LM387, LM387A

LM387 LM387A Low Noise Dual Preamplifier

Literature Number: SNOSBT7A
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 (VCC - 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 (VCC - 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

Typical Applications

FIGURE 1. Flat Gain Circuit (AV = 1000)

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

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

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 Preampifier

Frequency Response of NAB
Circuit of Figure 2
Typical Performance Characteristics

VCC vs ICC

Gain and Phase Response

Large Signal Frequency Response

PSRR vs Frequency (Input Referred)

Channel Separation

Distortion vs Frequency

Non-Inverting Amplifier

Noise Voltage vs Frequency

Noise Current vs Frequency

Distortion vs Frequency

Inverting Amplifier

TLH47845–7

Obsolete
Typical Applications (Continued)

Inverting Amplifier Ultra-Low Distortion

Typical Magnetic Phono Preamp

Physical Dimensions inches (millimeters)

Molded Dual-In-Line Package (N)
Order Number LM387N or LM387AN
NS Package Number NO8E

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