

## LM380 2.5W Audio Power Amplifier

Check for Samples: [LM380](#)

### 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 $\Omega$
- **Low Distortion**
- **Quiescent Output Voltage is at One-Half of the Supply Voltage**
- **Standard Dual-In-Line Package**

### 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.

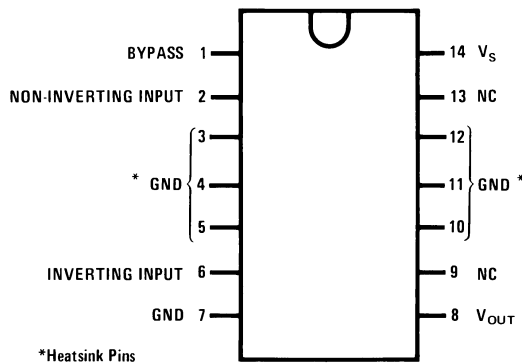
The output is short circuit proof with internal thermal limiting. The package outline is standard dual-in-line. The LM380N uses a copper lead frame. The center three pins on either side comprise a heat sink. This makes the device easy to use in standard PC layouts.

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.

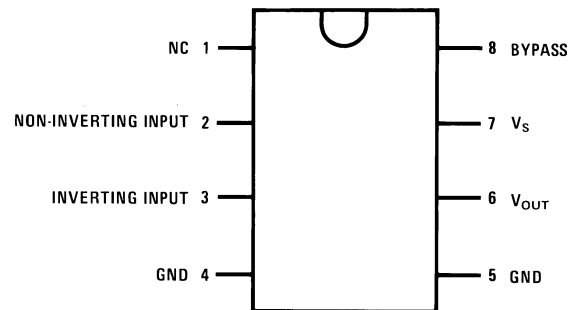
A selected part for more power on higher supply voltages is available as the LM384. For more information see [SNVA025](#).

### Connection Diagrams

(Dual-In-Line Packages, Top View)



**Figure 1. 14-Pin PDIP  
See NFF0014A Package**



**Figure 2. 8-Pin PDIP  
See P Package**



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

The diagram illustrates the internal circuitry of a 14-pin integrated circuit. The circuit is a precision operational amplifier featuring a differential input stage with two 150K resistors connected to the inverting (-IN (6)) and non-inverting (+IN (2)) inputs. The non-inverting input is also connected to a 10 pF capacitor. The input stage is followed by a voltage divider consisting of two 25K resistors, with the midpoint connected to a BYPASS (1) pin. The output stage is a push-pull arrangement of transistors, with the output (OUTPUT (8)) connected to a 25K resistor and a 10 pF capacitor. The circuit is powered by a supply voltage V\_S (14) and grounded at pins (3, 4, 5, 10, 11, 12, 7). The output is also connected to a 25K resistor and a 10 pF capacitor.

Product Folder Links: [LM380](#)



These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

## Absolute Maximum Ratings<sup>(1)(2)</sup>

Supply Voltage		22V
Peak Current		1.3A
Package Dissipation	14-Pin PDIP <sup>(3)</sup>	8.3W
	8-Pin PDIP <sup>(3)</sup>	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	$\theta_{JC}$ (14-Pin PDIP)	30°C/W
	$\theta_{JC}$ (8-Pin PDIP)	37°C/W
	$\theta_{JA}$ (14-Pin PDIP)	79°C/W
	$\theta_{JA}$ (8-Pin PDIP)	107°C/W

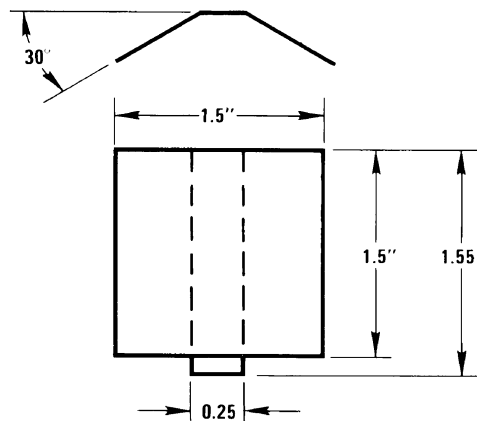
- (1) "Absolute Maximum Ratings" indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not ensure specific performance limits.
- (2) If Military/Aerospace specified devices are required, please contact the Texas Instruments Sales Office/Distributors for availability and specifications.
- (3) 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.

## Electrical Characteristics<sup>(1)</sup>

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$P_{OUT(RMS)}$	Output Power	$R_L = 8\Omega$ , THD = 3% <sup>(2)(3)</sup>	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		$\Omega$
THD	Total Harmonic Distortion	See <sup>(3)(4)</sup>		0.2		%
PSRR	Power Supply Rejection Ratio	See <sup>(5)</sup>		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

- (1)  $V_S = 18V$  and  $T_A = 25^\circ C$  unless otherwise specified.
- (2) 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.
- (3)  $C_{BYPASS} = 0.47 \mu fd$  on Pin 1.
- (4) The maximum junction temperature of the LM380 is 150°C.
- (5) Rejection ratio referred to the output with  $C_{BYPASS} = 5 \mu F$ .

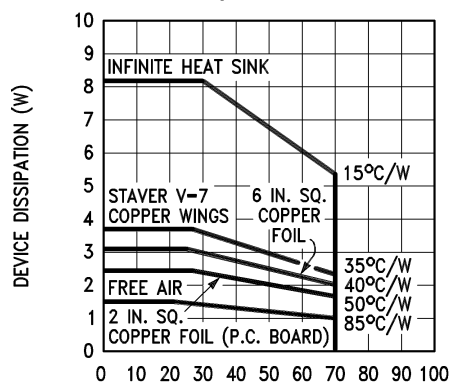
## Heat Sink Dimensions



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



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

Figure 6.

Device Dissipation vs Output Power—4 $\Omega$  Load

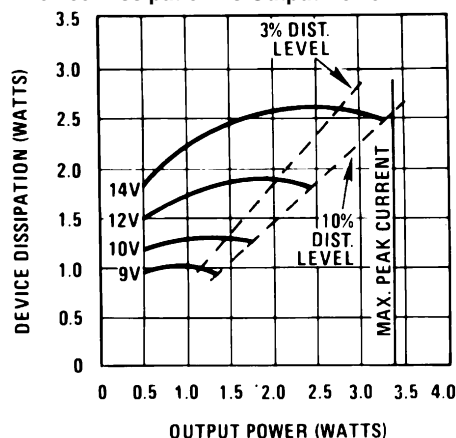


Figure 7.

Device Dissipation vs Output Power—8 $\Omega$  Load

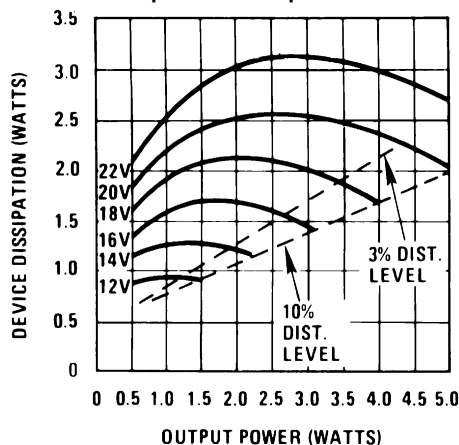


Figure 8.

Device Dissipation vs Output Power—16 $\Omega$  Load

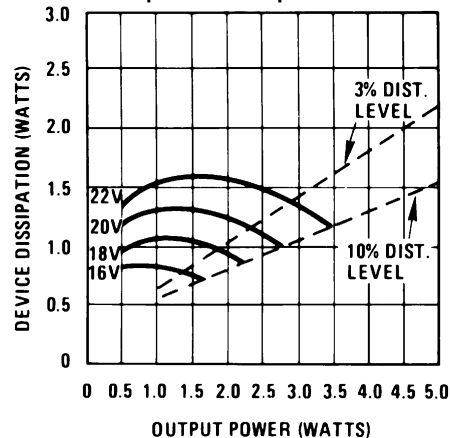


Figure 9.

Power Supply Current vs Supply Voltage

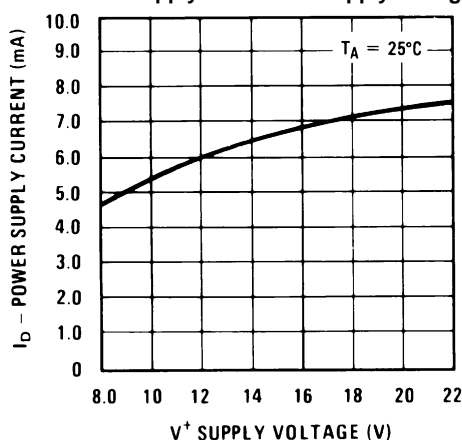


Figure 10.

Total Harmonic Distortion vs Frequency

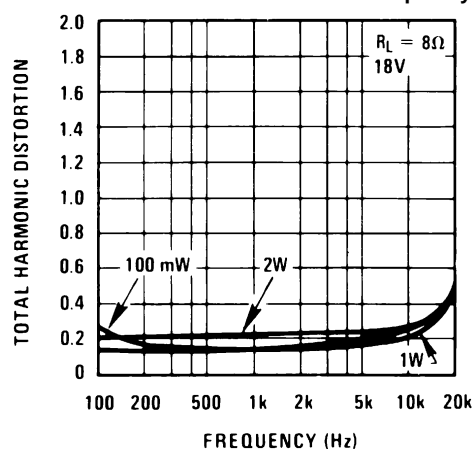


Figure 11.

### Typical Performance Characteristics (continued)

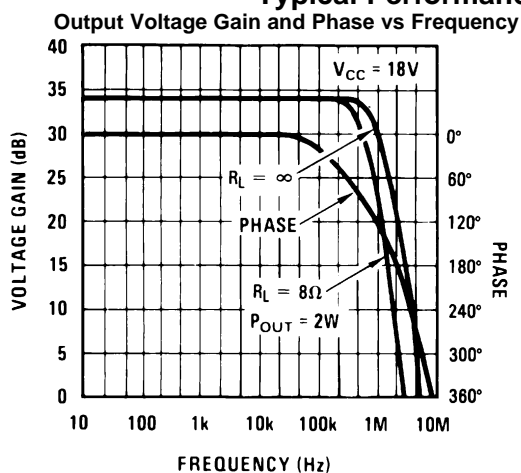


Figure 12.

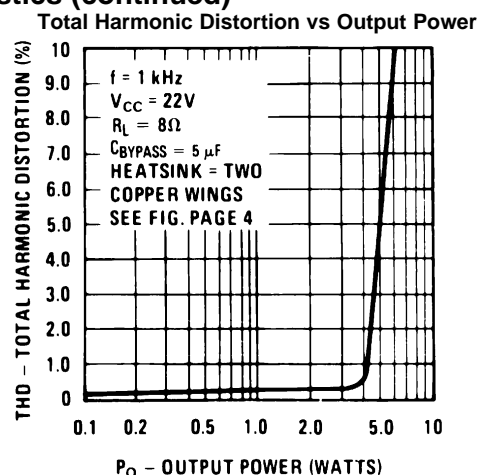


Figure 13.

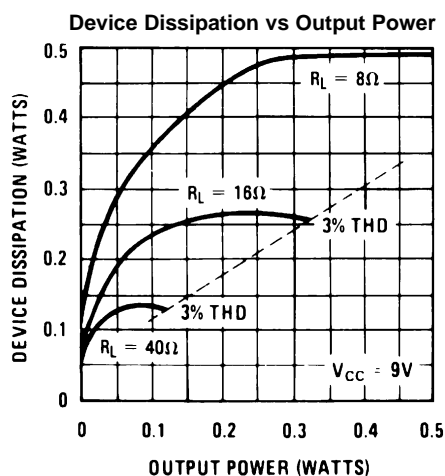


Figure 14.

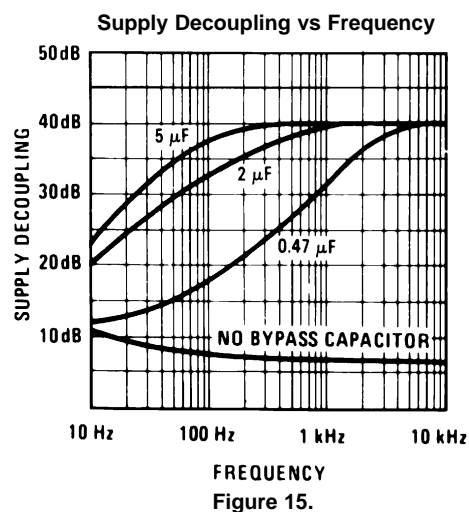


Figure 15.

## Typical Applications

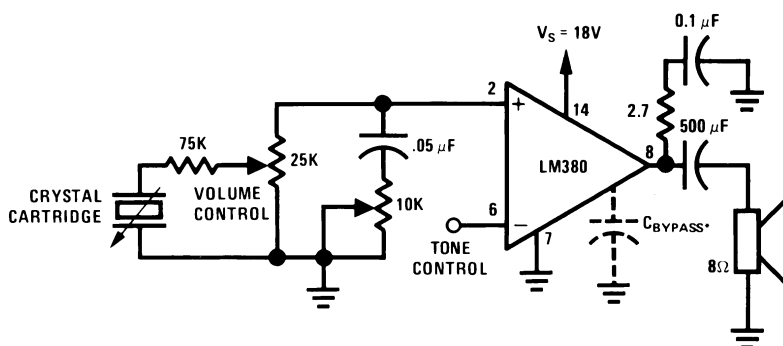


Figure 16. Phono Amplifier

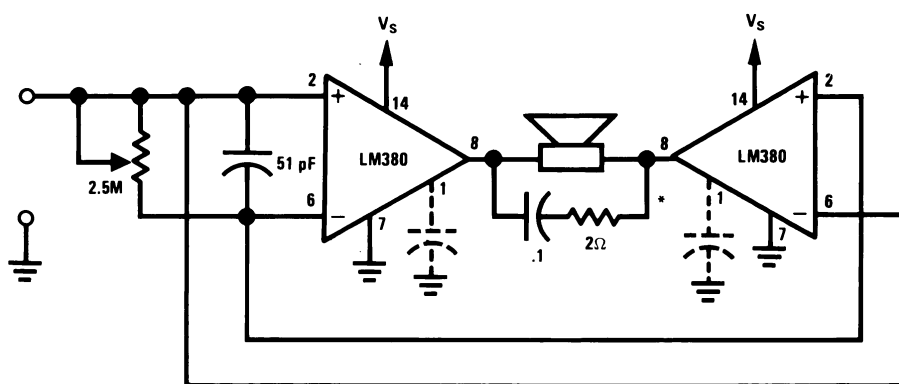


Figure 17. Bridge Amplifier

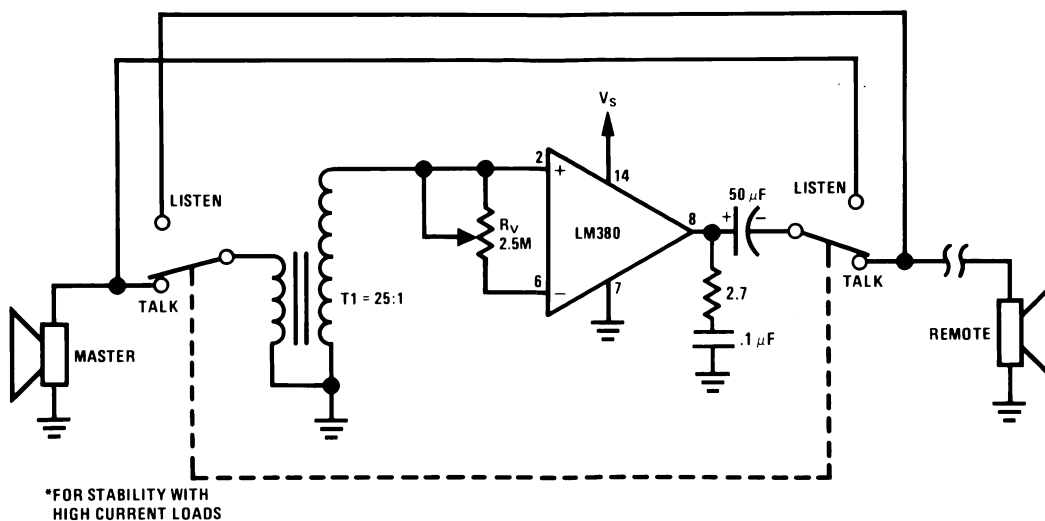


Figure 18. Intercom

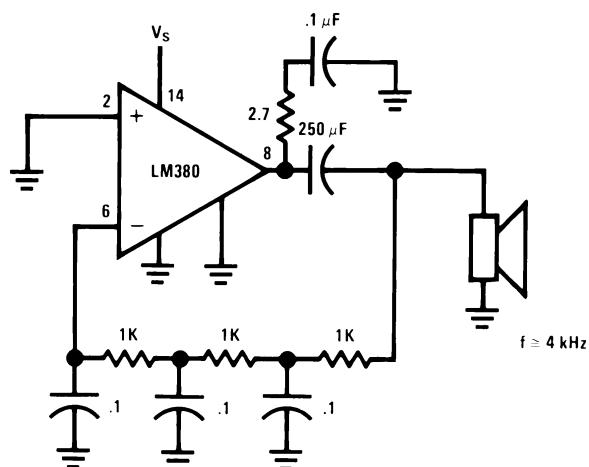


Figure 19. Phase Shift Oscillator



**PACKAGING INFORMATION**

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
LM380N	ACTIVE	PDIP	NFF	14	25	TBD	Call TI	Call TI	0 to 70	LM380N	<a href="#">Samples</a>
LM380N-8/NOPB	ACTIVE	PDIP	P	8	40	Green (RoHS & no Sb/Br)	SN	Level-1-NA-UNLIM	0 to 70	LM 380N-8	<a href="#">Samples</a>
LM380N/NOPB	ACTIVE	PDIP	NFF	14	25	Pb-Free (RoHS Exempt)	SN	Level-1-NA-UNLIM	0 to 70	LM380N	<a href="#">Samples</a>

(1) The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) Only one of markings shown within the brackets will appear on the physical device.

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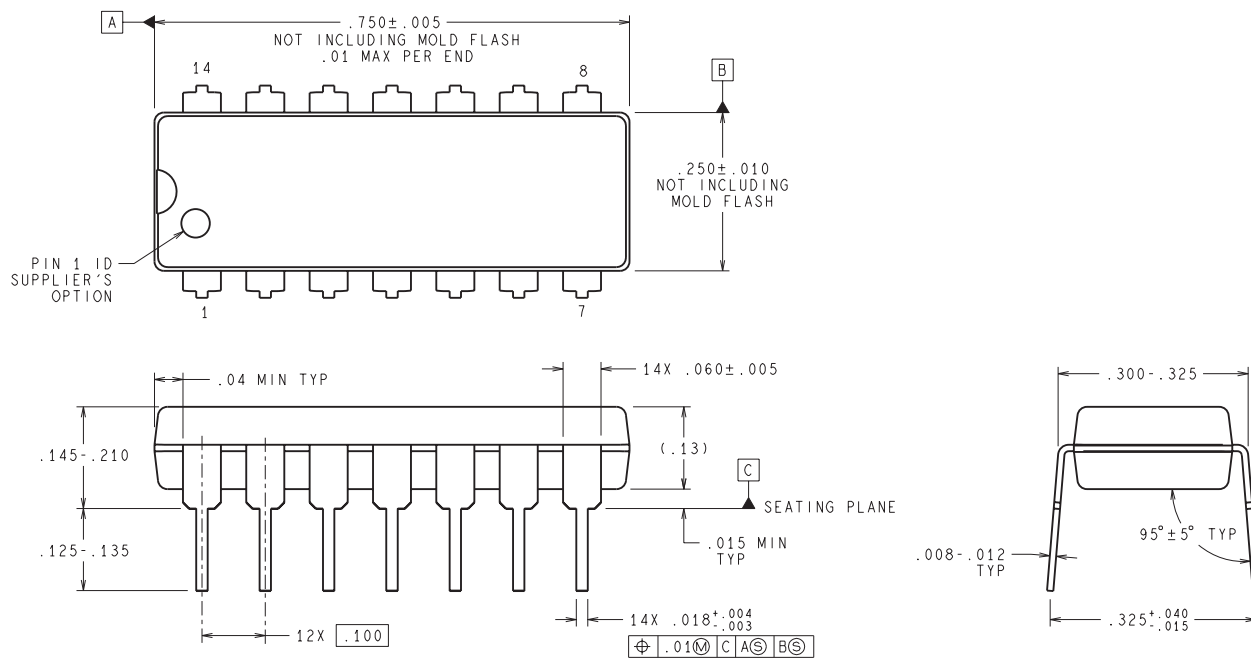
P (R-PDIP-T8)

PLASTIC DUAL-IN-LINE PACKAGE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Falls within JEDEC MS-001 variation BA.

NFF0014A



**DIMENSIONS ARE IN INCHES**  
DIMENSIONS IN ( ) FOR REFERENCE ONLY

N14A (Rev G)

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Data Converters	<a href="http://dataconverter.ti.com">dataconverter.ti.com</a>
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Interface	<a href="http://interface.ti.com">interface.ti.com</a>
Logic	<a href="http://logic.ti.com">logic.ti.com</a>
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Microcontrollers	<a href="http://microcontroller.ti.com">microcontroller.ti.com</a>
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