National Semiconductor

December 1994

LM380
Audio Power Amplifier

General Description

The LM380 is a power audio amplifier for consumer application. In order to hold system cost to a minimum, gain is internally fixed at 34 dB. A unique input stage allows inputs to be ground referenced. The output is automatically self centering 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.

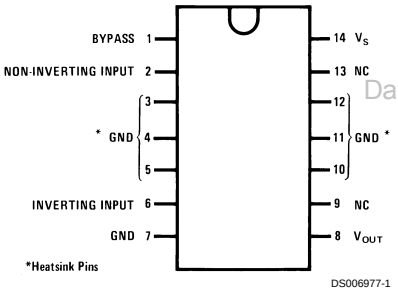
Uses include simple phonograph amplifiers, intercoms, line drivers, teaching machine outputs, alarms, ultrasonic drivers, TV sound systems, AM-FM radio, small servo drivers, power converters, etc.

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

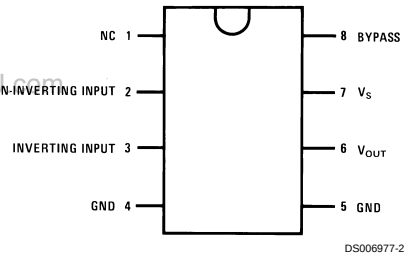
Features

- Wide supply voltage range
- Low quiescent power drain
- Voltage gain fixed at 50
- High peak current capability
- Input referenced to GND
- High input impedance
- 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)



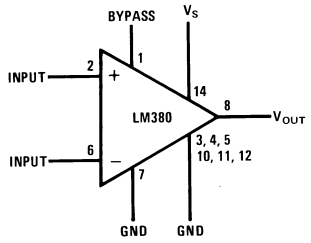
Order Number LM380N
See NS Package Number N14A



Order Number LM380N-8
See NS Package Number N08E

Block and Schematic Diagrams

LM380N



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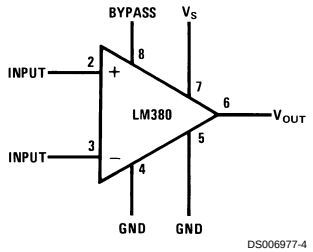
LM380N-8



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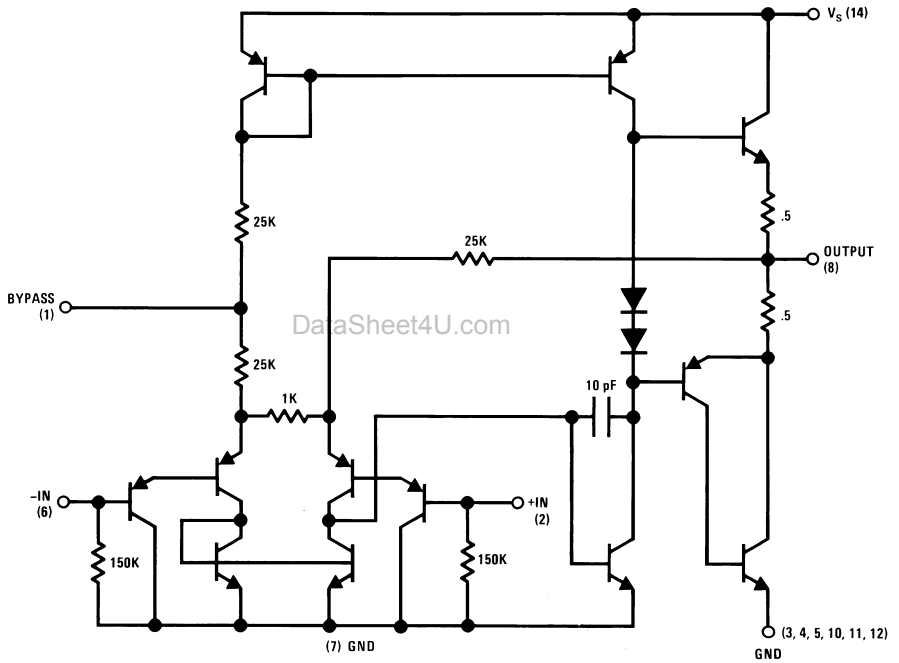

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Absolute Maximum Ratings (Note 1)

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	
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 = 8Ω, THD = 3% (Notes 4, 5)	2.5			W
A_V	Gain		40	50	60	V/V
V_{OUT}	Output Voltage Swing	R_L = 8Ω		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 = 8Ω		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˚C unless otherwise specified.

Note 3: Rejection ratio referred to the output with C_{BYPASS} = 5 µF.

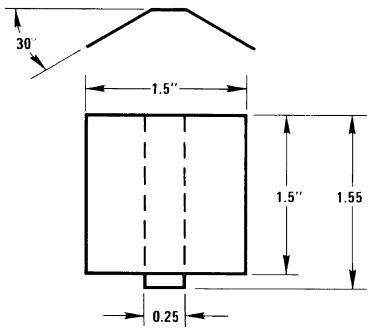
Note 4: With device Pins 3, 4, 5, 10, 11, 12 soldered into a 1/16" epoxy glass board with 2 ounce copper foil with a minimum surface of 6 square inches.

Note 5: C_{BYPASS} = 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



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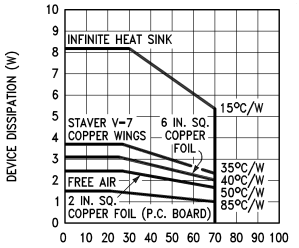
Staver Heat Sink #V-7
Staver Company
41 Saxon Ave.
P.O. Drawer H
Bayshore, NY 11706
Tel: (516) 666-8000
Copper Wings
2 Required
Soldered to
Pins 3, 4, 5,
10, 11, 12
Thickness 0.04
Inches

Typical Performance Characteristics

Maximum Device Dissipation vs Ambient Temperature



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

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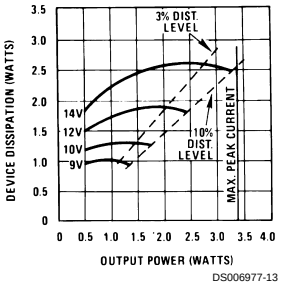
Device Dissipation vs Output Power — 4Ω Load



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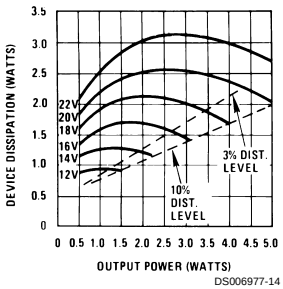
Device Dissipation vs Output Power — 8Ω Load



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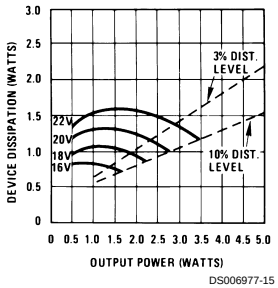
Device Dissipation vs Output Power — 16Ω Load



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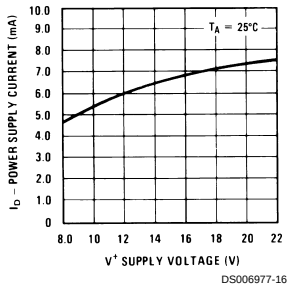
Typical Performance Characteristics (Continued)

Power Supply Current vs Supply Voltage



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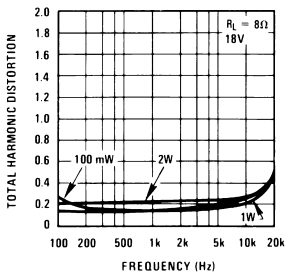
Total Harmonic Distortion vs Frequency



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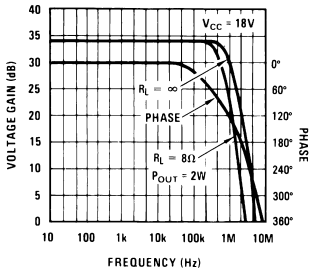
Output Voltage Gain and Phase vs Frequency



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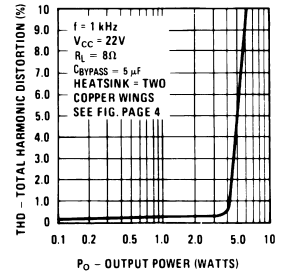
Total Harmonic Distortion vs Output Power



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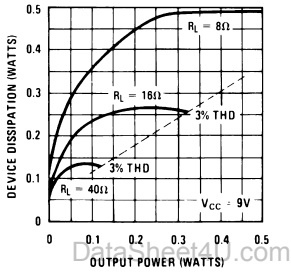
Device Dissipation vs Output Power



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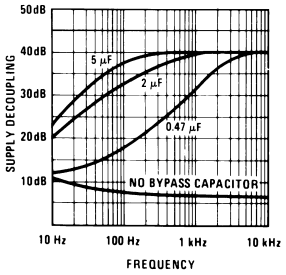
Supply Decoupling vs Frequency



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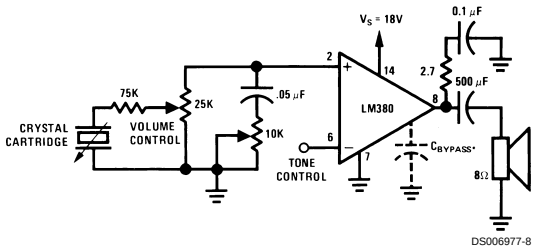
Typical Applications

Phono Amplifier



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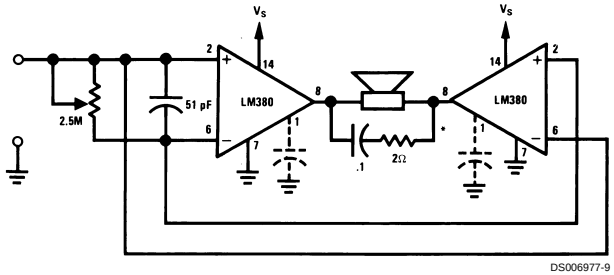
Bridge Amplifier



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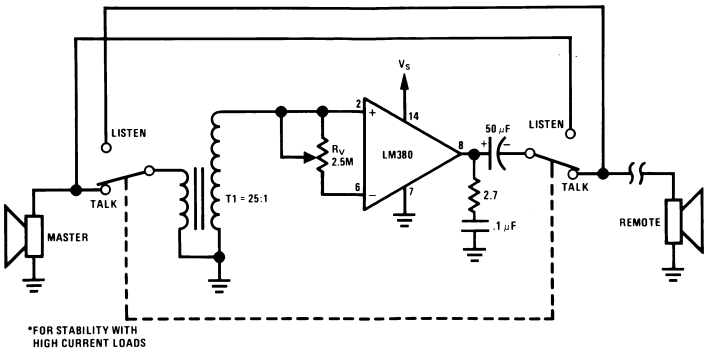
Typical Applications (Continued)

Intercom



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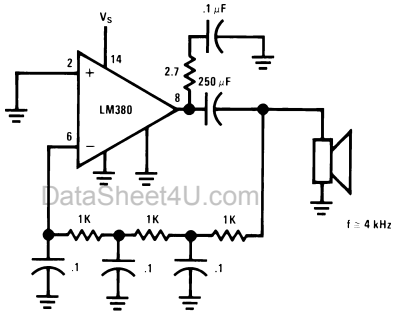
Phase Shift Oscillator



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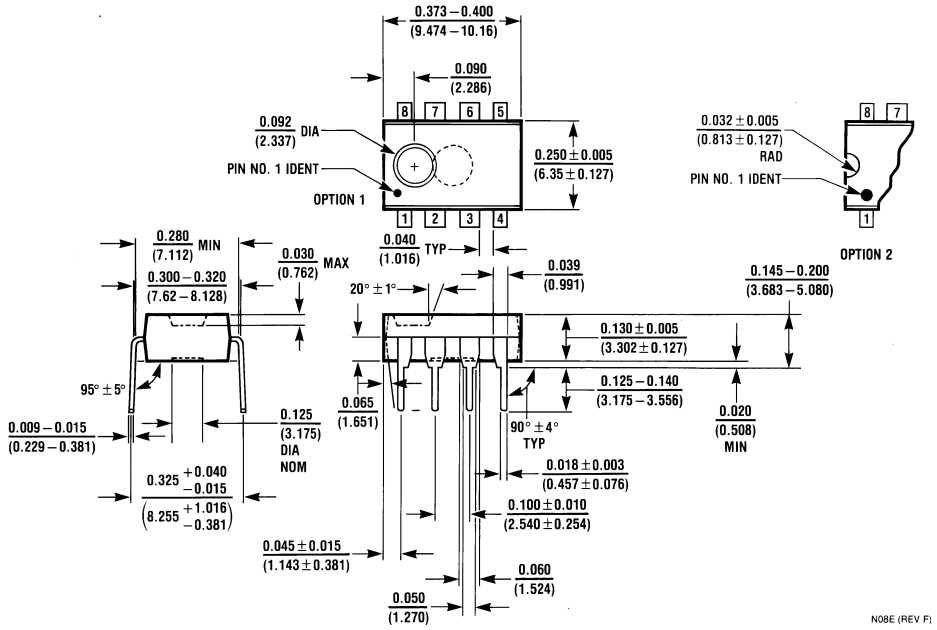
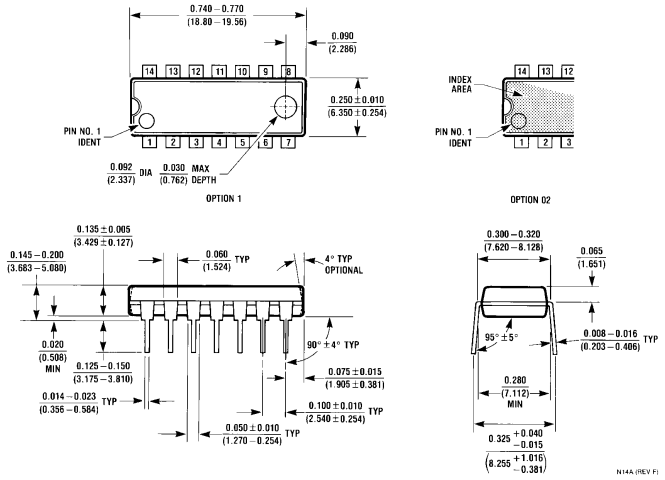
Physical Dimensions inches (millimeters) unless otherwise noted



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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2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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