National Semiconductor

LH4124C High Slew Rate Operational Amplifier

General Description

The LH4124C is a very wide bandwidth, high slew rate operational amplifier intended to fulfill a wide variety of high speed applications such as buffers for A/D and D/A converters and high speed comparators. The device exhibits useful gain in excess of 50 MHz making it possible to use in video applications requiring higher gain accuracy than is usually associated with such amplifiers.

The LH4124C's combination of wide bandwidth and high slew rate make it an ideal choice for a variety of high speed applications including active filters, oscillators, and comparators as well as many high speed general purpose applications.

The LH4124C is guaranteed over the temperature range −25°C to +85°C.

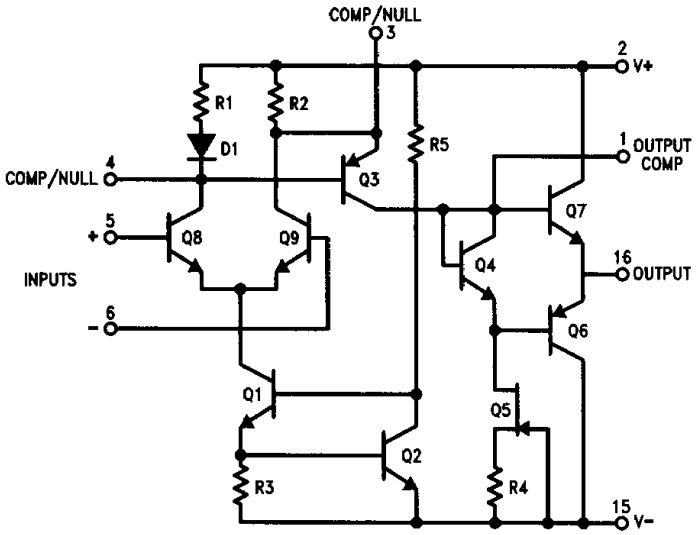
Features

■ Very high slew rate	500 V/μs at Av = +1
■ Wide small signal bandwidth	70 MHz
■ Wide large signal bandwidth	15 MHz
■ High output swing—	±12V into 1k
■ Offset null with single pot	
■ Low input offset	2 mV

Applications

- Flash A/D input buffer
- Video amplifier
- High frequency oscillator
- Active filter

Schematic and Connection Diagrams



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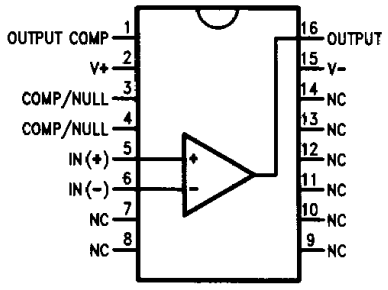

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Top View

Order Number LH4124CN
See NS Package Number N16A

Absolute Maximum Ratings

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

Supply Voltage	±18V
Input Voltage	Equal to Supply
Differential Input Voltage	±5V
Power Dissipation	600 mW
Operating Temperature Range	−25°C to +85°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec.)	300°C
ESD	TBD

DC Electrical Characteristics (Notes 1, 2)

Parameter	Conditions	Min	Typ	Max	Units
Input Offset Voltage	$R_S = 50\Omega$, $T_A = 25°C$ $R_S = 50\Omega$		5.0	8.0 10.0	mV mV
Average Temperature Coefficient of Input Offset Voltage	$V_S = \pm 15V$, $R_S = 50\Omega$ −25°C to +85°C		25		μV/°C
Input Offset Current	$T_A = 25°C$		4.0	15.0 20.0	μA μA
Input Bias Current	$T_A = 25°C$		18	40 50	μA μA
Supply Current	No Load		12.5	15	mA
Large Signal Voltage Gain	$V_S = \pm 15V$, $R_L = 1k$, $T_A = 25°C$ $V_S = \pm 15V$, $R_L = 1k$	3 2.5	4		V/mV V/mV
Input Voltage Range	$V_S = \pm 15V$	±12	±13		V
Output Voltage Swing	$V_S = \pm 15V$, $R_L = 1k$, $T_A = 25°C$ $V_S = \pm 15V$, $R_L = 1k$	±10 ±10	±13		V V
Slew Rate	$V_S = \pm 15V$, $R_L = 1k$, $C_1 = C_2 = 30$ pF $A_V = +1$, $T_A = 25°C$ (Note 3)	250	400		V/μs
Common Mode Rejection Ratio	$V_S = \pm 15V$, $\Delta V_{IN} = \pm 10V$ $R_S = 50\Omega$		60		dB
Power Supply Rejection Ratio	$\pm 5V \leq V_S \leq \pm 18V$ $R_S = 50\Omega$		60		dB

Note 1: These specifications apply for $V_S = \pm 15V$.

Note 2: LH4124C is 100% production tested at 25°C only. Specifications at temperature extremes are verified by sample testing. These limits are not used to calculate outgoing quality level.

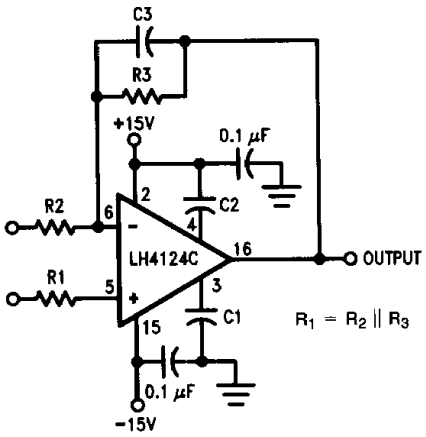
Note 3: Not 100% production tested, verified by sample testing only. Limits are not used to calculate outgoing quality level.

Frequency Compensation

TABLE I

Closed Loop Gain	C_1	C_2	C_3
100	0	0	0
20	0	0	0
10	0	20 pF	1 pF
1	30 pF	30 pF	3 pF

Frequency Compensation Circuit



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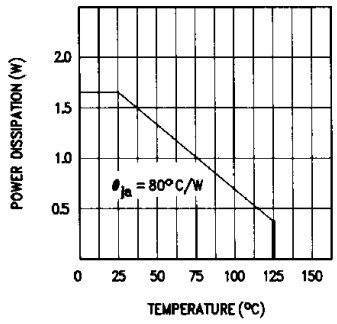
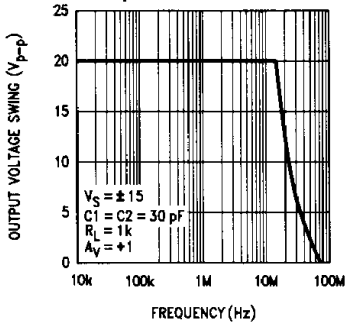
Typical Performance Characteristics

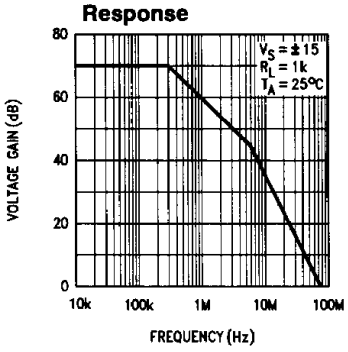
Package Power Dissipation



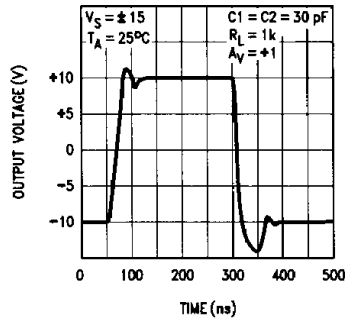
Large Signal Frequency Response



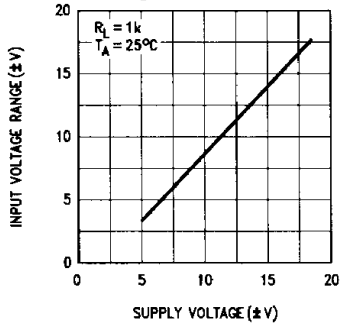
Open Loop Frequency Response



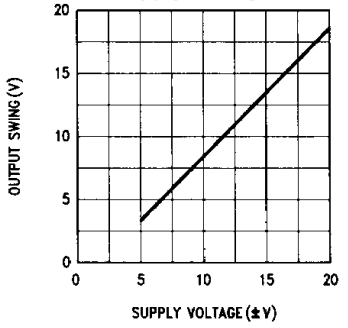
Voltage Follower Pulse Response



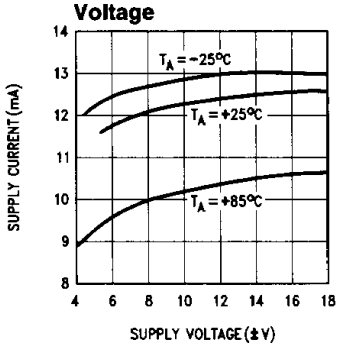
Input Voltage vs Supply Voltage



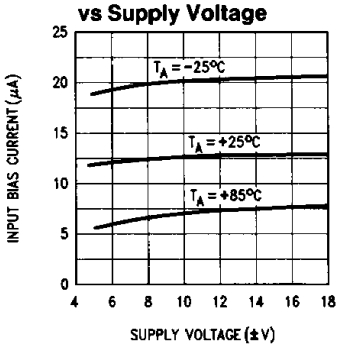
Output Voltage Swing vs Supply Voltage



Supply Current vs Supply Voltage



Input Bias Current vs Supply Voltage



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Applications Information

1.0 Layout Considerations

The LH4124C, like most high speed circuitry, is sensitive to layout and stray capacitance. Power supplies should be bypassed as close to the device as possible with at least 0.01 μF ceramic capacitor. Compensating capacitors should also be placed as close to the device as possible.

2.0 Compensation Recommendations

Compensation schemes recommended in Table I work well under typical conditions. However, poor layout and long lead lengths can degrade the performance of the LH4124C or cause the device to oscillate. Slight adjustments in the values for C1, C2 and C3 may be necessary for a given layout. In particular, when operating at a gain of −1, C3 may require adjustment in order to perfectly cancel the input capacitance of the device.

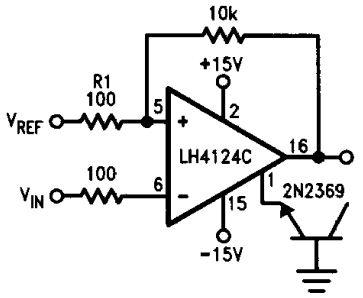
When operating the LH4124C at a gain of +1, the value of R1 should be at least 1 kΩ.

3.0 Heat Sinking

The LH4124C is specified for operation without the use of an explicit heat sink. However, internal power dissipation does cause a significant temperature rise. Improved offset voltage drift can be obtained by limiting the temperature rise with a clip-on heat sink.

Typical Applications

TTL Compatible Comparator



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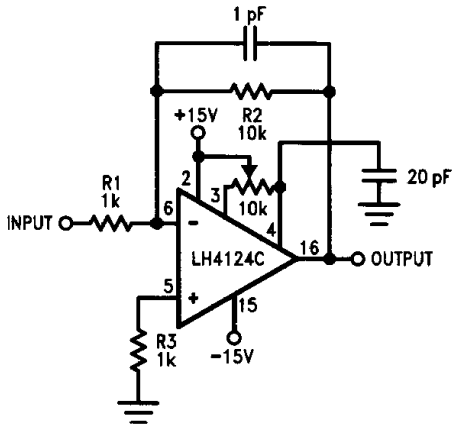
Offset Null



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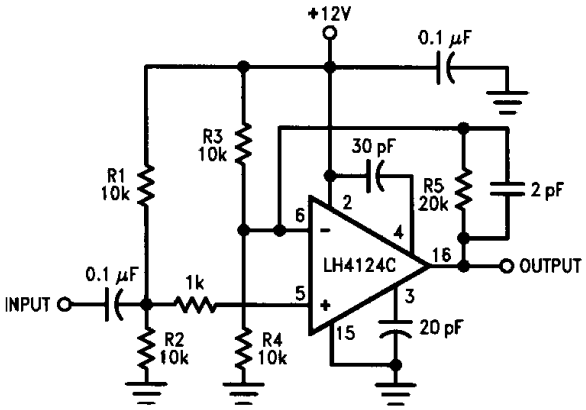
Video Amplifier



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