

**élantec**  
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

**ELH0041G/883/8508701ZX**  
**0.1 Amp Power Operational Amplifier**

ELH0041G/883/8508701ZX

**Features**

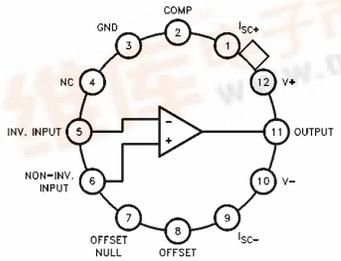
- High output current—200 mA
- Excellent open-loop gain—106 dB
- Low offset voltage—1 mV
- Wide full power bandwidth—20 kHz
- High slew rate—3 V/ $\mu$ s
- MIL-STD-883 devices 100% manufactured in U.S.A.

**Ordering Information**

| Part No.      | Temp. Range          | Pkg. Outline # |
|---------------|----------------------|----------------|
| ELH0041G/883B | -55°C to +125°C TO-8 | MDP002         |

8508701ZX is the SMD version of this device.

**Connection Diagram**



Top View

**General Description**

The ELH0041 are general purpose operational amplifiers capable of delivering large output currents not usually associated with conventional IC op amps; the ELH0041 delivers currents of 200 mA at voltage levels closely approaching the available power supplies. In addition, both the inputs and outputs are protected against overload. These devices are compensated with a single external capacitor and are free of any unusual oscillation or latch-up problems.

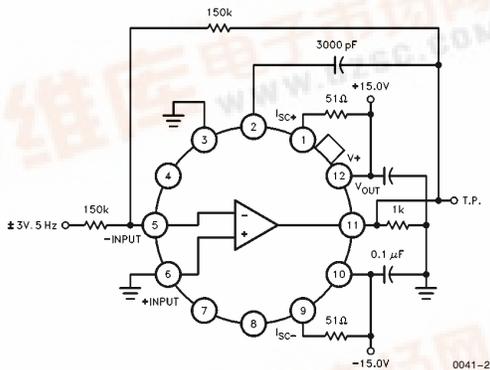
For applications requiring output currents in excess of 1A, see the ELH0021 data sheet.

The excellent input characteristics and high output capability of the ELH0041 make it an ideal choice for power applications such as DC servos, capstan drivers, deflection yoke drivers, and programmable power supplies.

The ELH0041 is particularly suited for applications such as torque drivers for inertial guidance systems, diddle yoke drivers for alphanumeric CRT displays, cable drivers, and programmable power supplies for automatic test equipment.

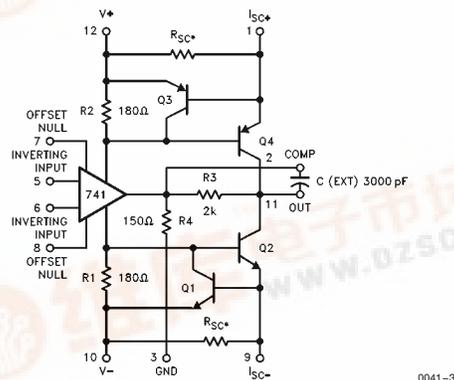
Elantec facilities comply with MIL-I-45208A and other applicable quality specifications. Elantec's Military devices are 100% fabricated and assembled in our rigidly controlled, ultra-clean facilities in Milpitas, California. For additional information on Elantec's Quality and Reliability Assurance policy and procedures request brochure QRA-1.

**Burn-In Circuit**



0041-2

**Equivalent Schematic**



0041-3

Note: All information contained in this data sheet has been carefully checked and is believed to be accurate as of the date of publication; however, this data sheet cannot be a "controlled document". Current revisions, if any, to these specifications are maintained at the factory and are available upon your request. We recommend checking the revision level before finalization of your design documentation. Patent pending.

September 1992 Rev G



# ELH0041G/883/8508701ZX

## 0.1 Amp Power Operational Amplifier

### Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ )

|          |   |                  |          |                             |   |
|----------|---|------------------|----------|-----------------------------|---|
| $V_S$    | Supply Voltage                            | $\pm 18\text{V}$ | $T_A$    | Operating Temperature Range |   |
| $V_{IN}$ | Input Voltage (Note 1)                    | $\pm 15\text{V}$ |          | ELH0041                     | $-55^\circ\text{C}$ to $+125^\circ\text{C}$ |
| $P_D$    | Power Dissipation (See curves)            |                  | $T_{ST}$ | Storage Temperature         | $-65^\circ\text{C}$ to $+150^\circ\text{C}$ |
|          | Differential Input Voltage                | $\pm 30\text{V}$ |          | Lead Temperature            |   |
|          | Peak Output Current (Note 2)              | 0.5A             |          | (Soldering, 10 seconds)     | $300^\circ\text{C}$                         |
|          | Output Short Circuit<br>Duration (Note 3) | Continuous       |          |                             |   |

#### Important Note:

All parameters having Min/Max specifications are guaranteed. The Test Level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series system. Unless otherwise noted, all tests are pulsed tests, therefore  $T_J = T_C = T_A$ .

| Test Level | Test Procedure  |
|------------|---|
| I          | 100% production tested and QA sample tested per QA test plan QCX0002.   |
| II         | 100% production tested at $T_A = 25^\circ\text{C}$ and QA sample tested at $T_A = 25^\circ\text{C}$ , $T_{MAX}$ and $T_{MIN}$ per QA test plan QCX0002. |
| III        | QA sample tested per QA test plan QCX0002.  |
| IV         | Parameter is guaranteed (but not tested) by Design and Characterization Data.   |
| V          | Parameter is typical value at $T_A = 25^\circ\text{C}$ for information purposes only.   |

### DC Electrical Characteristics $V_S = \pm 15\text{V}$ , $T_{MIN} \leq T_A \leq T_{MAX}$ , $C_C = 3000\text{ pF}$

| Parameter                | Description                             | Test Conditions  | ELH0041 |     |     |            | Units                          |
|--------------------------|---|--|---------|-----|-----|------------|--------------------------------|
|                          |   |  | Min     | Typ | Max | Test Level |                                |
| $V_{OS}$                 | Input Offset Voltage                    | $R_S \leq 100\Omega$ , $T_A = 25^\circ\text{C}$ (Note 4) |         | 1   | 3   | I          | mV                             |
|                          |   | $R_S \leq 100\Omega$ (Note 4)                            |         |     | 5   | I          | mV                             |
| $\Delta V_{OS}/\Delta T$ | Voltage Drift with Temperature          | $R_S \leq 100\Omega$                                     |         | 3   |     | V          | $\mu\text{V}/^\circ\text{C}$   |
|                          | Offset Voltage Drift with Time          | $T_A = 25^\circ\text{C}$                                 |         | 5   |     | V          | $\mu\text{V}/\sqrt{\text{wk}}$ |
| $\Delta V_{OS}/\Delta P$ | Offset Voltage Change with Output Power |  |         | 15  |     | V          | $\mu\text{V}/\text{W}$         |
|                          | Offset Voltage Adjustment Range         |  |         | 20  |     | V          | mV                             |
| $I_{OS}$                 | Input Offset Current                    | $T_A = 25^\circ\text{C}$ (Note 4)                        |         | 30  | 100 | I          | nA                             |
|                          |   | (Note 4)   |         |     | 300 | I          | nA                             |
|                          | Offset Current Drift with Temperature   |  |         | 0.1 | 1   | IV         | $\text{nA}/^\circ\text{C}$     |
|                          | Offset Current Drift with Time          | $T_A = 25^\circ\text{C}$                                 |         | 2   |     | V          | $\text{nA}/\sqrt{\text{wk}}$   |
| $I_B$                    | Input Bias Current                      | $T_A = 25^\circ\text{C}$ (Note 4)                        |         | 100 | 300 | I          | nA                             |
|                          |   | (Note 4)   |         |     | 1   | I          | $\mu\text{A}$                  |
| $R_{IN}$                 | Input Resistance                        | $T_A = 25^\circ\text{C}$                                 | 0.3     | 1   |     | I          | M $\Omega$                     |

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## 0.1 Amp Power Operational Amplifier

### DC Electrical Characteristics $V_S = \pm 15V, T_{MIN} \leq T_A \leq T_{MAX}, C_C = 3000 \text{ pF}$ — Contd.

| Parameter  | Description                  | Test Conditions  | ELH0041  |     |     |            | Units |
|------------|------------------------------|--|----------|-----|-----|------------|-------|
|            |                              |  | Min      | Typ | Max | Test Level |       |
| CMRR       | Common-Mode Rejection Ratio  | $R_S \leq 100\Omega, V_{CM} = \pm 10V$                           | 70       | 90  |     | I          | dB    |
| $V_{INCM}$ | Input Voltage Range          |  | $\pm 12$ |     |     | IV         | V     |
| PSRR       | Power Supply Rejection Ratio | $R_S \leq 100\Omega, V_S = \pm 5V \text{ to } \pm 15V$           | 80       | 96  |     | I          | dB    |
| $A_V$      | Voltage Gain (Note 5)        | $V_O = \pm 10V, R_L = 1 \text{ k}\Omega, T_A = 25^\circ\text{C}$ | 100      | 200 |     | I          | V/mV  |
|            |                              | $V_O = \pm 10V, R_L = 100\Omega$                                 | 25       |     |     | I          | V/mV  |
| $V_O$      | Output Voltage Swing         | $R_L = 100\Omega$  | $\pm 13$ | 14  |     | I          | V     |
| $I_{SC}$   | Output Short Circuit Current | $T_A = 25^\circ\text{C}, R_{SC} = 3.3\Omega$                     |          | 200 | 300 | I          | mA    |
| $I_S$      | Supply Current               | $V_{OUT} = 0V$   |          | 2.5 | 3.5 | I          | mA    |
| $P_C$      | Power Consumption            | $V_{OUT} = 0V$   |          | 75  | 105 | I          | mW    |

Note 1: Rating applies for supply voltages above  $\pm 15V$ . For supplies less than  $\pm 15V$ , rating is equal to supply voltage.

Note 2: Rating applies for LH0041G with  $R_{SC} = 0\Omega$ .

Note 3: Rating applies as long as package power rating is not exceeded.

Note 4: Specifications apply for  $\pm 5V \leq V_S \leq 18V$ .

Note 5: The ELH0041, like all Class B amplifiers, has a "dead band" when  $V_{OUT}$  is near zero volts. Typical values for the "dead band" are in the  $50 \mu V$  to  $200 \mu V$  range. Open-loop gain is measured at  $V_{OUT}$  from  $\pm 0.5 V_{DC}$  to  $\pm 10 V_{DC}$  which is out of the range of the "dead band".

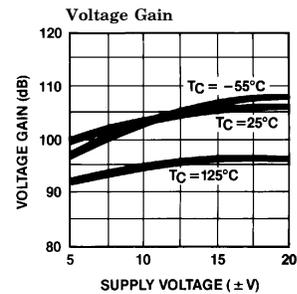
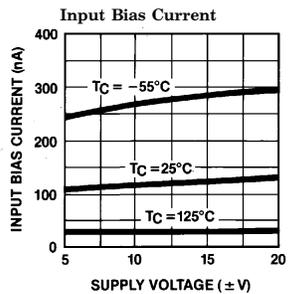
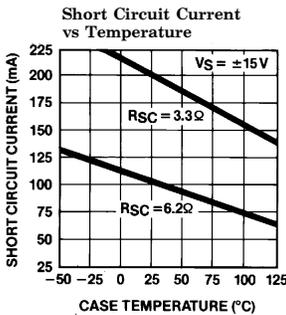
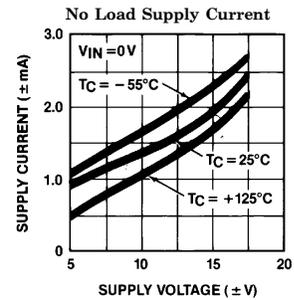
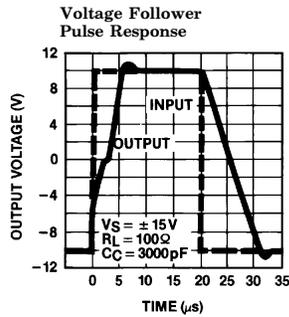
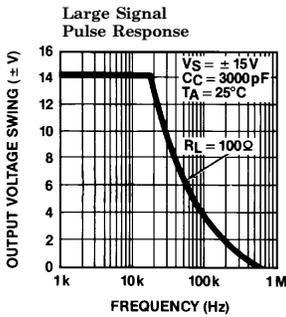
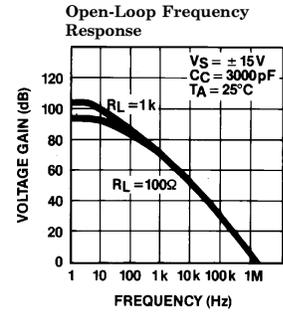
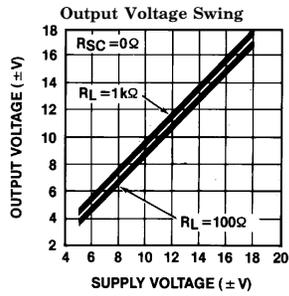
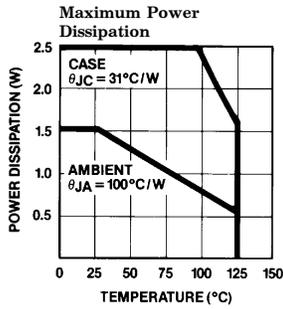
### AC Electrical Characteristics $T_A = 25^\circ\text{C}, V_S = \pm 15V, C_C = 3000 \text{ pF}$

| Parameter  | Description                    | Test Conditions   | ELH0041 |      |     |            | Units         |
|------------|--------------------------------|---|---------|------|-----|------------|---------------|
|            |                                |   | Min     | Typ  | Max | Test Level |               |
| SR         | Slew Rate                      | $A_V = 1, R_L = 100\Omega$                              | 1.5     | 3    |     | I          | V/ $\mu s$    |
| BW         | Bandwidth                      | $R_L = 100\Omega$                                       |         | 20   |     | V          | kHz           |
| $t_r, t_f$ | Small Signal Rise or Fall Time |   |         | 0.3  | 1   | I          | $\mu s$       |
|            | Small Signal Overshoot         |   |         | 5    | 20  | I          | %             |
| $t_S$      | Settling Time (0.1%)           | $\Delta V_{IN} = 10V, A_V = 1$                          |         | 4    |     | V          | $\mu s$       |
|            | Overload Recovery Time         |   |         | 3    |     | V          | $\mu s$       |
| HD         | Harmonic Distortion            | $f = 1 \text{ kHz}, P_O = 0.5W$                         |         | 0.2  |     | V          | %             |
| $E_N$      | Input Noise Voltage            | $R_S = 50\Omega, BW = 10 \text{ Hz to } 10 \text{ kHz}$ |         | 5    |     | V          | $\mu V_{rms}$ |
| $I_N$      | Input Noise Current            | $BW = 10 \text{ Hz to } 10 \text{ kHz}$                 |         | 0.05 |     | V          | $nA_{rms}$    |
| $C_{IN}$   | Input Capacitance              |   |         | 3    |     | V          | pF            |

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### Typical Performance Curves

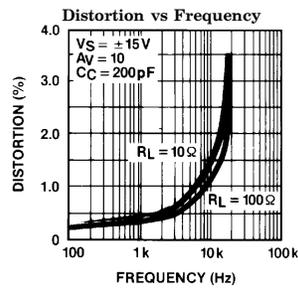
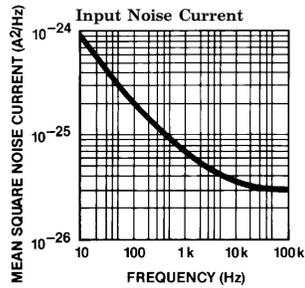
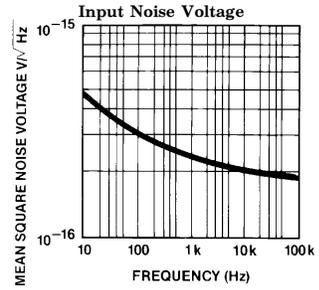
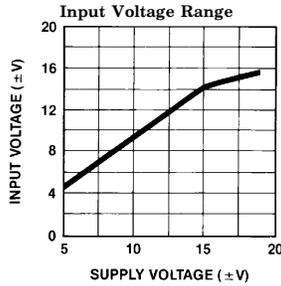
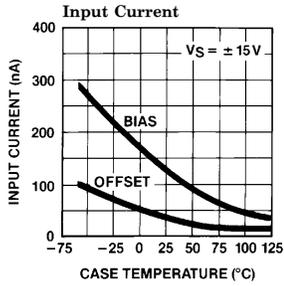


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# ELH0041G/883/8508701ZX

## 0.1 Amp Power Operational Amplifier

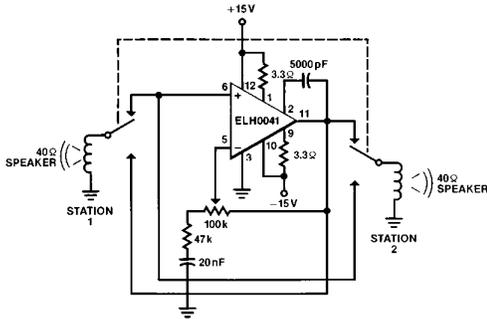
### Typical Performance Curves — Contd.



0041-5

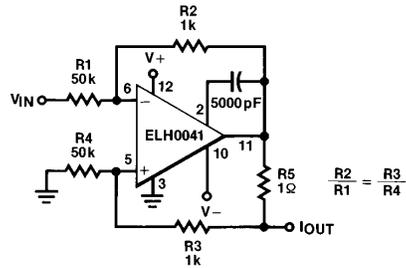
### Typical Applications

Two Way Intercom



0041-6

Programmable High Current Source/Sink



0041-7

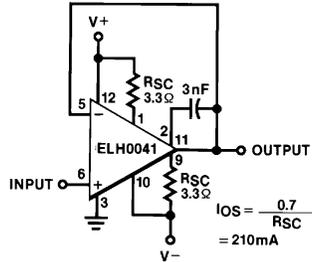
$$I_{OUT} = \frac{V_{IN}}{R_5} \left( \frac{R_2}{R_1} \right) + \frac{V_{OUT}}{R_1 + R_2} = 20 \text{ mA}/V_{IN}$$

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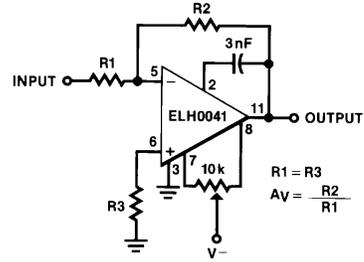
### Typical Applications — Contd.

Unity Gain with Short Circuit Limiting



0041-8

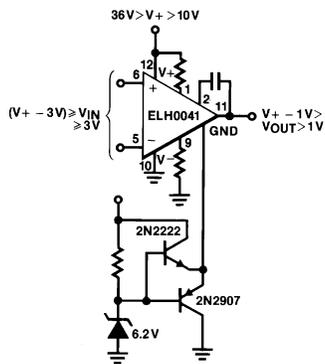
Offset Voltage Null Circuit



0041-9

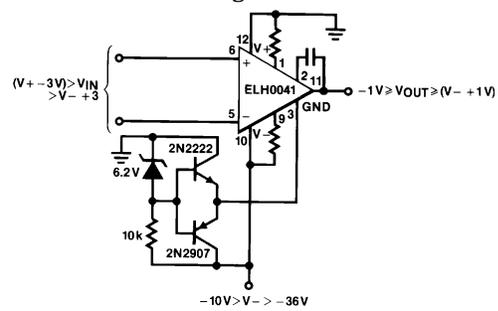
### Operation from Single Supplies

Positive



0041-10

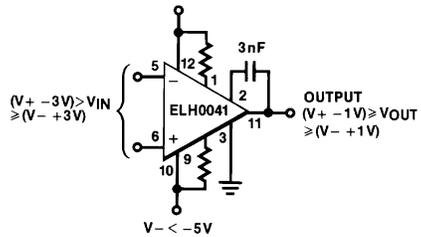
Negative



0041-11

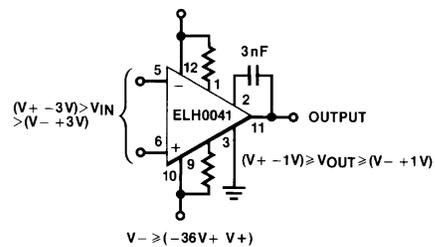
### Operation from Non-Symmetrical Supplies

V+ < (+36V - V-)



0041-12

V+ > +5V



0041-13

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# ***ELH0041G/883/8508701ZX***

## ***0.1 Amp Power Operational Amplifier***

### **General Disclaimer**

Specifications contained in this data sheet are in effect as of the publication date shown. Elantec, Inc. reserves the right to make changes in the circuitry or specifications contained herein at any time without notice. Elantec, Inc. assumes no responsibility for the use of any circuits described herein and makes no representations that they are free from patent infringement.

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HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

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