

LM381/LM381A Low Noise Dual Preamplifier

General Description

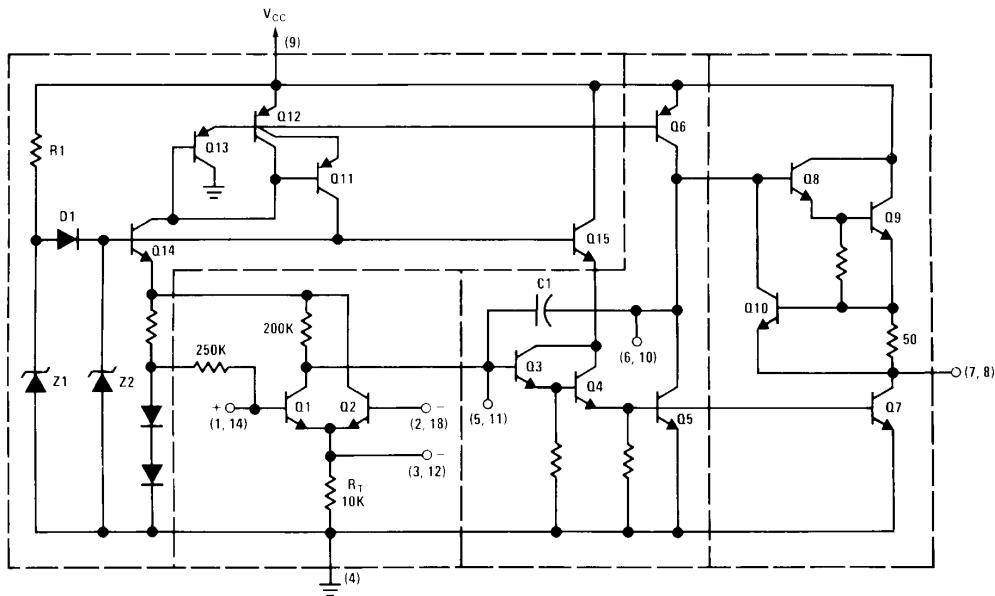
The LM381/LM381A is a dual preamplifier for the amplification of low level signals in applications requiring optimum noise performance. Each of the two amplifiers is completely independent, with individual internal power supply decoupler-regulator, providing 120 dB supply rejection and 60 dB channel separation. Other outstanding features include high gain (112 dB), large output voltage swing ($V_{CC} - 2V$) p-p, and wide power bandwidth (75 kHz, 20 Vp-p). The LM381/LM381A operates from a single supply across the wide range of 9V to 40V.

Either differential input or single ended input configurations may be selected. The amplifier is internally compensated with the provision for additional external compensation for narrow band applications. For additional information see AN-64, AN-104.

Features

- Low noise — 0.5 μV total input noise
- High gain — 112 dB open loop
- Single supply operation
- Wide supply range 9V–40V
- Power supply rejection — 120 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

Schematic Diagram



TL/H/7841-1

Absolute Maximum Ratings

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

Supply Voltage +40V
Power Dissipation (Note 1) 1.56 W

Operating Temperature Range

0°C to +70°C

Storage Temperature Range

−65°C to +150°C

Lead Temperature (Soldering, 10 sec.)

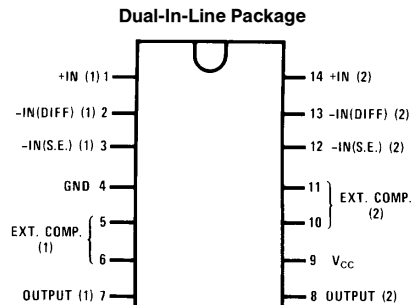
260°C

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 (Differential Input), $f = 100\text{ Hz}$		160,000		V/V
	Open Loop (Single Ended), $f = 100\text{ Hz}$		320,000		V/V
Supply Current	$V_{CC} 9\text{V to } 40\text{V}$, $R_L = \infty$		10		mA
Input Resistance (Positive Input) (Negative Input)			100		k Ω
			200		k Ω
Input Current (Negative Input)			0.5		μA
Output Resistance	Open Loop		150		Ω
Output Current	Source		8		mA
	Sink		2		mA
Output Voltage Swing	Peak-to-Peak		$V_{CC} - 2$		V
Unity Gain Bandwidth			15		MHz
Power Bandwidth	$20 V_{PP}$ ($V_{CC} = 24\text{V}$)		75		kHz
Maximum Input Voltage	Linear Operation			300	mVrms
Supply Rejection Ratio	$f = 1\text{ kHz}$		120		dB
Channel Separation	$f = 1\text{ kHz}$		60		dB
Total Harmonic Distortion	60 dB Gain, $f = 1\text{ kHz}$		0.1		%
Total Equivalent Input Noise LM381A LM381	$R_S = 60\Omega$, 10–10,000 Hz (Single Ended Input, Flat Gain Circuit, $A_V = 1000$)		0.5	0.7	μVrms
			0.5	1.0	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.

Connection Diagram

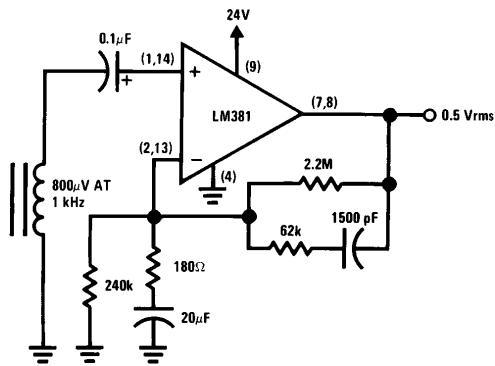


TL/H/7841–2

Order Number LM381N or LM381AN
See NS Package Number N14A

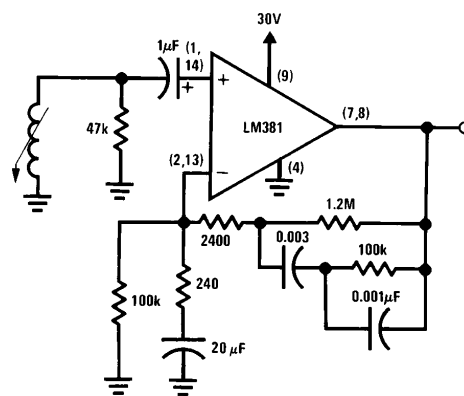
Typical Applications

Typical Tape Playback Amplifier



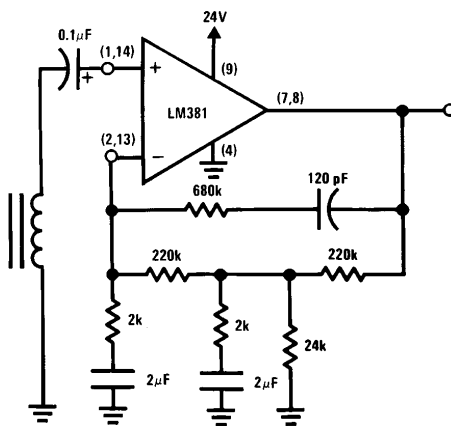
TL/H/7841-3

Typical Magnetic Phono Preamp



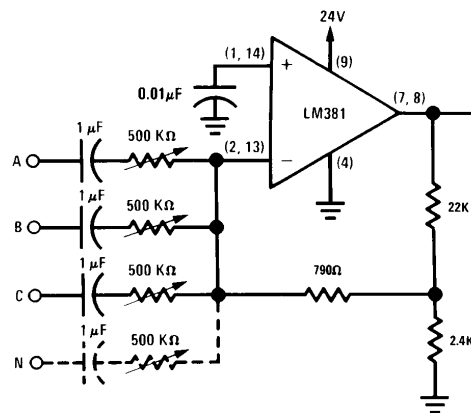
TL/H/7841-4

Two-Pole Fast Turn-On NAB Tape Preamp



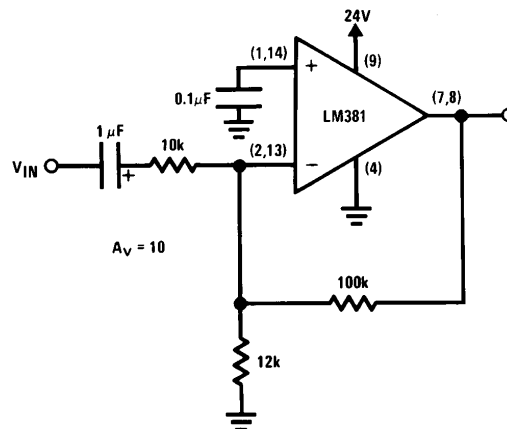
TL/H/7841-5

Audio Mixer



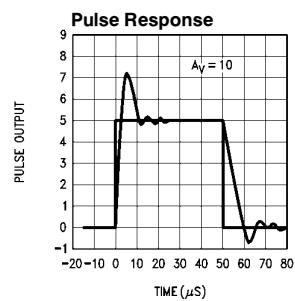
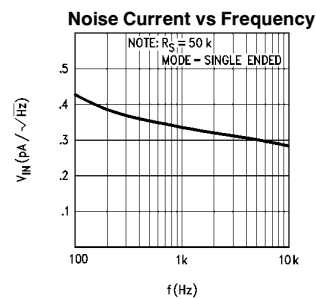
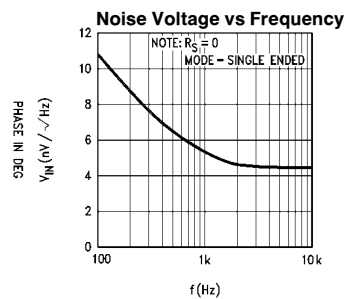
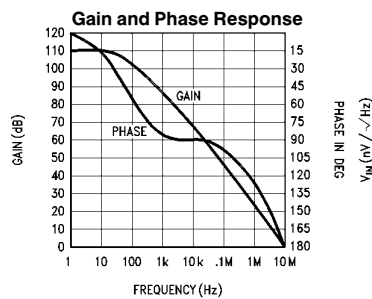
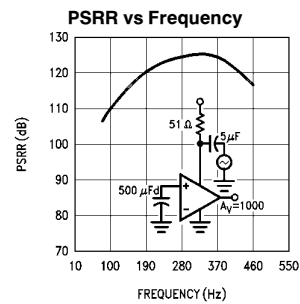
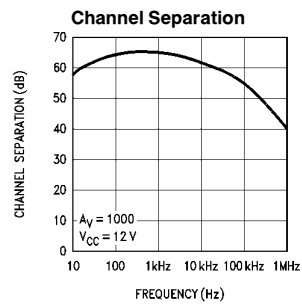
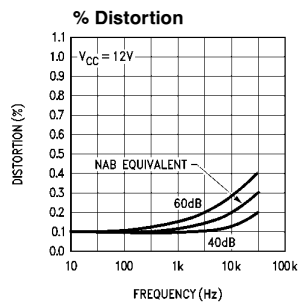
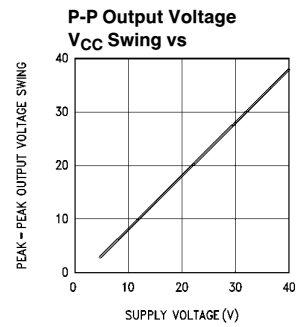
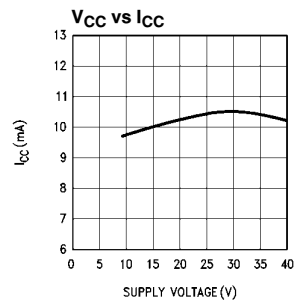
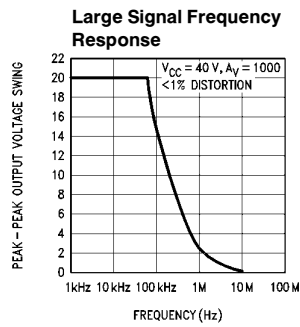
TL/H/7841-6

Ultra-Low Distortion Amplifier
($A_V = 10$, THD < 0.05%, $V_{OUT} = 3 V_{RMS}$)

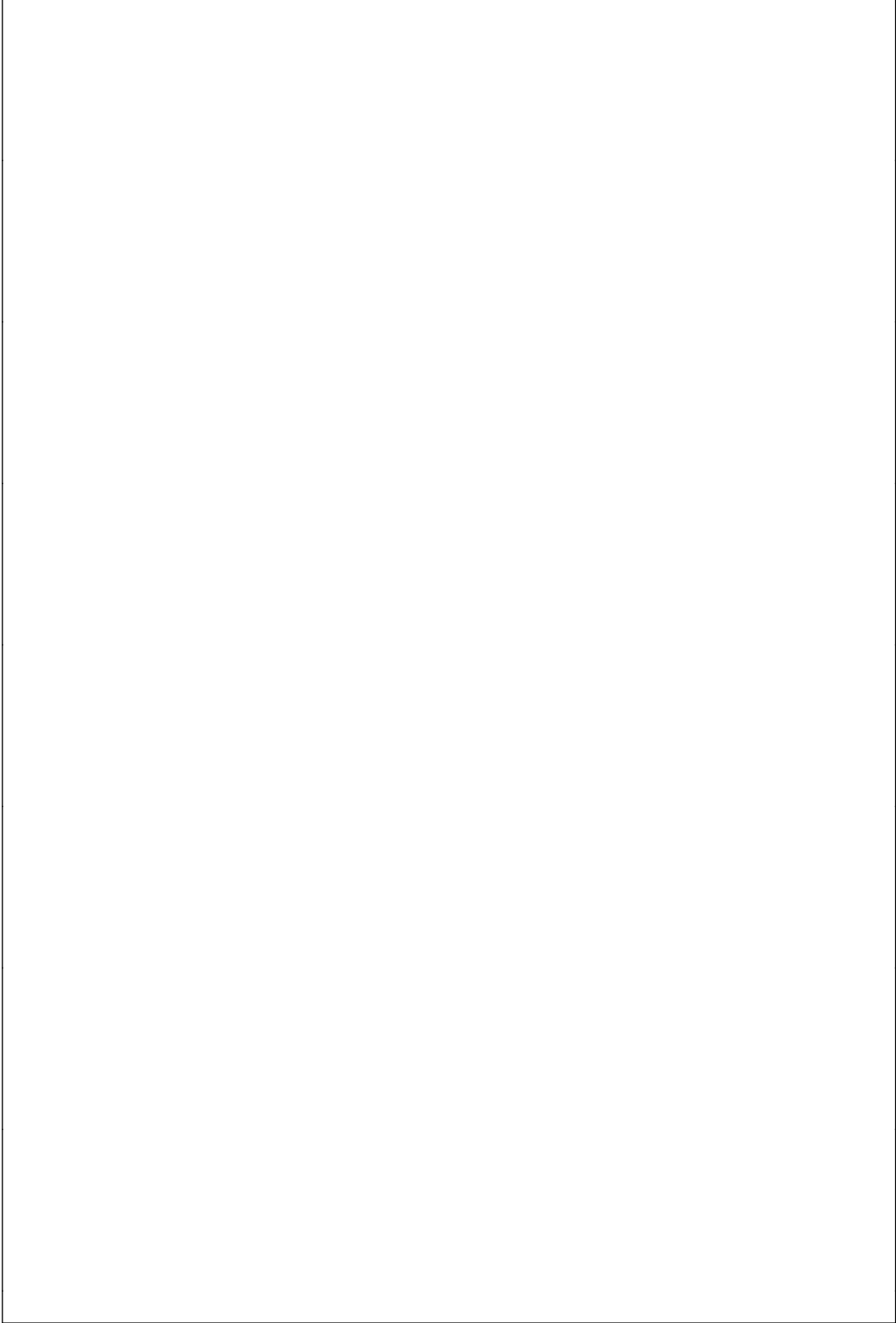


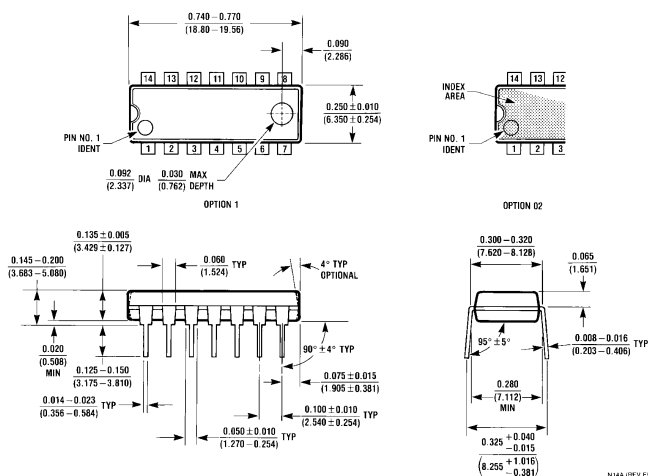
TL/H/7841-7

Typical Performance Characteristics



TL/H/7841-8






LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
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.

 National Semiconductor Corporation 1111 West Bardin Road Arlington, TX 76017 Tel: (1800) 272-9959 Fax: (1800) 737-7018	National Semiconductor Europe Fax: (+49) 0-180-530 85 86 Email: cnjwge@tevm2.nsc.com	National Semiconductor Hong Kong Ltd. 13th Floor, Straight Block, Ocean Centre, 5 Canton Rd. Tsimshatsui, Kowloon Hong Kong Tel: (852) 2737-1600 Fax: (852) 2736-9960	National Semiconductor Japan Ltd. Tel: 81-04-299-2309 Fax: 81-04-299-2408
	Deutsch Tel: (+49) 0-180-530 85 85 English Tel: (+49) 0-180-532 78 32 Français Tel: (+49) 0-180-532 93 58 Italiano Tel: (+49) 0-180-534 16 80		