National Semiconductor Corporation

# LH0061/LH0061C 0.5 Amp Wide Band Operational Amplifier

## General Description

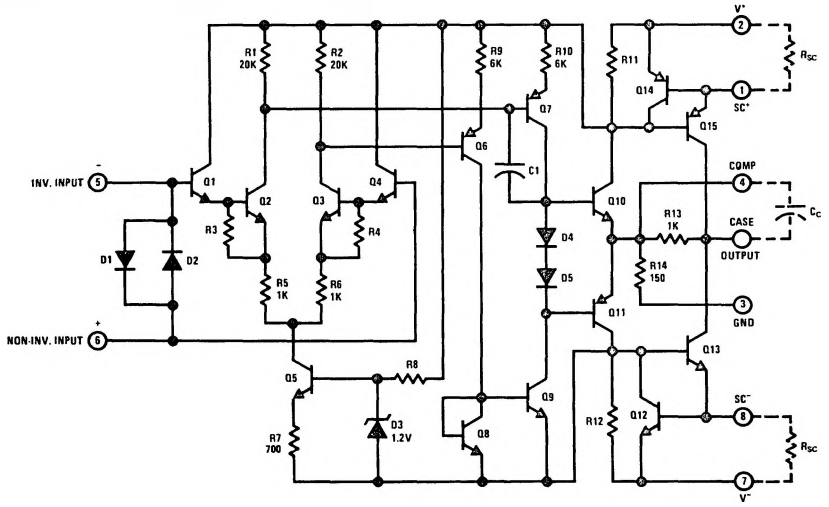
The LH0061/LH0061C is a wide band, high speed, operational amplifier capable of supplying currents in excess of 0.5 ampere at voltage levels of ±12V. Output short circuit protection is set by external resistors, and compensation is accomplished with a single external capacitor. With a suitable heat sink the device is rated at 20W.

The wide bandwidth and high output power capabilities of the LH0061/LH0061C make it ideal for such applications as AC servos, deflection yoke drivers, capstan drivers, and audio amplifiers. The LH0061 is guaranteed over the temperature range −55°C to +125°C; whereas, the LH0061C is guaranteed from −25°C to +85°C.

## Features

| | |
|---|---|
| ■ Output current | 0.5A |
| ■ Wide large signal bandwidth | 1 MHz |
| ■ High slew rate | 70V/μs |
| ■ Low standby power | 240 mW |
| ■ Low input current | 300 nA Max |

## Schematic and Connection Diagrams

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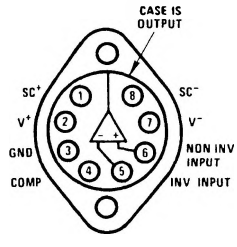
**TO-3 Package**

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**Top View**

**Order Number LH0061CK**
**See NS Package Number K08A**

## Absolute Maximum Ratings

**If Military/Aerospace specified devices are required, contact the National Semiconductor Sales Office/ Distributors for availability and specifications. (Note 5)**

| | |
|---|---|
| Supply Voltage | ±18V |
| Power Dissipation | See Curve |
| Differential Input Current (Note 2) | ±10 mA |
| Input Voltage (Note 3) | ±15V |
| Peak Output Current | 2A |
| Output Short Circuit Duration (Note 4) | Continuous |
| Operating Temperature Range | |
| LH0061 | −55°C to +125°C |
| LH0061C | −25°C to +85°C |
| Storage Temperature Range | −65°C to +150°C |
| Lead Temperature (Soldering, 10 sec.) | 260°C |

ESD rating to be determined.

## DC Electrical Characteristics (Note 1)

| Parameter | Conditions | Limits | | | | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | LH0061 | | | LH0061C | | | |
| | | Min | Typ | Max | Min | Typ | Max | |
| Input Offset Voltage | $R_S \leq 10\,k\Omega$, $T_C = 25°C$, $V_S = \pm 15V$<br>$R_S \leq 10\,k\Omega$, $V_S = \pm 15V$ | | 1.0 | 4.0<br>6.0 | | 3.0 | 10<br>15 | mV<br>mV |
| Voltage Drift with Temperature | $R_S \leq 10\,k\Omega$ | | 5 | | | 5 | | μV/°C |
| Offset Voltage Change with Output Power | | | 5 | | | 5 | | μV/watt |
| Input Offset Current | $T_C = 25°C$ | | 30 | 100<br>300 | | 50 | 200<br>500 | nA<br>nA |
| Offset Current Drift with Temperature | | | 1 | | | 1 | | nA/°C |
| Input Bias Current | $T_C = 25°C$ | | 100 | 300<br>1.0 | | 200 | 500<br>1.0 | nA<br>μA |
| Input Resistance | $T_C = 25°C$ | 0.3 | 1.0 | | 0.3 | 1.0 | | MΩ |
| Input Capacitance | | | 3 | | | 3 | | pF |
| Common Mode Rejection Ratio | $R_S \leq 10\,k\Omega$, $\Delta V_{CM} = \pm 10V$ | 70 | 90 | | 60 | 80 | | dB |
| Input Voltage Range | $V_S = \pm 15V$ | ±11 | | | ±11 | | | V |
| Power Supply Rejection Ratio | $R_S \leq 10\,k\Omega$, $\Delta V_S = \pm 10V$ | 70 | 80 | | 50 | 70 | | dB |
| Voltage Gain | $V_S = \pm 15V$, $V_O = \pm 10V$<br>$R_L = 1\,k\Omega$, $T_C = 25°C$<br>$V_S = \pm 15V$, $V_O = \pm 10V$<br>$R_L = 20\Omega$ | 50<br><br>5 | 100 | | 25<br><br>2.5 | 50 | | V/mV<br><br>V/mV |
| Output Voltage Swing | $V_S = \pm 15V$, $R_L = 20\Omega$ | ±10 | ±12 | | ±10 | ±12 | | V |
| Output Short Circuit Current | $V_S = \pm 15V$, $T_C = 25°C$, $R_{SC} = 1.0\Omega$ | | 600 | | | 600 | | mA |
| Power Supply Current | $V_S = \pm 15V$, $V_{OUT} = 0$ | | 7 | 10 | | 10 | 15 | mA |
| Power Consumption | $V_S = \pm 15V$, $V_{OUT} = 0$ | | 210 | 300 | | 300 | 450 | mW |

## AC Electrical Characteristics ($T_C$ = 25°C, $V_S$ = ±15V, $C_C$ = 3000 pF)

| Parameter | Conditions | Limits | | | | | | Units |
|---|---|---|---|---|---|---|---|---|
| | | LH0061 | | | LH0061C | | | |
| | | Min | Typ | Max | Min | Typ | Max | |
| Slew Rate | $A_V$ = +1, $R_L$ = 100Ω | 25 | 70 | | 25 | 70 | | V/μs |
| Power Bandwidth | $R_L$ = 100Ω | | 1 | | | 1 | | MHz |
| Small Signal Transient Response | | | 30 | | | 30 | | ns |
| Small Signal Overshoot | | | 5 | 20 | | 10 | 30 | % |
| Settling Time (0.1%) | $\Delta V_{IN}$ = 10V, $A_V$ = +1 | | 0.8 | | | 0.8 | | μs |
| Overload Recovery Time | | | 1 | | | 1 | | μs |
| Harmonic Distortion | f = 1 kHz, $P_O$ = 0.5W | | 0.2 | | | 0.2 | | % |

**Note 1:** Specifications apply for ±5V ≤ $V_S$ ≤ ±18V, $C_C$ = 3000 pF, and −55°C ≤ $T_C$ ≤ +125°C for the LH0061K and −25°C ≤ $T_C$ ≤ +85°C for the LH0061CK. Typical values are for $T_C$ = 25°C.

**Note 2:** The inputs are shunted with back-to-back diodes for overvoltage protection. Excessive current will flow if a differential voltage in excess of 1V is applied between the inputs without limiting resistors.

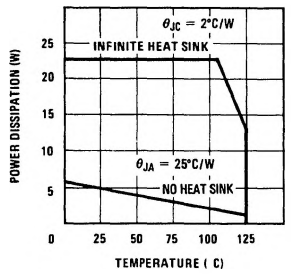
**Note 3:** For supply voltages less than ±15V, the absolute maximum input voltage is equal to the supply voltage.

**Note 4:** Rating applies as long as package power rating is not exceeded.

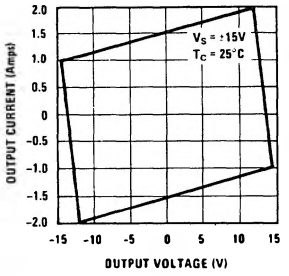
**Note 5:** Refer to RETS0061K for LH0061K military specifications.

## Typical Performance Characteristics

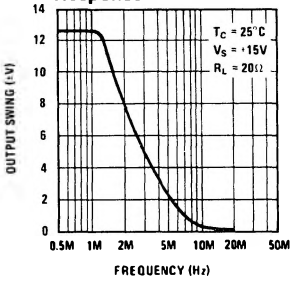
**Power Derating**




**Safe Operating Area**




**Large Signal Frequency Response**

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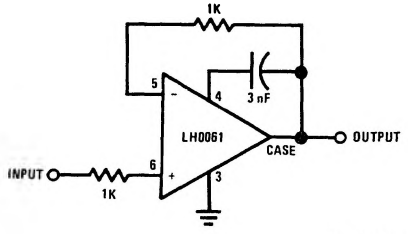
## Typical Applications

**Unity Gain Driver**

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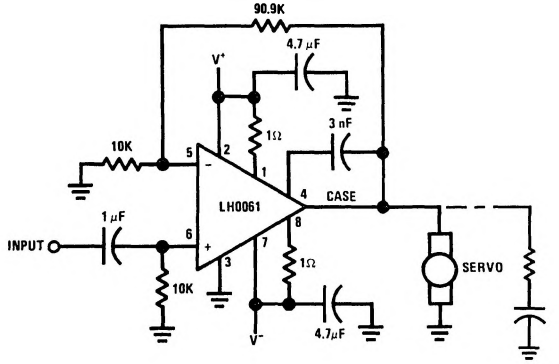
**AC Servo Amplifier**

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