

## Features

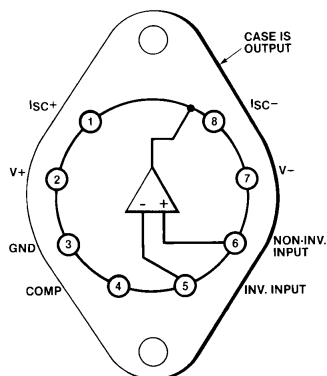
- High output current—1.2A
- Large output voltage swing— $\pm 12V$
- Low standby power—100 mW
- Wide full power bandwidth—20 kHz
- Low input bias current
- Low input offset voltage
- High open-loop gain  $> 100$  dB
- MIL-STD-883 devices 100% manufactured in U.S.A.

## Ordering Information

Part No.	Temp. Range	Pkg.	Outline #
ELH0021K/883B	$-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$	TO-3	MDP0003

8508801YX is the SMD version of this device.

## Connection Diagram



Top View

0021-1

## General Description

The ELH0021 is a general purpose operational amplifier capable of delivering large output currents not usually associated with conventional IC op amps; the ELH0021 will provide output currents in excess of 1A at voltage levels of  $\pm 12V$ . In addition, both the inputs and outputs are protected against overload. The device is compensated with a single external capacitor and are free of any unusual oscillation or latch-up problems.

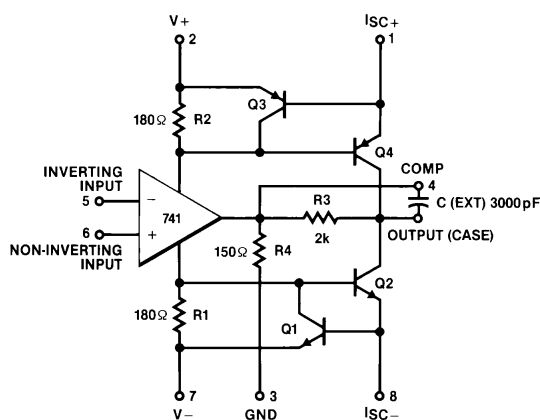
The excellent input characteristics and high output capability of the ELH0021 make it an ideal choice for power applications such as DC servos, capstan drivers, deflection yoke drivers, and programmable power supplies.

Other applications include torque drivers for inertial guidance systems, diddle yoke drivers for alphanumeric CRT displays, cable drivers, and programmable power supplies for automatic test equipment.

The ELH0021 is supplied in an 8-pin TO-3 package rated at 20W with suitable heatsink. The ELH0021 is guaranteed over the temperature range of  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$ .

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.

## Equivalent Schematic



0021-2

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. CMS # 0021DS

# ELH0021K/883/8508801YX

## 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)	$\pm 15\text{V}$		ELH0021	$-55^\circ\text{C}$ 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)	2A		(Soldering, 10 seconds)	300°C
	Output Short				
	Circuit 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	ELH0021				Units
			Min	Typ	Max	Test Level	
$V_{OS}$	Input Offset Voltage	$R_S \leq 100\Omega$ , $T_C = 25^\circ\text{C}$ (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	25	IV	$\mu\text{V}/^\circ\text{C}$
	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			5	15	I	$\mu\text{V}/\text{W}$
$I_{OS}$	Input Offset Current	$T_C = 25^\circ\text{C}$ (Note 4)		30	100	I	nA
		(Note 4)			300	I	nA
	Offset Current Drift with Temperature			0.1	1	IV	nA/ $^\circ\text{C}$
	Offset Current Drift with Time	$T_A = 25^\circ\text{C}$		2		V	nA/ $\sqrt{\text{wk}}$
$I_B$	Input Bias Current	$T_C = 25^\circ\text{C}$ (Note 4)		100	300	I	nA
		(Note 4)			1	I	$\mu\text{A}$
$R_{IN}$	Input Resistance	$T_C = 25^\circ\text{C}$	0.3	1		I	M $\Omega$
CMRR	Common-Mode Rejection Ratio	$R_S \leq 100\Omega$ , $V_{CM} = \pm 10\text{V}$	70	90		I	dB
$V_{INCM}$	Input Voltage Range		$\pm 12$			IV	V

# ***ELH0021K/883/8508801YX***

## ***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	ELH0021				Units
			Min	Typ	Max	Test Level	
PSRR	Power Supply Rejection Ratio	$R_S \leq 100\Omega$ , $V_S = \pm 5V$ to $\pm 15V$	80	96		I	dB
$A_{VOL}$	Voltage Gain (Note 5)	$V_O = \pm 10V$ , $R_L = 1 \text{ k}\Omega$ , $T_C = 25^\circ\text{C}$	100	200		I	V/mV
		$V_O = \pm 10V$ , $R_L = 100\Omega$	25			I	V/mV
$V_O$	Output Voltage Swing	$R_L = 100\Omega$	$\pm 13.5$	14		I	V
		$R_L = 10\Omega$ , $T_C = 25^\circ\text{C}$	$\pm 11$	$\pm 12$		I	V
$I_{SC}$	Output Short Circuit Current	$T_C = 25^\circ\text{C}$ , $R_{SC} = 0.5\Omega$	0.8	1.2	1.6	I	A
$I_S$	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 ELH0021K with  $R_{SC} = 0\Omega$ .

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

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

Note 5: The ELH0021, like all Class B amplifiers, has a “dead band” when  $V_{OUT}$  is near 0V. 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  $\pm 10.0 V_{DC}$  which is out of the range of the “dead band”.

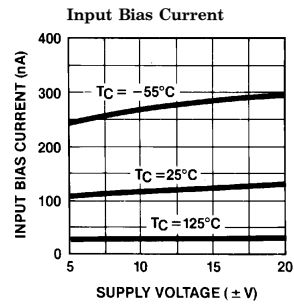
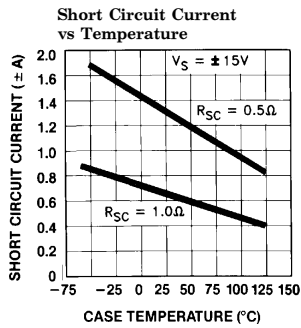
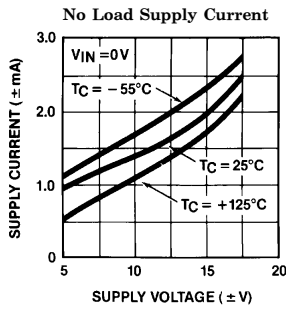
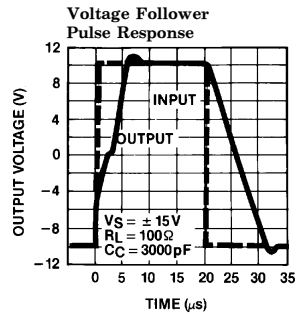
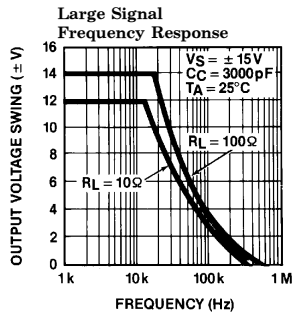
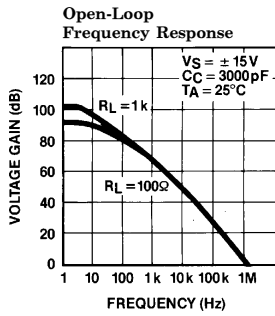
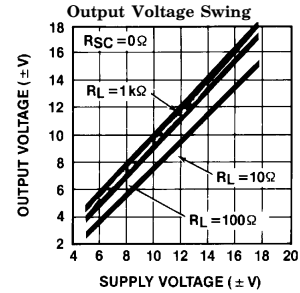
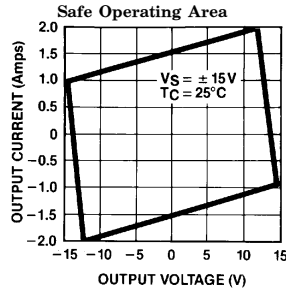
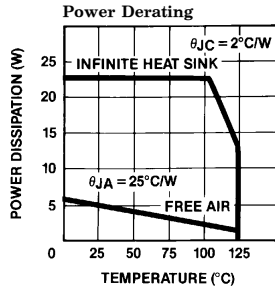
### AC Electrical Characteristics $T_A = 25^\circ\text{C}$ , $V_S = \pm 15V$ , $C_C = 3000 \text{ pF}$

Parameter	Description	Test Conditions	ELH0021				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 Hz to 10 kHz		5		V	$\mu V_{rms}$
$i_n$	Input Noise Current	BW = 10 Hz to 10 kHz		0.05		V	nA <sub>rms</sub>
$C_{IN}$	Input Capacitance			3		V	pF

# ELH0021K/883/8508801YX

## 1 Amp Power Operational Amplifier

### Typical Performance Curves

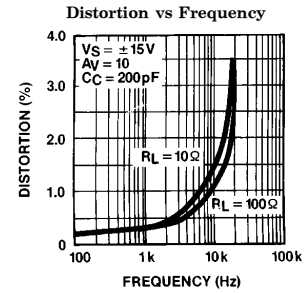
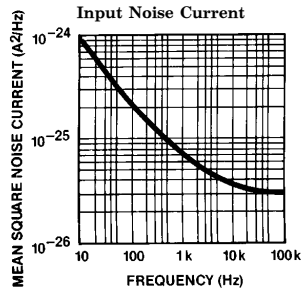
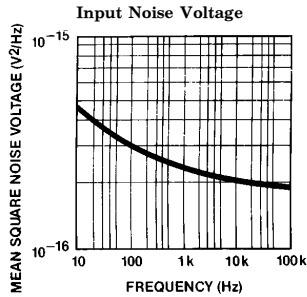
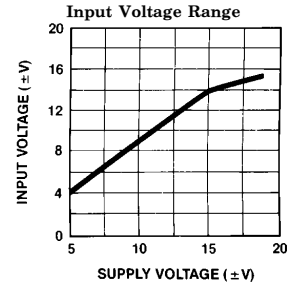
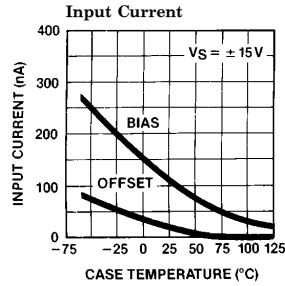
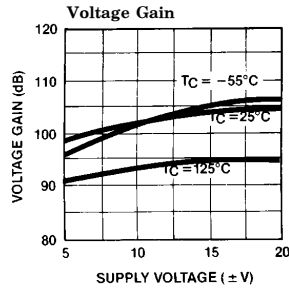


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# ELH0021K/883/8508801YX

## 1 Amp Power Operational Amplifier

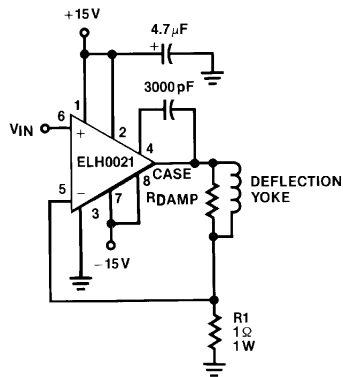
### Typical Performance Curves — Contd.



0021-4

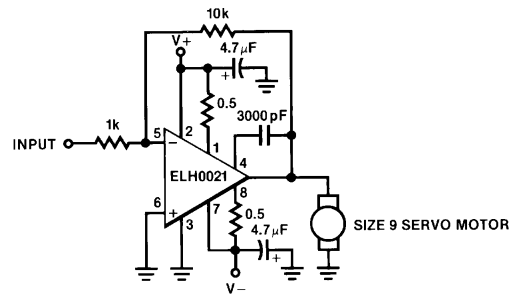
### Typical Applications

#### CRT Deflection Yoke Driver



0021-5

#### DC Servo Amplifier



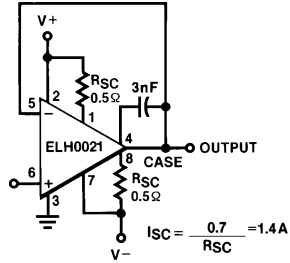
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# ELH0021K/883/8508801YX

## 1 Amp Power Operational Amplifier

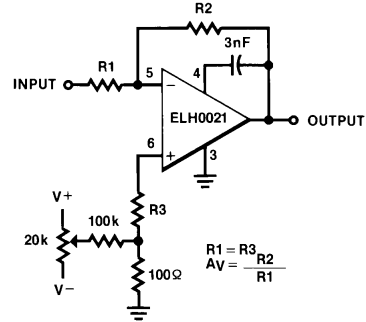
### Typical Applications — Contd.

Unity Gain with Short Circuit Limiting



0021-7

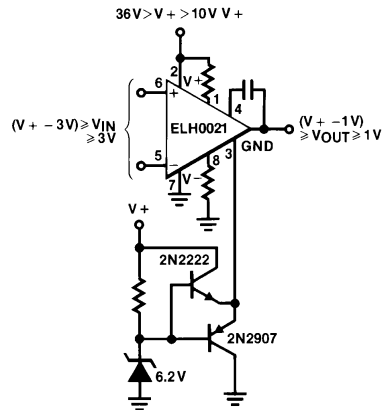
Offset Voltage Null Circuit



0021-8

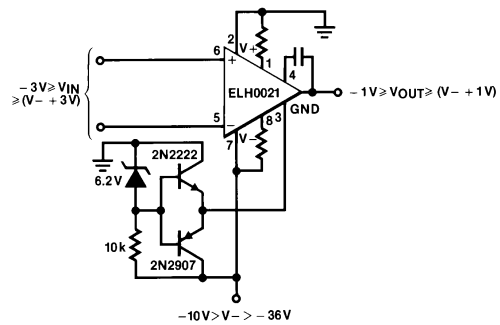
### Operation from Single Supplies

Positive



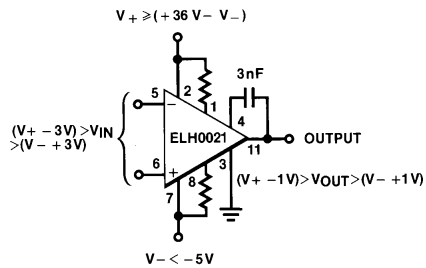
0021-9

Negative

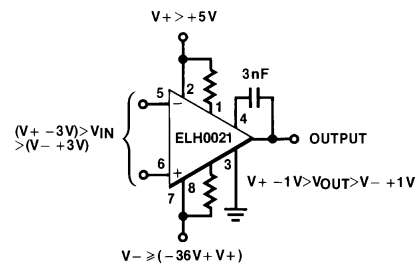


0021-10

### Operation from Non-Symmetrical Supplies

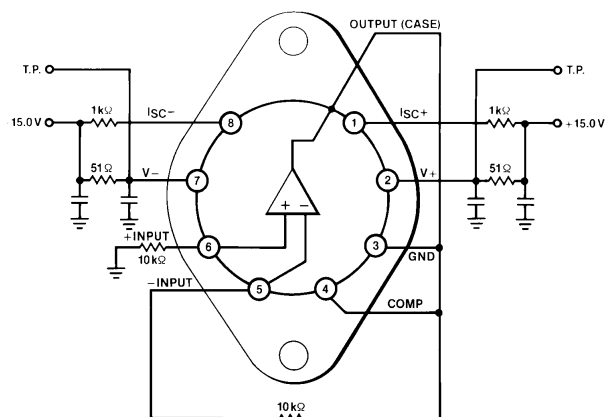


0021-11



0021-12

### Burn-In Circuit



0021-13

# ***ELH0021K/883/8508801YX***

## ***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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