

March 1987

LM387/LM387A Low Noise Dual Preamplifier

General Description

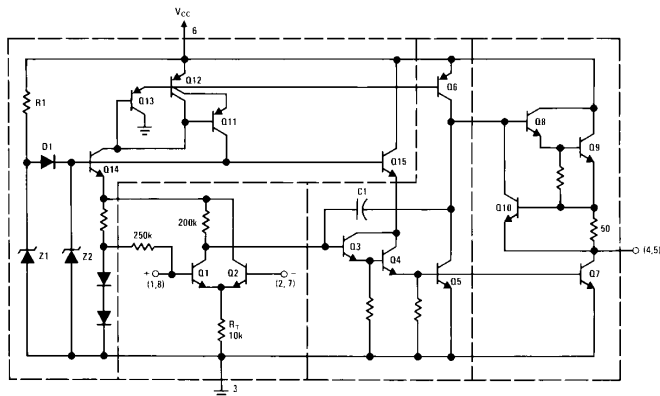
The LM387 is a dual preamplifier for the amplification of low level signals in applications requiring optimum noise performance. Each of the two amplifiers is completely independent, with an internal power supply decoupler-regulator, providing 110 dB supply rejection and 60 dB channel separation. Other 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

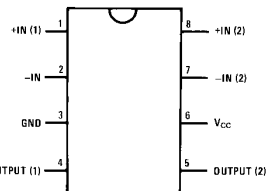
- Low noise 1.0 μV total input noise
- High gain 104 dB open loop
- Single supply operation
- Wide supply range LM387 9 to 30V
LM387A 9 to 40V
- Power supply rejection 110 dB
- Large output voltage swing ($V_{CC} - 2V$)p-p
- Wide bandwidth 15 MHz unity gain
- Power bandwidth 75 kHz, 20 Vp-p
- Internally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

Schematic and Connection Diagrams



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Dual-In-Line Package

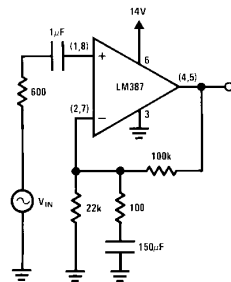


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Top View

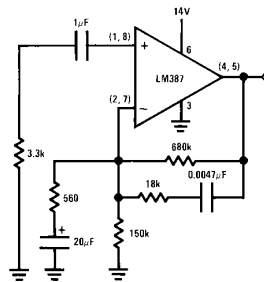
Order Number LM387N or LM387AN
See NS Package Number N08E

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

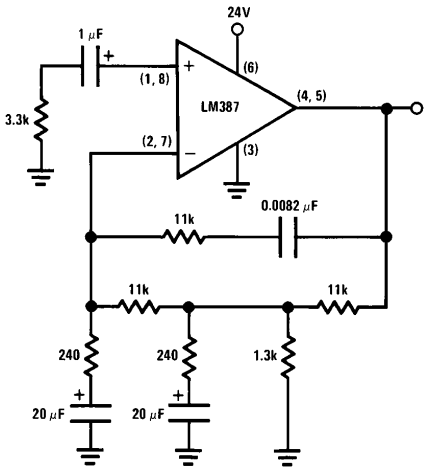
Electrical Characteristics $T_A = 25^\circ\text{C}$, $V_{CC} = 14\text{V}$, unless otherwise stated

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 Ω
Negative Input			200		k Ω
Input Current					
Negative Input			0.5	3.1	μA
Output Resistance	Open Loop		150		Ω
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	$f = 1\text{ kHz}$		110		dB
Input Referred					
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	μVrms
Output Noise NAB Tape Playback Circuit Gain of 37 dB	Unweighted LM387A Figure 2		400	700	μVrms

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.

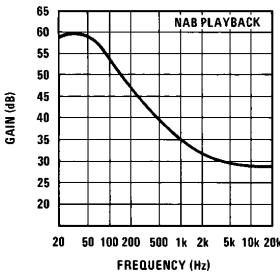
Typical Applications (Continued)

Two-Pole Fast Turn-ON NAB Tape Preamp



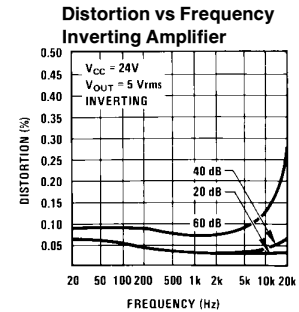
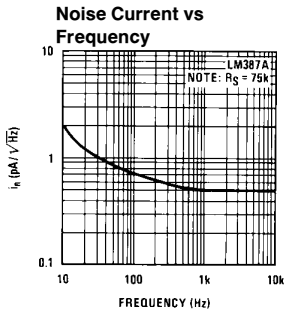
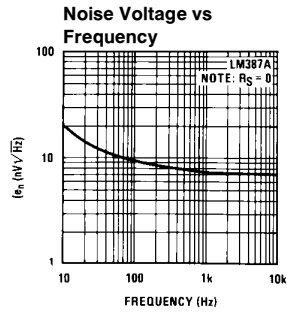
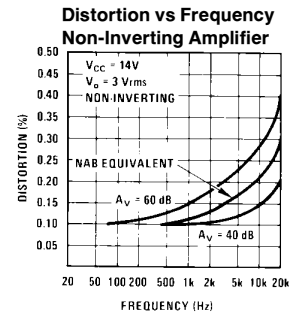
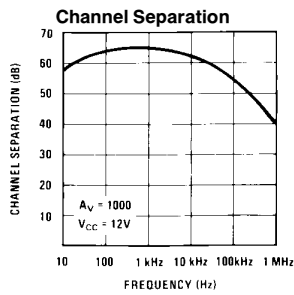
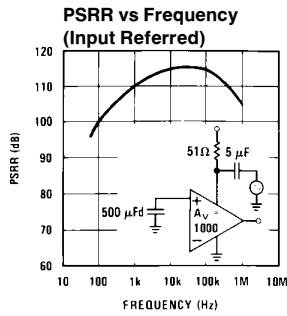
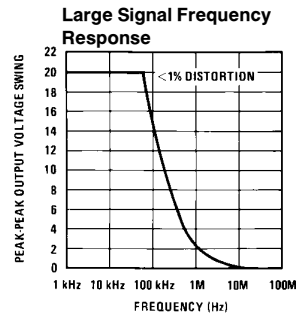
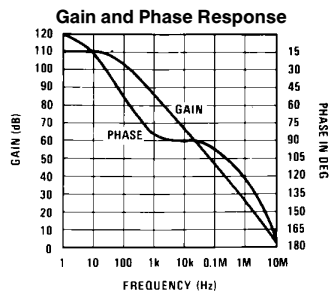
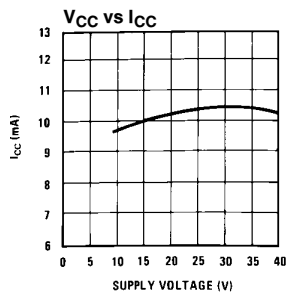
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Frequency Response of NAB Circuit of Figure 2



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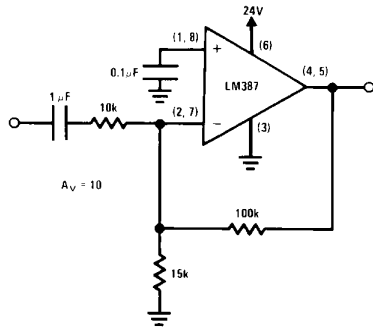
Typical Performance Characteristics



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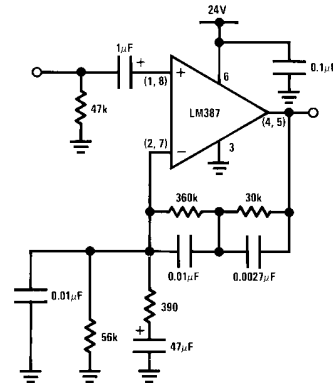
Typical Applications (Continued)

Inverting Amplifier Ultra-Low Distortion



TL/H/7845-8

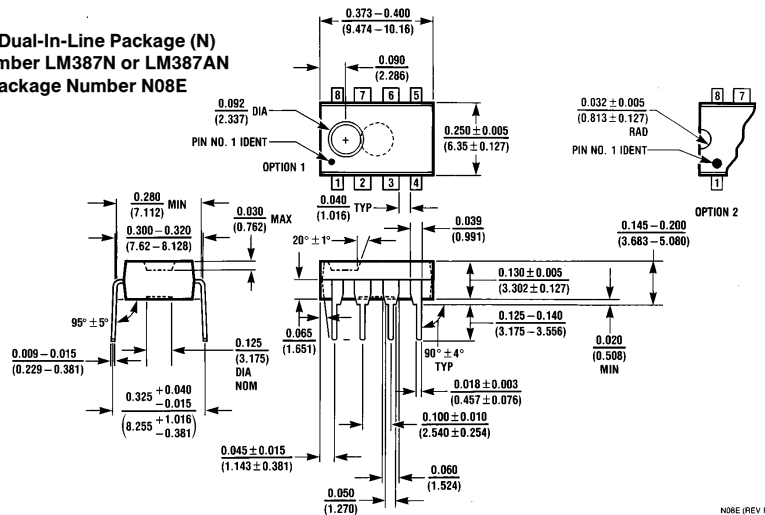
Typical Magnetic Phono Preamplifier



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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