Copper Wings
- Copper Foil
- Free Air
- 2 in. Sq. Copper Foil (P.C. Board)

$T_a =$ Ambient Temperature (°C)

Note: 2 oz. copper foil, single-sided PCB board.

Device Dissipation vs Output Power — 4Ω Load

- 3% Dist Level
- 10% Dist Level
- Max Peak Current

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Typical Performance Characteristics (Continued)

- **Device Dissipation vs Output Power**
  - 8 ohm Load
  - Graph showing device dissipation in watts vs output power.

- **Device Dissipation vs Output Power**
  - 16 ohm Load
  - Graph showing device dissipation in watts vs output power.

- **Power Supply Current vs Supply Voltage**
  - Graph showing power supply current in mA vs supply voltage.
  - TA = 25°C

- **Total Harmonic Distortion vs Frequency**
  - Graph showing total harmonic distortion vs frequency.
  - R1 = 81 ohm
  - 18V

- **Output Voltage Gain and Phase vs Frequency**
  - Graph showing output voltage gain and phase vs frequency.
  - VCC = 18V
  - Rf = 81 ohm
  - Pout = 2W

- **Total Harmonic Distortion vs Output Power**
  - Graph showing total harmonic distortion vs output power.
  - Frequency = 1kHz
  - VCC = 22V
  - Rf = 81 ohm
  - See Fig. Page 4
Typical Performance Characteristics (Continued)

Device Dissipation vs Output Power

Supply Decoupling vs Frequency

Typical Applications

Phono Amplifier

Bridge Amplifier
Typical Applications (Continued)

Intercom

*FOR STABILITY WITH HIGH CURRENT LOADS

Phase Shift Oscillator

f = 4 kHz
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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