

# LM387/LM387A Low Noise Dual Preamplifier

## General Description

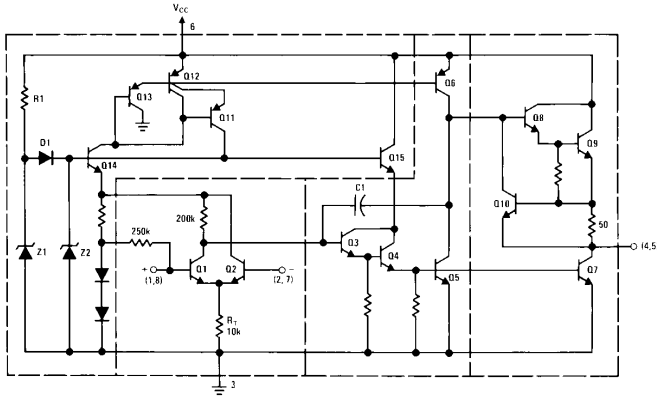
The LM387 is a dual preamplifier for the amplification of low level signals in applications requiring optimum noise performance. Each of the two amplifiers is completely independent, with an internal power supply decoupler-regulator, providing 110 dB supply rejection and 60 dB channel separation. Other outstanding features include high gain (104 dB), large output voltage swing ( $V_{CC} - 2V$ )p-p, and wide power bandwidth (75 kHz, 20 Vp-p). The LM387A is a selected version of the LM387 that has lower noise in a NAB tape circuit, and can operate on a larger supply voltage. The LM387 operates from a single supply across the wide range of 9V to 30V, the LM387A operates on a supply of 9V to 40V.

The amplifiers are internally compensated for gains greater than 10. The LM387, LM387A is available in an 8-lead dual-in-line package. The LM387, LM387A is biased like the LM381. See AN-64 and AN-104.

## Features

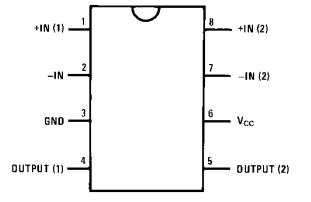
- Low noise 1.0  $\mu$ V total input noise
- High gain 104 dB open loop
- Single supply operation
- Wide supply range LM387 9 to 30V
- LM387A 9 to 40V
- Power supply rejection 110 dB
- Large output voltage swing ( $V_{CC} - 2V$ )p-p
- Wide bandwidth 15 MHz unity gain
- Power bandwidth 75 kHz, 20 Vp-p
- Internally compensated
- Short circuit protected
- Performance similar to LM381

## Schematic and Connection Diagrams



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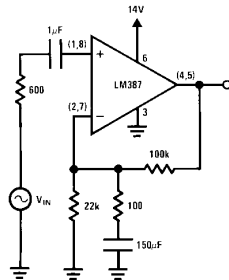
### Dual-In-Line Package



Top View

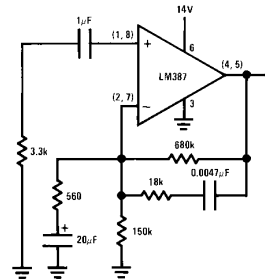
Order Number LM387N or LM387AN  
See NS Package Number N08E

## Typical Applications



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FIGURE 1. Flat Gain Circuit ( $A_V = 1000$ )



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FIGURE 2. NAB Tape Circuit

## Absolute Maximum Ratings

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

Supply Voltage	
LM387	+30V
LM387A	+40V

Power Dissipation (Note 1)	1.5W
Operating Temperature Range	0°C to +70°C
Storage Temperature Range	-65°C to +150°C
Lead Temperature (Soldering, 10 sec.)	260°C

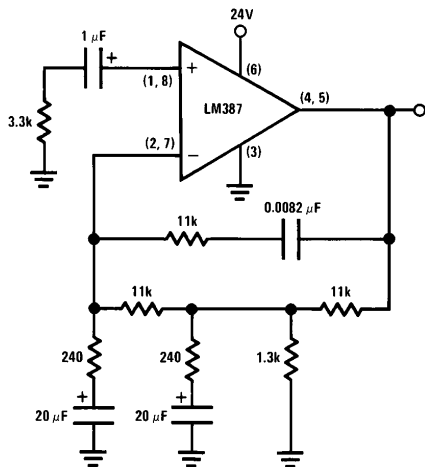
## Electrical Characteristics $T_A = 25^\circ\text{C}$ , $V_{CC} = 14\text{V}$ , unless otherwise stated

Parameter	Conditions	Min	Typ	Max	Units
Voltage Gain	Open Loop, $f = 100\text{ Hz}$		160,000		V/V
Supply Current	LM387, $V_{CC} 9\text{V}-30\text{V}$ , $R_L = \infty$ LM387A, $V_{CC} 9\text{V}-40\text{V}$ , $R_L = \infty$		10 10		mA mA
Input Resistance					
Positive Input		50	100		k $\Omega$
Negative Input			200		k $\Omega$
Input Current					
Negative Input			0.5	3.1	$\mu\text{A}$
Output Resistance	Open Loop		150		$\Omega$
Output Current	Source Sink		8 2		mA mA
Output Voltage Swing	Peak-to-Peak		$V_{CC}-2$		V
Unity Gain Bandwidth			15		MHz
Large Signal Frequency Response	20 Vp-p ( $V_{CC} > 24\text{V}$ ), THD $\leq 1\%$		75		kHz
Maximum Input Voltage	Linear Operation			300	mVrms
Supply Rejection Ratio Input Referred	$f = 1\text{ kHz}$		110		dB
Channel Separation	$f = 1\text{ kHz}$	40	60		dB
Total Harmonic Distortion	60 dB Gain, $f = 1\text{ kHz}$		0.1	0.5	%
Total Equivalent Input Noise (Flat Gain Circuit)	10 Hz-10,000 Hz LM387 Figure 1		1.0	1.2	$\mu\text{Vrms}$
Output Noise NAB Tape Playback Circuit Gain of 37 dB	Unweighted LM387A Figure 2		400	700	$\mu\text{Vrms}$

Note 1: For operation in ambient temperatures above 25°C, the device must be derated based on a 150°C maximum junction temperature and a thermal resistance of 80°C/W junction to ambient.

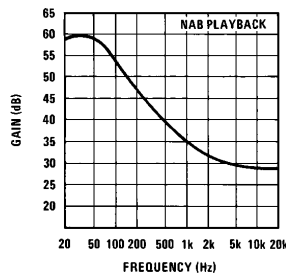
## Typical Applications (Continued)

### Two-Pole Fast Turn-ON NAB Tape Preamplifier



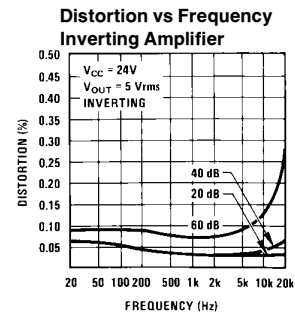
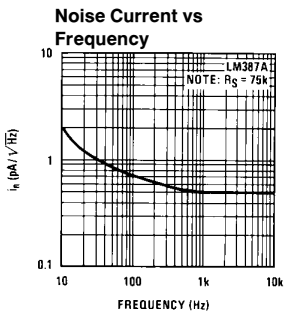
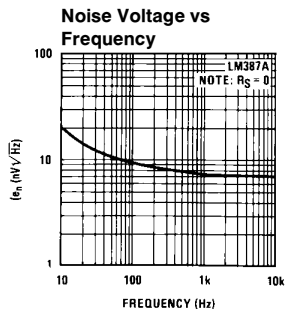
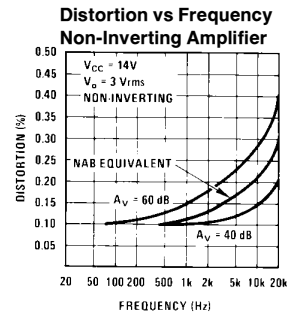
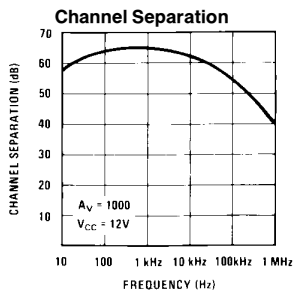
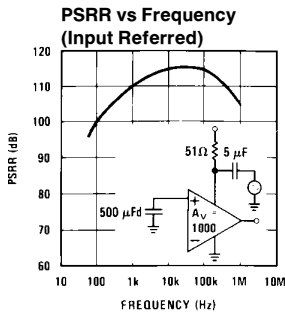
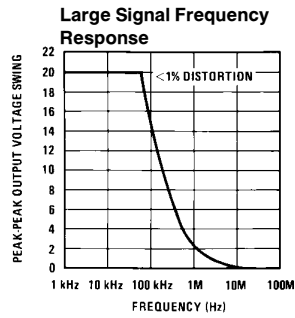
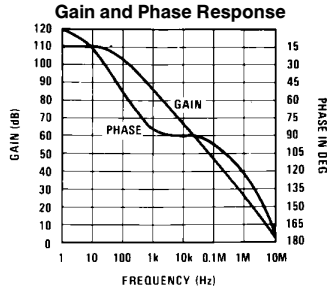
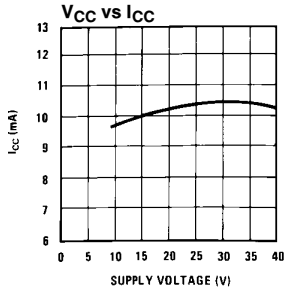
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### Frequency Response of NAB Circuit of Figure 2



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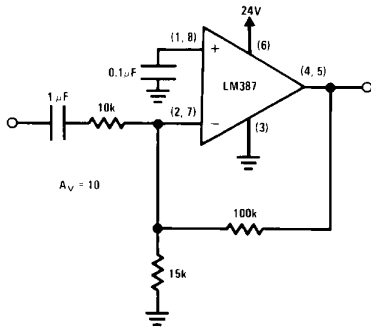
# Typical Performance Characteristics



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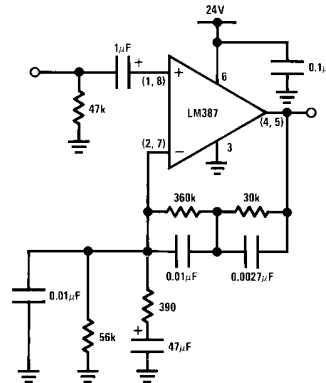
## Typical Applications (Continued)

**Inverting Amplifier Ultra-Low Distortion**



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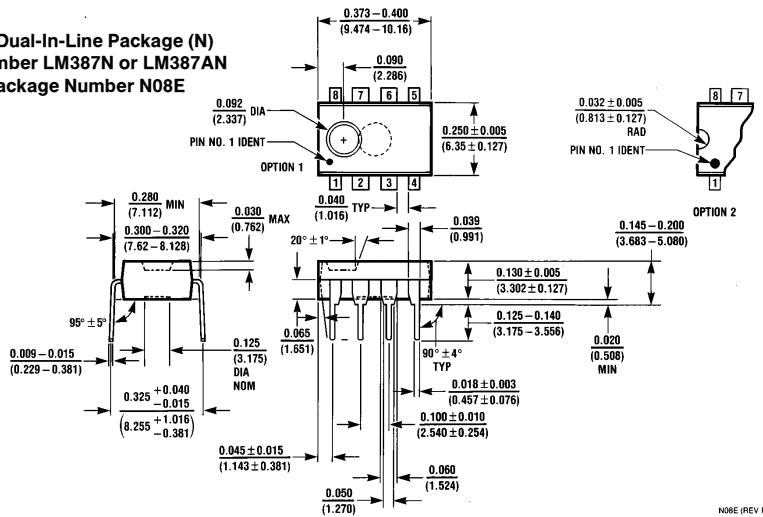
**Typical Magnetic Phono Preamplifier**



TL/H/7845-9

## Physical Dimensions inches (millimeters)

**Molded Dual-In-Line Package (N)**  
**Order Number LM387N or LM387AN**  
**NS Package Number N08E**



N08E (REV F)

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