EHA5190/EHA5195

Wideband, Fast Settling Operational Amplifier

Features

- Very high slew rate—200 V/μs
- Wide gain-bandwidth—150 MHz
- Power bandwidth—6.5 MHz
- Fast settling—70 ns
- Low offset voltage—0.5 mV
- Input voltage noise—6 nV/$\sqrt{\text{Hz}}$
- Monolithic bipolar construction
- MIL-STD-883 Rev. C compliant
- Exact replacement for HA5190/5195

Applications

- Fast, precise D/A converters
- High speed sample-hold circuits
- Pulse and video amplifiers
- Wideband amplifiers
- Replace costly hybrid

Ordering Information

Part No.	Temp. Range	Package	Outline #
EHA1-5190-2	−55°C to +125°C	14-Pin CerDIP	MDP0014
EHA1-5190/883B	−55°C to +125°C	14-Pin CerDIP	MDP0014
EHA2-5190-2	−55°C to +125°C	12-Pin TO-8	MDP0002
EHA2-5190/883B	−55°C to +125°C	12-Pin TO-8	MDP0002
EHA4-5190/883B	−55°C to +125°C	20-Pad LCC	MDP0007
EHA1-5195-5	0°C to +75°C	14-Pin CerDIP	MDP0014
EHA2-5195-5	0°C to +75°C	12-Pin TO-8	MDP0002

5962-87734 is the SMD version of this device.

General Description

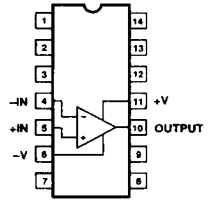
The Elantec EHA5190/EHA5195 are monolithic operational amplifiers featuring a combination of speed, precision, and bandwidth. Employing monolithic Complementary Bipolar construction, these devices are capable of delivering 200 V/μs slew rate with 70 ns settling times. These truly differential input operational amplifiers are designed to operate at gains ≥5 without the need for external compensation.

With a high Slew Rate and low settling time, these devices make ideal output amplifiers for accurate, high speed D/A converters or the main components in high speed sample-hold circuits. 150 MHz gain-bandwidth product, 6.5 MHz power bandwidth, and 0.5 mV offset voltage all make the EHA5190/EHA5195 well suited for a variety of pulse and wideband video amplifier applications.

Elantec's EHA5190/883B complies with MIL-STD-883 Revision C in all aspects, including burn-in at 125°C. Elantec's facilities comply with MIL-I-45208A and other applicable quality specifications. For information on Elantec's military processing, see the Elantec document, QRA-2: *Elantec's Military Processing Monolithic Products.*

Connection Diagrams

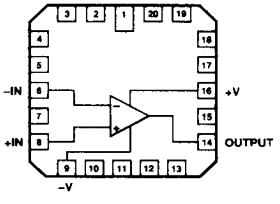
CerDIP Package



5190-1

Top View

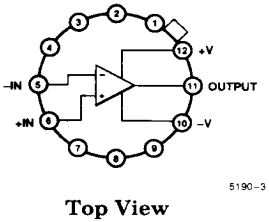
20-Lead LCC



5190-2

Top View

12-Lead TO-8



5190-3

Top View

Note: Case is tied to pin 10.

Note: Non-designated pins are no connects and are not electrically connected internally.

Manufactured under U.S. Patent No. 4,837,523

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Absolute Maximum Ratings (T_A = 25°C)

Voltage between V+ and V−	35V	Operating Temperature Range	
Differential Input Voltage	6V	EHA5190	−55°C to +125°C
Output Current	50 mA (Peak)	EHA5195	0°C to +75°C
	30 mA (Continuous)	Operating Junction Temperature	
Internal Power Dissipation	See Curves	CerDIP, Ceramic LCC, TO-8	175°C
		Storage Temperature Range	−65°C to +150°C
		Lead Temperature (Soldering, 5 seconds)	300°C

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°C and QA sample tested at T_A = 25°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°C for information purposes only.

DC Electrical Characteristics V_S = ±15V, R_L = 200Ω; unless otherwise specified

Parameter	Description	Temp	EHA5190				EHA5195				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
V_{OS}	Offset Voltage	25°C		0.5	5	I		0.5	6	I	mV
		Full			10	I			10	III	mV
TCV_{OS}	Average Offset Voltage Drift	Full		20		V		20		V	µV/°C
I_B	Bias Current	25°C		5	15	I		5	15	I	µA
		Full			20	I			20	III	µA
I_{OS}	Offset Current	25°C		1	4	I		1	4	I	µA
		Full			6	I			6	III	µA
R_{IN}	Input Resistance	25°C		10		V		10		V	kΩ
C_{IN}	Input Capacitance	25°C		1		V		1		V	pF
V_{CM}	Common Mode Input Range	Full	±5	±10		I	±5	±10		II	V
e_{IN}	Input Noise Voltage (f = 1 kHz, R_G = 0Ω)	25°C		6		V		6		V	nV/√Hz
A_{VOL}	Large Signal Voltage Gain	25°C	15k	30k		I	10k	30k		I	V/V
	(Notes 1, 2)	Full	5k			I	5k			III	V/V
CMRR	Common-Mode Rejection Ratio (Note 3)	Full	74	90		I	74	90		II	dB
V_O	Output Voltage Swing (Note 1)	Full	±5	±8		I	±5	±8		II	V

DC Electrical Characteristics $V_S = \pm 15V$, $R_L = 200\Omega$; unless otherwise specified — Contd.

Parameter	Description	Temp	EHA5190				EHA5195				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
I_O	Output Current (Note 1)	Full	±25	±40		I	±25	±40		II	mA
R_O	Output Resistance	25°C		30		V		30		V	Ω
I_S	Supply Current	Full		13	28	I		13	28	II	mA
PSRR	Power Supply Rejection Ratio (Note 8)	Full	70	80		I	70	80		II	dB

AC Electrical Characteristics $V_S = \pm 15V$, $R_L = 200\Omega$; unless otherwise specified

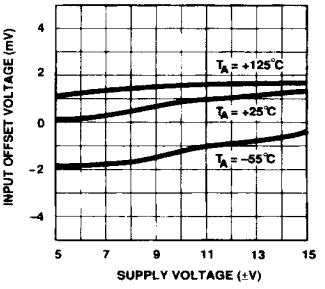
Parameter	Description	Temp	EHA5190				EHA5195				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
GBW	Gain-Bandwidth Product (Notes 4, 5)	25°C		150		V		150		V	MHz
FPBW	Full Power Bandwidth (Notes 2, 6)	25°C	5	6.5		I	5	6.5		I	MHz
t_r	Rise Time (Note 7)	25°C		7	18	IV		7	18	IV	ns
OS	Overshoot (Note 7)	25°C		25		V		25		V	%
SR	Slew Rate (Note 7)	25°C	160	200		I	160	200		I	V/μs
t_s	Settling Time (Notes 9, 10)										
	5V Step to 0.1%	25°C		50		V		50		V	ns
	5V Step to 0.05%	25°C		70		V		70		V	ns

Note 1: $R_L = 200\Omega$, $C_L < 10$ pF, $V_O = \pm 5V$.
Note 2: $V_O = \pm 5V$.
Note 3: Two tests are performed. $V_{CM} = 0V$ to $-5V$ and $V_{CM} = 0V$ to $+5V$.
Note 4: $V_O = 90$ mV.
Note 5: $A_V = 10$.
Note 6: Full Power Bandwidth guaranteed based on slew rate measurement using: $FPBW = \frac{\text{Slew Rate}}{2\pi\ \text{Vpeak}}$.
Note 7: Refer to Test Circuits section of data sheet.
Note 8: Two tests are performed. V+ = +15V, and V− is changed from −10V to −20V. V− = −15V and V+ is changed from +10V to +20V.
Note 9: Settling time measurements are made with techniques in the following reference: "Take The Guesswork Out of Settling-Time Measurements," EDN, September 19, 1985.
Note 10: $R_L = 1k$, $A_V = -5$.

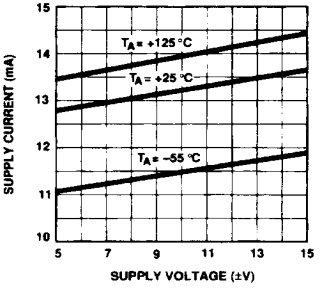
EHA5190/EHA5195
Wideband, Fast Settling Operational Amplifier

Typical Performance Curves

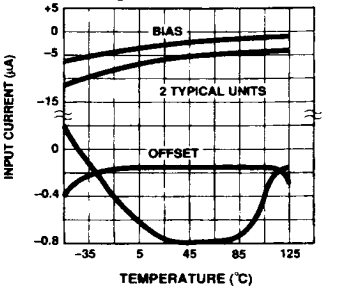
Input Offset Voltage vs Supply Voltage



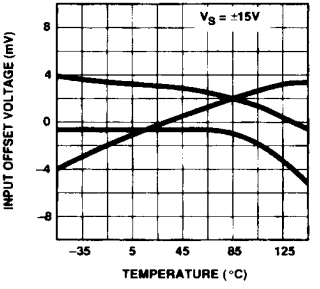
Supply Current vs Supply Voltage



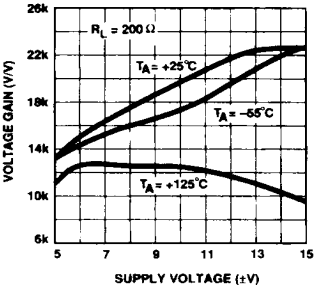
Input Currents vs Temperature



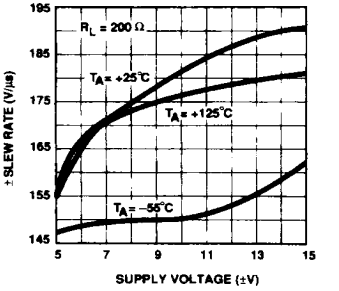
Input Offset Voltage vs Temperature (3 Typical units)



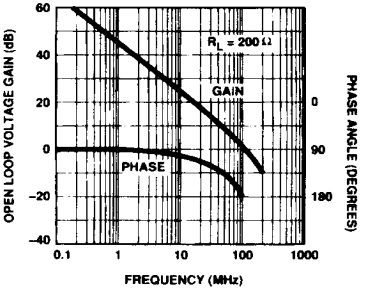
Voltage Gain vs Supply Voltage



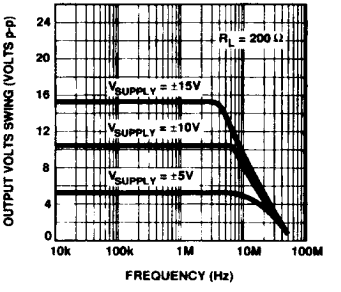
±Slew Rate vs Supply Voltage



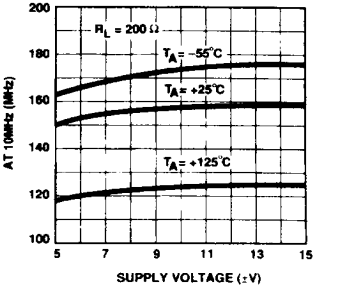
Open Loop Voltage Gain vs Frequency



Output Voltage Swing vs Frequency



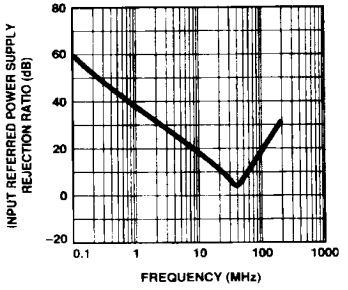
Gain Bandwidth Product at 10 MHz vs Supply Voltage



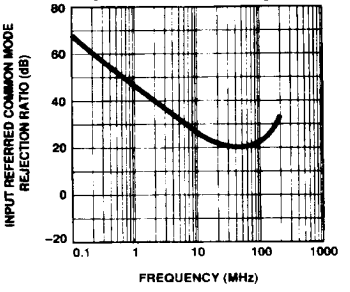
5190-4

Typical Performance Curves — Contd.

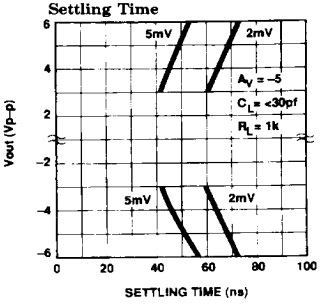
Input Referred Power Supply Rejection Ratio vs Frequency



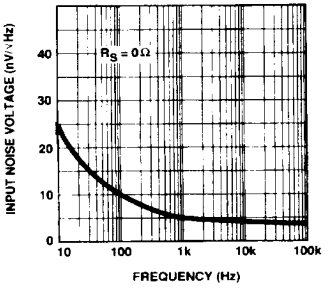
Input Referred Common Mode Rejection Ratio vs Frequency



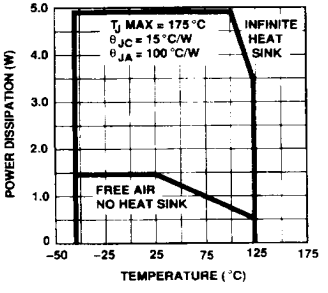
Settling Time



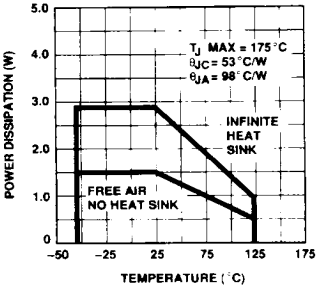
Input Noise Voltage vs Frequency



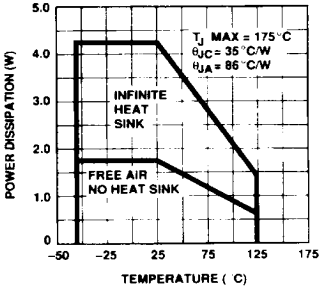
12-Lead TO-8 Maximum Power Dissipation vs Ambient Temperature



20-Lead LCC Maximum Power Dissipation vs Ambient Temperature



14-Lead CerDIP Maximum Power Dissipation vs Ambient Temperature



5190-5

EHA5190/EHA5195
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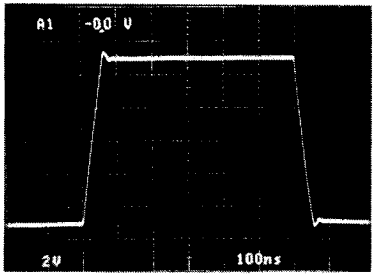
Typical Performance Curves — Contd.

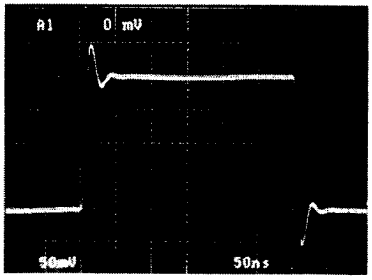
Large Signal Response



V_{IN} = ±1V
V_O = ±5V

5190-6

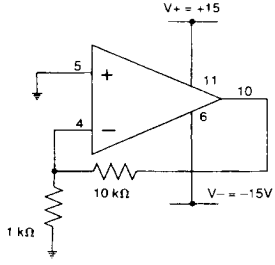
Small Signal Response



V_{IN} = ±20 mV
V_O = ±100 mV

5190-7

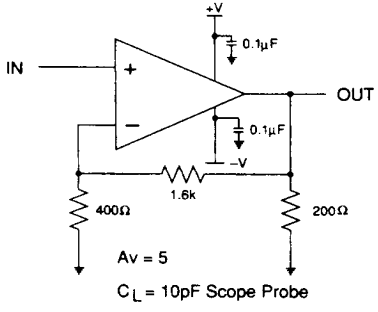
Burn-In Circuit



5190-8

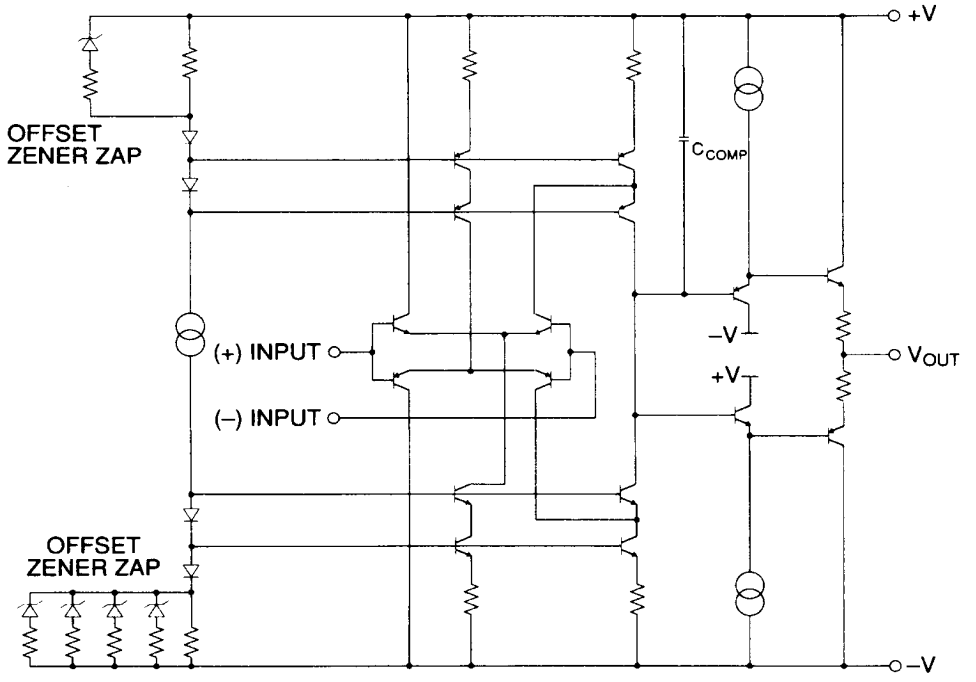
Pin numbers are for 14-lead CerDIP. Burn-in circuit is identical for all package types.

Test Circuit



5190-9

Schematic



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EHA5190 Macromodel

```
* Connections:      +input
*                   |     -input
*                   |     |     +Vsupply
*                   |     |     |     -Vsupply
*                   |     |     |     |     output
*                   |     |     |     |     |
.subckt M5190       5     4     11    6     10
* Input Stage
ie 37 6 2mA
r6 36 37 60
r7 38 37 60
rc1 11 30 75
rc2 11 39 75
q1 30 5 36 qn
q2 39 4 38 qna
ediff 33 0 39 30 7.25
rdiff 33 0 1Meg
* Compensation Section
ga 0 34 33 0 2.6m
rh 34 0 1.5Meg
ch 34 0 3.5pF
rc 34 40 600
cc 40 0 7pF
* Poles
ep 41 0 40 0 1
rpa 41 42 75
cpa 42 0 5pF
rpb 42 43 50
cpb 43 0 5pF
* Output Stage
ios1 11 50 1.25mA
ios2 51 6 1.25mA
q3 6 43 50 qp
q4 11 43 51 qn
q5 11 50 52 qn
q6 6 51 53 qp
ros1 52 10 25
ros2 10 53 25
* Power Supply Current
ips 11 6 8.5mA
* Models
.model qn npn(is=800.0E-18 bf=200 tf=0.2nS)
.model qna npn(is=864E-18 bf=250 tf=0.2nS)
.model qp pnp(is=800E-18 bf=60 tf=0.2nS)
.ends
```

EHA5190 Macromodel — Contd.