Operational Amplifiers

NH0004/NH0004C high voltage operational amplifier

general description

The NH0004/NH0004C is a general purpose operational amplifier designed to operate from supply voltages up to ±40V. The device dissipates extremely low quiescent power, typically 8 mW at 25°C and V_S = ±40V. Additional features include:

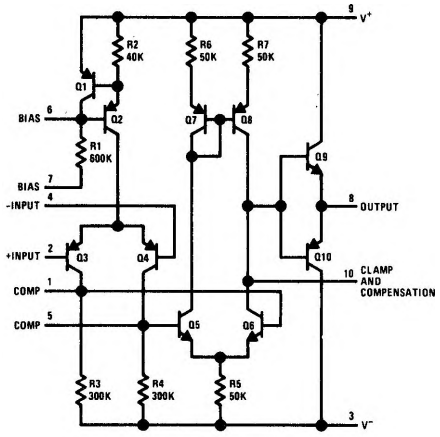
- Capable of operation over the range of ±5V to ±40V.
- Large output voltage typically ±35V for the NH0004 and ±33V for the NH0004C into a 2 KΩ load with ±40V supplies
- Low input offset current typically 20 nA for the NH0004 and 45 nA for the NH0004C
- Low input offset voltage typically 0.3 mV
- Frequency compensation with two small capacitors.
- Low power consumption 8 mW at ±40V

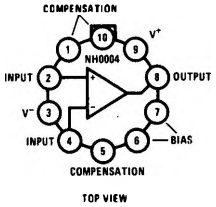
The NH0004's high gain and wide range of operating voltages make it ideal for applications requiring large output swing and low power dissipation.

applications

- Precision high voltage power supply.
- Resolver excitation.
- Wideband high voltage amplifier.
- Transducer power supply.

schematic and connection diagrams

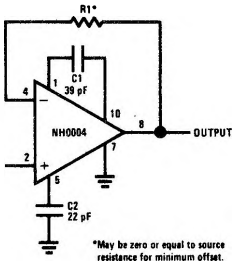




Note: Pin 7 must be grounded or connected to a voltage at least 5 volts more negative than the positive supply (Pin 9). Pin 7 may be connected to the negative supply; however, the standby current will be increased. A resistor may be inserted in series with Pin 7 to Pin 9. The value of the resistor should be a maximum of 100 KΩ per volt of potential between Pin 3 and Pin 9.

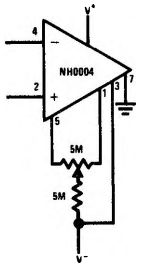
typical applications

Voltage Follower

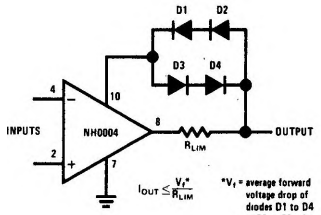


*May be zero or equal to source resistance for minimum offset.

Input Offset Voltage Adjust

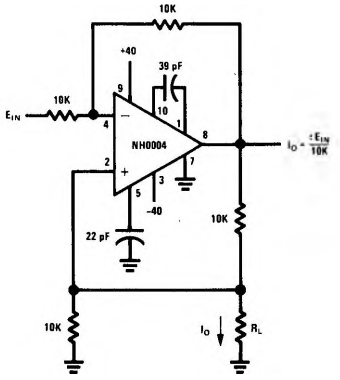


External Current Limiting Method



*V_f = average forward voltage drop of diodes D1 to D4 at 20 to 50 μA.

High Compliance Current Source



absolute maximum ratings

Supply Voltage, Continuous	±45V
Supply Voltage, Transient (≤0.1 sec, no load)	±60V
Power Dissipation (See curve)	400 mW
Differential Input Voltage	±7V
Input Voltage	Equal to supply
Short Circuit Duration	3 sec
Operating Temperature Range NH0004	−55°C to +125°C
NH0004C	0°C to 85°C
Storage Temperature Range	−65°C to +150°C
Lead Temperature (Soldering, 10 sec)	300°C

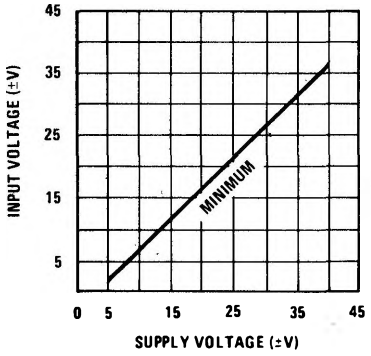
electrical characteristics (Note 1)

PARAMETER	CONDITIONS	NH0004			NH0004C			UNITS
		MIN	TYP	MAX	MIN	TYP	MAX	
Input Offset Voltage	$R_S \leq 5k$, $T_A = 25°C$		0.3	1.0		0.3	1.5	mV
	$R_S \leq 5k$			2.0			3.0	mV
Input Bias Current	$T_A = 25°C$		20	100		30	120	nA
	$= -55°C$			300			300	nA
Input Offset Current	$T_A = 25°C$		3	20		10	45	nA
	$= -55°C$			100			150	nA
Positive Supply Current	$V_S = \pm40V$, $T_A = 25°C$		110	150		110	150	μA
	$V_S = \pm40V$			175			175	μA
Negative Supply Current	$V_S = \pm40V$, $T_A = 25°C$		80	100		80	100	μA
	$V_S = \pm40V$			135			135	μA
Voltage Gain	$V_S = \pm40V$, $R_L = 100k$, $T_A = 25°C$ $V_{OUT} = \pm30V$	30	60		30	60		V/mV
	$V_S = \pm40V$, $R_L = 100k$ $V_{OUT} = \pm30V$	10			10			V/mV
Output Voltage	$V_S = \pm40V$, $R_L = 2k$	±30	±35		±30	±33		V
	$V_S = \pm40V$, $R_L = 4k$	±34	±36		±33	±35		V
CMRR	$V_S = \pm40V$, $R_S \leq 5k$ $V_{IN} = \pm33V$	70	90		70	90		dB
PSRR	$V_S = \pm40V$, $R_S \leq 5k$ $\Delta V = 20V$ to 40V	70	90		70	90		dB
Average Temperature Coefficient Offset Voltage	$R_S \leq 5k$		4.0			4.0		μV/°C
Average Temperature Coefficient of Offset Current			0.4			0.4		μA/°C
Equivalent Input Noise Voltage	$R_S = 1k$, $V_S = \pm40V$ f = 500 Hz to 5 kHz, $T_A = 25°C$		3.0			3.0		μVrms

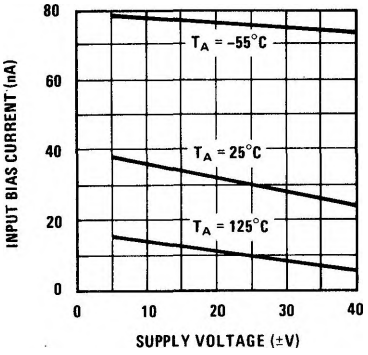
Note 1: These specifications apply for $\pm5V \leq V_S \leq \pm40V$, Pin 7 grounded, with capacitors C1 = 39 pF between Pin 1 and Pin 10, C2 = 22 pF between Pin 5 and ground, −55°C to 125°C for the NH0004, and 0°C to 85°C for the NH0004C unless otherwise specified.

typical performance

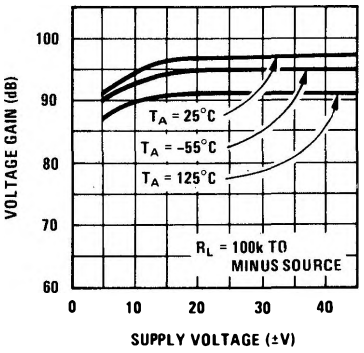
Input Voltage Range



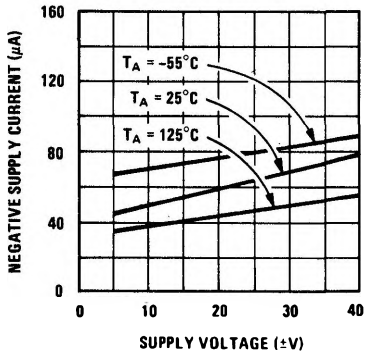
Input Bias Current



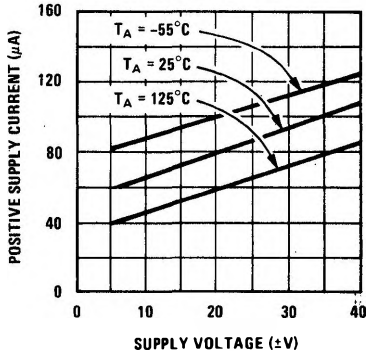
Voltage Gain



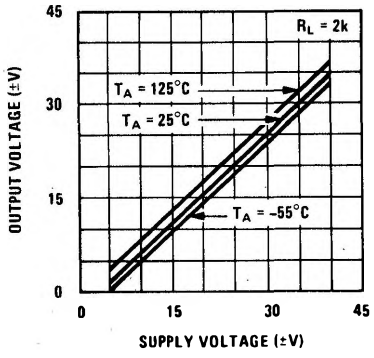
Negative Supply Current



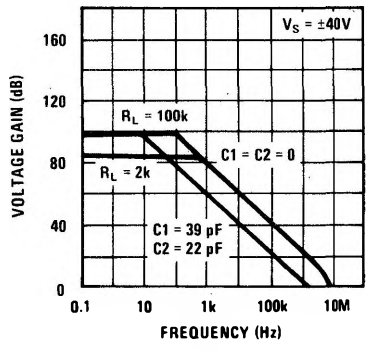
Positive Supply Current



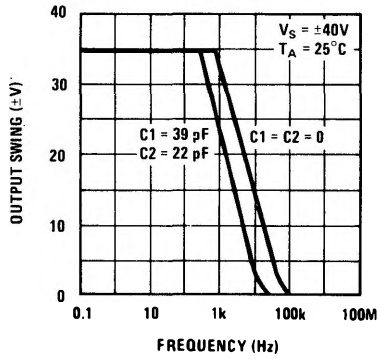
Output Voltage



Open Loop Frequency Response



Large Signal Frequency Response



Package Power Dissipation