

Features

- High slew rate—100 V/ μ s
- Fast settling—200 ns
- Wide power bandwidth
- High input impedance
- Low offset current—25 nA
- Compensated versions available

Applications

- Data acquisition systems
- R.F. amplifiers
- Video amplifiers
- Signal generators
- Pulse amplification
- High speed sample and holds

General Description

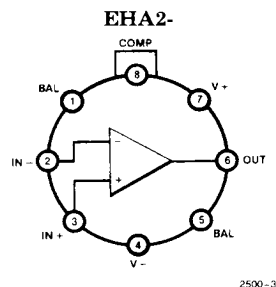
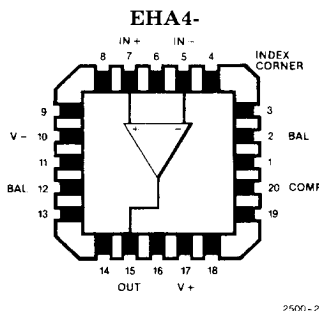
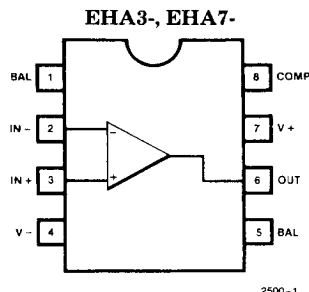
Elantec's EHA2500 Series of monolithic high slew rate amplifiers is designed and optimized for high slew rates and wide bandwidths. Three different types are offered. The EHA250X series is unity gain stable and low cost. The EHA251X series has twice the bandwidth and slew rate of the EHA250X series and is also unity gain stable. For the best AC performance choose the EHA252X series which has the highest slew rate —120 V/ μ s— and the widest bandwidths available. The EHA252X series is stable with closed loop gains as low as three.

These devices are fabricated using Elantec's DInamic Dielectrically Isolated process that has excellent PNPs and NPNs that allow higher bandwidths than standard junction isolated process.

Elantec's high speed amplifiers are widely used in military, video and medical applications. They are especially suited for high speed video amplifiers, pulse detectors, and wide bandwidth filters.

Elantec's facilities comply with MIL-I-45208A and other applicable quality specifications. For information on Elantec's military processing, request our brochure: *Elantec's Military Processing—Monolithic Products*.

Connection Diagrams



Top Views

EHA2500 Series

High Slew Rate Operational Amplifier

Selection Guide

Part Number	Temp	V _{OS} (Max) mV	I _{BIAS} (Max) nA	I _{OS} (Max) nA	G _{BW} (Typ) MHz	PBW (Min) kHz	S _R (Min) V/ μ s	t _{SET} (Typ) μ s	PSRR, CMRR (Min) dB	R _{IN} (Min) M Ω	Minimum Stable Gain
EHA2500	M	5	200	25	12	350	25	0.33	80	25	1
EHA2502	M	8	250	50	12	300	20	0.33	74	20	1
EHA2505	C	8	250	50	12	300	20	0.33	74	20	1
EHA2510	M	8	200	25	12	750	50	0.25	80	50	1
EHA2512	M	10	250	50	12	600	40	0.25	74	40	1
EHA2515	C	10	250	50	12	600	40	0.25	74	40	1
EHA2520	M	8	200	25	20	1500	100	0.20	80	50	3
EHA2522	M	10	250	50	20	1200	80	0.20	74	40	3
EHA2525	C	10	250	50	20	1200	80	0.20	74	40	3

Ordering Information

Dice (Note 1) (EHA0-)	14-Pin DIP Ceramic (EHA1-)	TO-99 Metal Can (EHA2-)	8-Pin DIP Plastic (EHA3-)	LCC 20-Pin (EHA4-)	8-Pin DIP CerDIP (EHA7-)
EHA0-2500-6		EHA2-2500/883B EHA2-2500-2			EHA7-2500/883B EHA7-2500-2
EHA0-2502-6		EHA2-2502/883B EHA2-2502-2			EHA7-2502/883B EHA7-2502-2
EHA0-2505-6		EHA2-2505-5	EHA3-2505-5		EHA7-2505-5
EHA0-2510-6		EHA2-2510/883B EHA2-2510-2			EHA7-2510/883B EHA7-2510-2
EHA0-2512-6		EHA2-2512/883B EHA2-2512-2			EHA7-2512/883B EHA7-2512-2
EHA0-2515-6		EHA2-2515-5	EHA3-2515-5		EHA7-2515-5
EHA0-2520-6	(Note 2)	EHA2-2520/883B EHA2-2520-2		EHA4-2520/883B	EHA7-2520/883B EHA7-2520-2
EHA0-2522-6		EHA2-2522/883B EHA2-2522-2			EHA7-2522/883B EHA7-2522-2
EHA0-2525-6		EHA2-2525-5	EHA3-2525-5		EHA7-2525-5

Note 1: Dice are available in waffle packs. Consult factory for more information.

Note 2: Consult factory for special packaging or temperature range requirements.

PREFIX	
EHA2—	TO-99 Metal Can MDP0004
EHA3—	8-Pin Plastic DIP MDP0031
EHA4—	Leadless Chip Carrier (LCC) . . MDP0007
EHA7—	8-Pin CerDIP MDP0010
EHA0—	Dice

SUFFIX	
—2	—55°C to +125°C
—3	
—4	—25°C to +85°C
—5	0°C to +75°C
—6	100% 25°C Probe (Dice Only)
—7	
/883B	See Elantec's "Military Processing—Monolithic Products".
—9	

EHA2500 Series

High Slew Rate Operational Amplifier

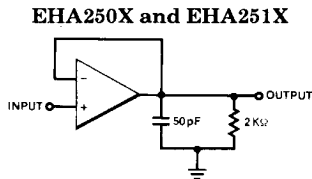
EHA2500 SERIES

Important Note:

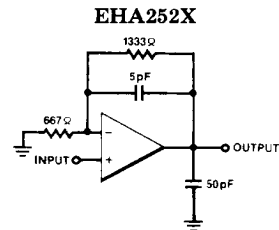
All parameters having Min/Max specifications are guaranteed. The Test Level column indicates the specific device testing actually performed during production and Quality inspection. Elantec performs most electrical tests using modern high-speed automatic test equipment, specifically the LTX77 Series 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.

AC Test Circuits

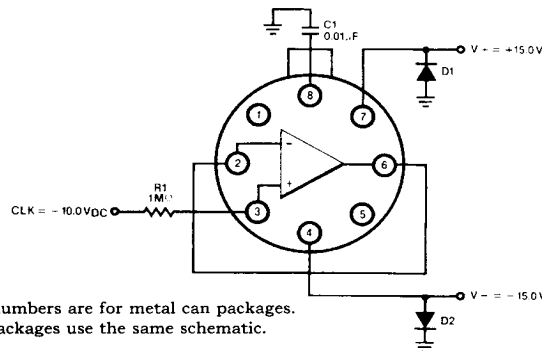


2500-4



2500-5

Burn-In Circuit



2500-6

Top View

EHA2500/2502/2505

High Slew Rate Operational Amplifier

Absolute Maximum Ratings

V_S	Supply Voltage	$\pm 20V$	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	$\pm 15V$		EHA2500/02	$-55^{\circ}C$ to $+125^{\circ}C$
P_D	Maximum Power Dissipation	See Curves		EHA2505	$0^{\circ}C$ to $+75^{\circ}C$
I_{OP}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	$-65^{\circ}C$ to $+150^{\circ}C$
				Lead Temperature	
				(Soldering, 5 seconds)	$300^{\circ}C$

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 $T_A = 25^{\circ}C$ and QA sample tested at $T_A = 25^{\circ}C$, 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 $T_A = 25^{\circ}C$ for information purposes only.

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified

Parameter	Description	Test Conditions	EHA2500				EHA2502				EHA2505				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
V_{OS}	Offset Voltage	$T_A = 25^{\circ}C$		2	5	I		4	8	I		4	8	I	mV
					8	I			10	I			10	III	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift			20		V		20		V		20		V	$\mu V/^{\circ}C$
I_B	Bias Current (Note 1)	$T_A = 25^{\circ}C$		100	200	I		125	250	I		125	250	I	nA
					400	I			500	I			500	III	nA
I_{OS}	Offset Current	$T_A = 25^{\circ}C$		10	25	I		20	50	I		20	50	I	nA
					50	I			100	I			100	III	nA
R_{IN}	Input Resistance	$T_A = 25^{\circ}C$	25	50		IV	20	50		IV	20	50		IV	M Ω
V_{CMR}	Common-Mode Range		± 10			I	± 10			I	± 10			II	V
$CMRR$	Common-Mode Rejection Ratio (Note 2)	$\Delta V_{CM} = \pm 10V$	80	90		I	74	90		I	74	90		II	dB
$PSRR$	Power Supply Rejection Ratio (Note 3)	$\Delta V_S = \pm 5V$	80	90		I	74	90		I	74	90		II	dB

EHA2500/2502/2505

High Slew Rate Operational Amplifier

EHA2500/2502/2505

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DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified — Contd.

Parameter	Description	Test Conditions	EHA2500				EHA2502				EHA2505				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
A_{VOL}	Large Signal Voltage Gain (Note 4)	$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	20	30		I	15	25		I	15	25		I	V/mV
		$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$	15			I	10			I	10			III	V/mV
V_{OUT}	Output Voltage Swing	$R_L = 2\text{ k}\Omega$	± 10	± 20		I	± 10	± 12		I	± 10	± 12		II	V
I_{OUT}	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	± 10	± 20		I	± 10	± 20		I	± 10	± 20		I	mA
		$V_{OUT} = \pm 10V$	± 7.5			I	± 7.5			I	± 7.5			III	mA
I_{CC}	Supply Current (Note 5)	$T_A = 25^\circ\text{C}$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

$V_S = \pm 15V$, $A_V = 1$, $R_S = 50\Omega$, $R_L = 2\text{ k}\Omega$, $C_L = 50\text{ pF}$, $V_{OUT} = \pm 200\text{ mV}$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified (See AC test circuit)

Parameter	Description	Test Conditions	EHA2500				EHA2502				EHA2505				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
t _r , t _f	Rise and Fall Times	T _A = 25°C		25	50	I		25	50	I		25	50	I	ns
				60	I			60	I			60	III	ns	
SR	Slew Rate	V _{OUT} = ±5V, T _A = 25°C	±25	±30		I	±20	±30		I	±20	±30		I	V/μs
		V _{OUT} = ±5V	±20			I	±15			I	±15			III	V/μs
GBW	Gain Bandwidth Products	A _v ≥ 10, T _A = 25°C		12		V		12		V		12		V	MHz
FPBW	Full Power Bandwidth (Note 6)	V _{OUT} = ±10V, T _A = 25°C	350	500		IV	300	500		IV	300	500		IV	kHz
O.S.	Overshoot	T _A = 25°C		25	40	I		25	50	I		25	50	I	%
					50	I			60	I			60	III	%
t _s	Settling Time to 0.1%	V _{OUT} = ±5V, T _A = 25°C		0.33		V		0.33		V		0.33		V	μs

Note 1: Both input currents, I_{B+} , and I_{B-} , are tested individually.

Note 2: For $CMRR+$, $V_{CM} = 0V$ to $+10V$ and for $CMRR-$, $V_{CM} = 0V$ to $-10V$.

Note 3: $PSRR+$, $V_{S+} = +10V$ to $+20V$ with $V_{S-} = -15V$. For $PSRR-$, $V_{S-} = -10V$ to $-20V$ with $V_{S+} = +15V$.

Note 4: For A_{VOL+} , $V_{OUT} = 0V$ to $+10V$ and for A_{VOL-} , $V_{OUT} = 0V$ to $-10V$.

Note 5: Both positive and negative supply currents, I_{CC+} , and I_{CC-} , are tested.

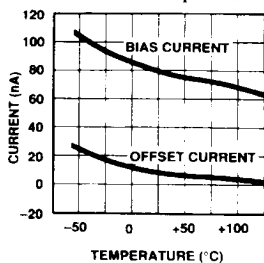
Note 6: The Full Power Bandwidth is guaranteed by testing slew rate, $FPBW = SR/(2\pi V_P)$.

EHA2500/2502/2505

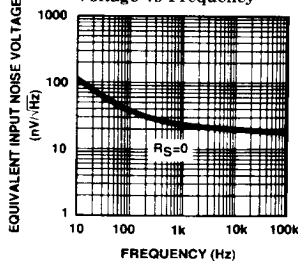
High Slew Rate Operational Amplifier

Typical Performance Curves

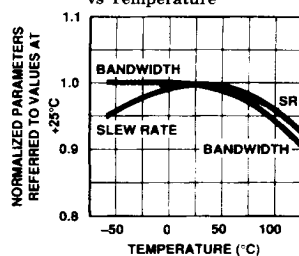
Input Bias and Offset Current vs Temperature



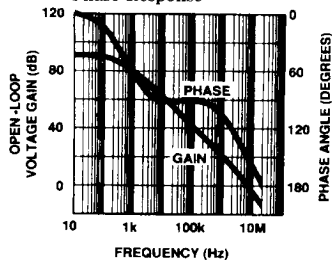
Equivalent Input Noise Voltage vs Frequency



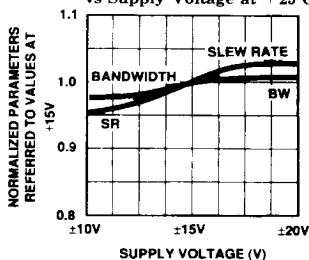
Normalized AC Parameters vs Temperature



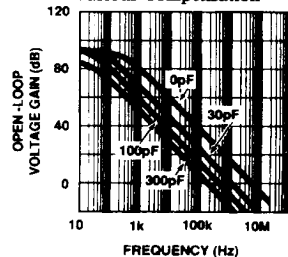
Open-Loop Frequency and Phase Response



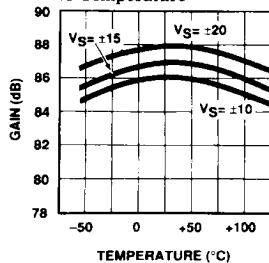
Normalized AC Parameters vs Supply Voltage at +25°C



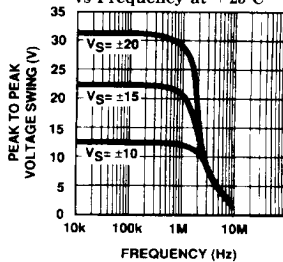
Open-Loop Frequency Response For Various Compensation



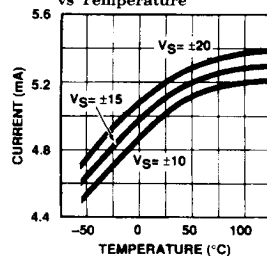
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



2500-7

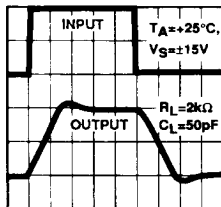
EHA2500/2502/2505

High Slew Rate Operational Amplifier

EHA2500/2502/2505

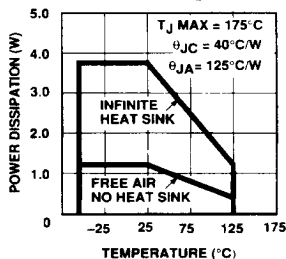
Typical Performance Curves — Contd.

Voltage Follower
Pulse Response

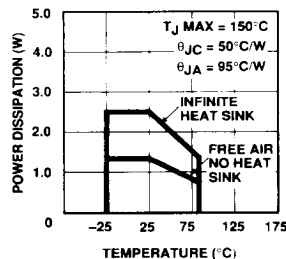


VERTICAL=5V/DIV
HORIZONTAL=200ns/DIV

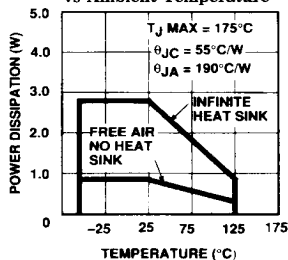
8-Lead CerDIP Maximum
Power Dissipation
vs Ambient Temperature



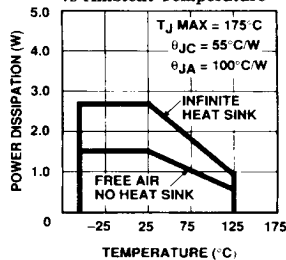
8-Lead Plastic DIP
Maximum Power Dissipation
vs Ambient Temperature



8-Lead TO-99 Metal Can
Maximum Power Dissipation
vs Ambient Temperature



20-Pad LCC
Maximum Power Dissipation
vs Ambient Temperature



2500-8

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EHA2510/2512/2515

High Slew Rate Operational Amplifier

Absolute Maximum Ratings

V_S	Supply Voltage	$\pm 20V$	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	$\pm 15V$		EHA2510/12	$-55^{\circ}C$ to $+125^{\circ}C$
P_D	Maximum Power Dissipation	See Curves		EHA2515	$0^{\circ}C$ to $+75^{\circ}C$
I_{OP}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	$-65^{\circ}C$ to $+150^{\circ}C$
				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 $T_A = 25^{\circ}C$ and QA sample tested at $T_A = 25^{\circ}C$, 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 $T_A = 25^{\circ}C$ for information purposes only.

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified

Parameter	Description	Test Conditions	EHA2510				EHA2512				EHA2515				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
V_{OS}	Offset Voltage	$T_A = 25^{\circ}C$		4	8	I		5	10	I		5	10	I	mV
					10	I			14	I			14	III	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift			20		V		25		V		30		V	$\mu V/^{\circ}C$
I_B	Bias Current (Note 1)	$T_A = 25^{\circ}C$		100	200	I		125	250	I		125	250	I	nA
					400	I			500	I			500	III	nA
I_{OS}	Offset Current	$T_A = 25^{\circ}C$		10	25	I		20	50	I		20	50	I	nA
					50	I			100	I			100	III	nA
R_{IN}	Input Resistance	$T_A = 25^{\circ}C$	50	100		IV	40	100		IV	40	100		IV	M Ω
V_{CMR}	Common-Mode Range		± 10			I	± 10			I	± 10			II	V
CMRR	Common-Mode Rejection Ratio (Note 2)	$\Delta V_{CM} = \pm 10V$	80	90		I	74	90		I	74	90		II	dB
PSRR	Power Supply Rejection Ratio (Note 3)	$\Delta V_S = \pm 5V$	80	90		I	74	90		I	74	90		II	dB

EHA2510/2512/2515

High Slew Rate Operational Amplifier

EHA2510/2512/2515

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DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified — Contd.

Parameter	Description	Test Conditions	EHA2510				EHA2512				EHA2515				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
AVOL	Large Signal Voltage Gain (Note 4)	$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	10	15		I	7.5	15		I	7.5	15		I	V/mV
		$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$	7.5			I	5			I	5			III	V/mV
VOUT	Output Voltage Swing	$R_L = 2\text{ k}\Omega$	± 10	± 12		I	± 10	± 12		I	± 10	± 12		II	V
IOUT	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	± 10	± 20		I	± 10	± 20		I	± 10	± 20		I	mA
		$V_{OUT} = \pm 10V$	± 7.5			I	± 7.5			I	± 7.5			III	mA
ICC	Supply Current (Note 5)	$T_A = 25^\circ\text{C}$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

$V_S = \pm 15V$, $A_V = 1$, $R_S = 50\Omega$, $R_L = 2\text{ k}\Omega$, $C_L = 50\text{ pF}$, $V_{OUT} = \pm 200\text{ mV}$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified
(See AC test circuit)

Parameter	Description	Test Conditions	EHA2510				EHA2512				EHA2515				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
t_r, t_f	Rise and Fall Times	$T_A = 25^\circ\text{C}$		25	50	I		25	50	I		25	50	I	ns
					60	I			60	I			60	III	ns
SR	Slew Rate	$V_{OUT} = \pm 5V$, $T_A = 25^\circ\text{C}$	± 50	± 65		I	± 40	± 60		I	± 40	± 60		I	V/ μs
		$V_{OUT} = \pm 5V$	± 45			I	± 35			I	± 35			III	V/ μs
GBW	Gain Bandwidth Products	$A_V \geq 10$, $T_A = 25^\circ\text{C}$		12		V		12		V		12		V	MHz
FPBW	Full Power Bandwidth (Note 6)	$V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	750	1000		IV	600	1000		IV	600	1000		IV	kHz
O.S.	Overshoot	$T_A = 25^\circ\text{C}$		25	40	I		25	50	I		25	50	I	%
					50	I			60	I			60	III	%
t_s	Settling Time to 0.1%	$V_{OUT} = \pm 5V$		0.25		V		0.25		V		0.25		V	μs

Note 1: Both input currents, I_{B+} , and I_{B-} , are tested individually.

Note 2: For $CMRR+$, $V_{CM} = 0V$ to $+10V$ and for $CMRR-$, $V_{CM} = 0V$ to $-10V$.

Note 3: $PSRR+$, $V_{S+} = +10V$ to $+20V$ with $V_{S-} = -15V$. For $PSRR-$, $V_{S-} = -10V$ to $-20V$ with $V_{S+} = +15V$.

Note 4: For $AVOL+$, $V_{OUT} = 0V$ to $+10V$ and for $AVOL-$, $V_{OUT} = 0V$ to $-10V$.

Note 5: Both positive and negative supply currents, I_{CC+} , and I_{CC-} , are tested.

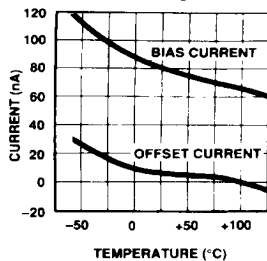
Note 6: The Full Power Bandwidth is guaranteed by testing slew rate, $FPBW = SR/(2\pi V_P)$.

EHA2510/2512/2515

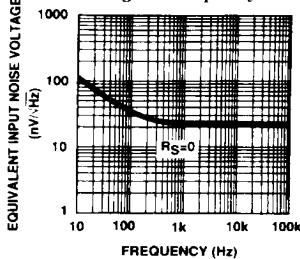
High Slew Rate Operational Amplifier

Typical Performance Curves

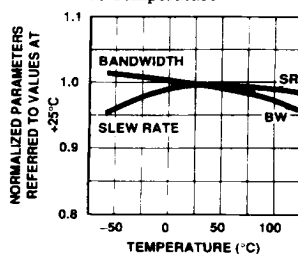
Input Bias and Offset Current vs Temperature



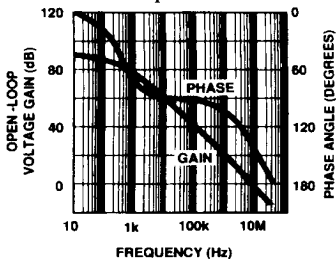
Equivalent Input Noise Voltage vs Frequency



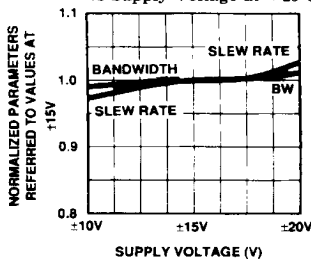
Normalized AC Parameters vs Temperature



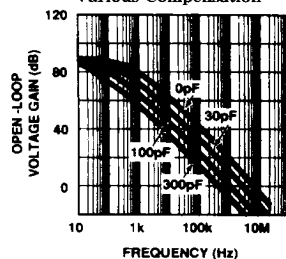
Open-Loop Frequency and Phase Response



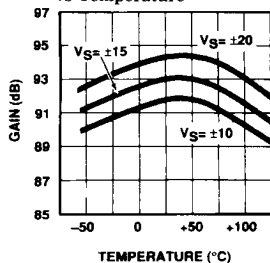
Normalized AC Parameters vs Supply Voltage at +25°C



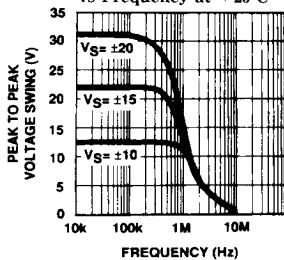
Open-Loop Frequency Response For Various Compensation



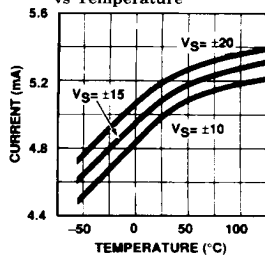
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



2500-B

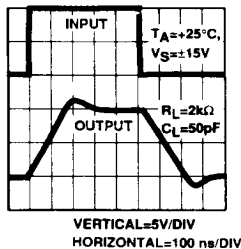
EHA2510/2512/2515

High Slew Rate Operational Amplifier

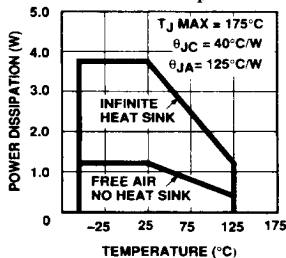
EHA2510/2512/2515

Typical Performance Curves — Contd.

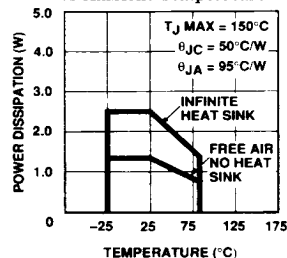
Voltage Follower
Pulse Response



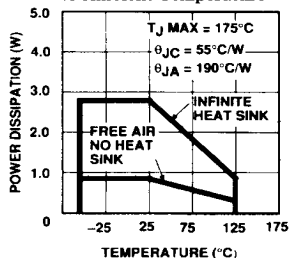
8-Lead CerDIP Maximum
Power Dissipation
vs Ambient Temperature



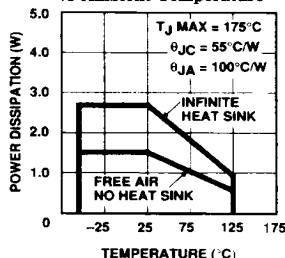
8-Lead Plastic DIP
Maximum Power Dissipation
vs Ambient Temperature



8-Lead TO-99 Metal Can
Maximum Power Dissipation
vs Ambient Temperature



20-Pad LCC
Maximum Power Dissipation
vs Ambient Temperature



2500-10

EHA2520/2522/2525

High Slew Rate Operational Amplifier

Absolute Maximum Ratings

V_S	Supply Voltage	$\pm 20V$	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	$\pm 15V$		EHA2520/22	$-55^{\circ}C$ to $+125^{\circ}C$
P_D	Maximum Power Dissipation	See Curves		EHA2525	$0^{\circ}C$ to $+75^{\circ}C$
I_{OUT}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	$-65^{\circ}C$ to $+150^{\circ}C$
				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 QCX0001.
II	100% production tested at $T_A = 25^{\circ}C$ and QA sample tested at $T_A = 25^{\circ}C$, 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 $T_A = 25^{\circ}C$ for information purposes only.

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified

Parameter	Description	Test Conditions	EHA2520				EHA2522				EHA2525				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
V_{OS}	Offset Voltage	$T_A = 25^{\circ}C$		4	8	I		5	10	I		5	10	I	mV
					10	I			14	I			14	III	mV
$\Delta V_{OS}/\Delta T$	Offset Voltage Drift			20		V		25		V		30		V	$\mu V/^{\circ}C$
I_B	Bias Current (Note 1)	$T_A = 25^{\circ}C$		100	200	I		125	250	I		125	250	I	nA
					400	I			500	I			500	III	nA
I_{OS}	Offset Current	$T_A = 25^{\circ}C$		10	25	I		20	50	I		20	50	I	nA
					50	I			100	I			100	III	nA
R_{IN}	Input Resistance	$T_A = 25^{\circ}C$	50	100		IV	40	100		IV	40	100		IV	M Ω
V_{CMR}	Common-Mode Range		± 10			I	± 10			I	± 10			II	V
$CMRR$	Common-Mode Rejection Ratio (Note 2)	$\Delta V_{CM} = \pm 10V$	80	90		I	74	90		I	74	90		II	dB
$PSRR$	Power Supply Rejection Ratio (Note 3)	$\Delta V_S = \pm 5V$	80	90		I	74	90		I	74	90		II	dB

EHA2520/2522/2525

High Slew Rate Operational Amplifier

EHA2520/2522/2525

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DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\text{ k}\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified — Contd.

Parameter	Description	Test Conditions	EHA2520				EHA2522				EHA2525				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
A _{VOL}	Large Signal Voltage Gain (Note 4)	$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	10	15		I	7.5	15		I	7.5	15		I	V/mV
		$R_L = 2\text{ k}\Omega$, $V_{OUT} = \pm 10V$	7.5			I	5			I	5			III	V/mV
V _{OUT}	Output Voltage Swing	$R_L = 2\text{ k}\Omega$	± 10	± 12		I	± 10	± 12		I	± 10	± 12		II	V
I _{OUT}	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	± 10	± 20		I	± 10	± 20		I	± 10	± 20		I	mA
		$V_{OUT} = \pm 10V$	± 7.5			I	± 7.5			I	± 7.5			III	mA
I _{CC}	Supply Current (Note 5)	$T_A = 25^\circ\text{C}$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

$V_S = \pm 15V$, $A_V = 3$, $R_S = 50\Omega$, $R_L = 2\text{ k}\Omega$, $C_L = 50\text{ pF}$, $V_{OUT} = \pm 200\text{ mV}$, $T_{MIN} \leq T_A \leq T_{MAX}$, unless otherwise specified (See AC test circuit)

Parameter	Description	Test Conditions	EHA2520				EHA2522				EHA2525				Units
			Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	Min	Typ	Max	Test Level	
t _r , t _f	Rise and Fall Times	$T_A = 25^\circ\text{C}$		25	50	III		25	50	III		25	50	III	ns
					55	IV			60	IV			60	IV	ns
SR	Slew Rate	$V_{OUT} = \pm 5V$, $T_A = 25^\circ\text{C}$	± 100	± 120		III	± 80	± 120		III	± 80	± 120		III	V/ μs
		$V_{OUT} = \pm 5V$	± 84			IV	± 60			IV	± 60			IV	V/ μs
GBW	Gain Bandwidth Products	$A_V \geq 10$, $T_A = 25^\circ\text{C}$	10	20		IV	10	20		IV	10	20		IV	MHz
FPBW	Full Power Bandwidth (Note 6)	$V_{OUT} = \pm 10V$, $T_A = 25^\circ\text{C}$	1500	2000		IV	1200	1600		IV	1200	1600		IV	kHz
O.S.	Overshoot	$T_A = 25^\circ\text{C}$		25	40	III		25	50	III		25	50	III	%
					45	IV			60	IV			60	IV	%
t _s	Settling Time to 0.1%	$V_{OUT} = \pm 5V$, $T_A = 25^\circ\text{C}$		0.20		V		0.20		V		0.20		V	μs

Note 1: Both input currents, I_{B+} , and I_{B-} , are tested individually.

Note 2: For CMRR+, $V_{CM} = 0V$ to $+10V$ and for CMRR-, $V_{CM} = 0V$ to $-10V$.

Note 3: PSRR+, $V_{S+} = +10V$ to $+20V$ with $V_{S-} = -15V$. For PSRR-, $V_{S-} = -10V$ to $-20V$ with $V_{S+} = +15V$.

Note 4: For A_{VOL}+, $V_{OUT} = 0V$ to $+10V$ and for A_{VOL}-, $V_{OUT} = 0V$ to $-10V$.

Note 5: Both positive and negative supply currents, I_{CC+} , and I_{CC-} , are tested.

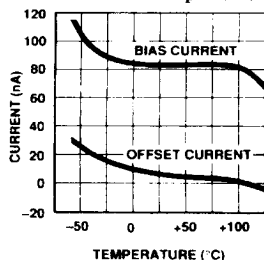
Note 6: The Full Power Bandwidth is guaranteed by testing slew rate, $FPBW = SR/(2\pi V_P)$.

EHA2520/2522/2525

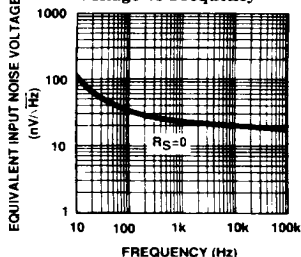
High Slew Rate Operational Amplifier

Typical Performance Curves

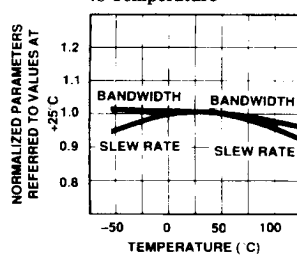
Input Bias and Offset Current vs Temperature



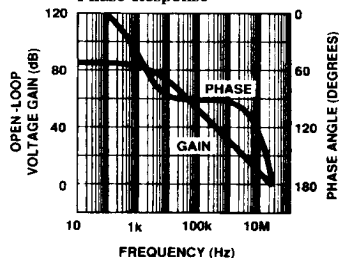
Equivalent Input Noise Voltage vs Frequency



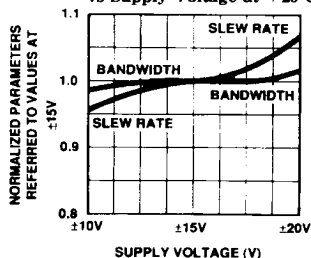
Normalized AC Parameters vs Temperature



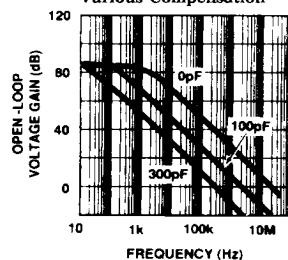
Open-Loop Frequency and Phase Response



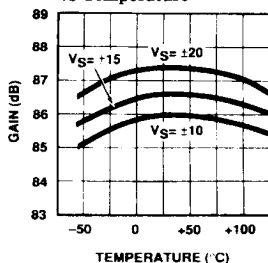
Normalized AC Parameters vs Supply Voltage at +25°C



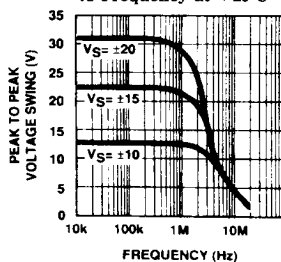
Open-Loop Frequency Response For Various Compensation



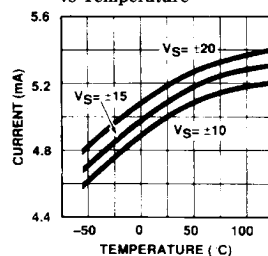
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



2500-11

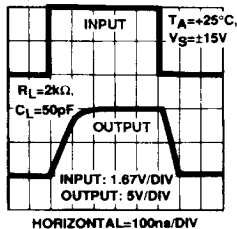
EHA2520/2522/2525

High Slew Rate Operational Amplifier

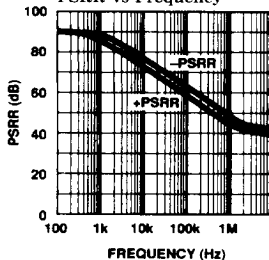
EHA2520/2522/2525

Typical Performance Curves — Contd.

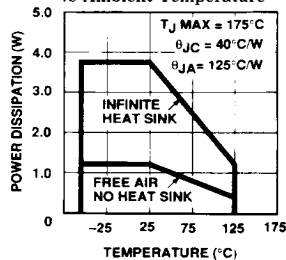
Pulse Response,
 $A_V = +3$



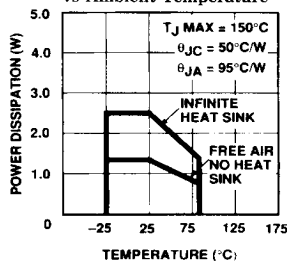
PSRR vs Frequency



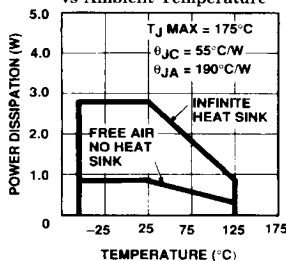
8-Lead CerDIP Maximum
Power Dissipation
vs Ambient Temperature



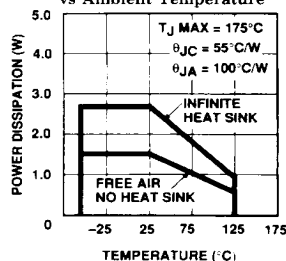
8-Lead Plastic DIP
Maximum Power Dissipation
vs Ambient Temperature



8-Lead TO-99 Metal Can
Maximum Power Dissipation
vs Ambient Temperature



20-Pad LCC
Maximum Power Dissipation
vs Ambient Temperature



2500-12

1

EHA2500 Series

High Slew Rate Operational Amplifier

EHA2500 Macromodel

```

* Connections:  + input
*               |
*               | - input
*               |
*               | + Vsupply
*               | - Vsupply
*               |
*               | output
*               |
*               | comp

```

```

.subckt M2500 3 2 7 4 6 8

```

* Input Stage

```

ie 37 4 425uA
r6 36 37 1.6K
r7 38 37 1.6K
rc1 7 30 1.7K
rc 7 39 1.7K
q1 30 3 36 qn
q2 39 2 38 qna
ediff 33 0 39 30 1.00
rdiff 33 0 1Meg

```

* Compensation Section

```

ga 0 8 33 0 0.5m
rh 8 0 79.6Meg
ch 8 0 9pF
rc 8 40 1K
cc 40 0 1pF

```

* Poles

```

ep 41 0 40 0 1
rpa 41 42 1K
cpa 42 0 2pF
rpb 42 43 1K
cpb 43 0 4pF

```

* Output Stage

```

iso1 7 50 1.0mA
ios2 51 4 1.0mA
q3 4 43 50 qp
q4 7 43 51 qn
q5 7 50 52 qn
q6 4 51 53 qp
ros1 52 6 25
ros2 6 53 25

```

* Power Supply Current

```

ips 7 4 1mA

```

* Models

```

.model qn npn(is=800.0e-18 bf=2e3 tf=0.2nS)
.model qna npn(is=864e-18 bf=2.5e3 tf=0.2nS)
.model qp pnp(is=800e-18 bf=2e3 tf=0.2nS)
.ends

```

EH A2520/2522/2525

1



EHA2500 Series

High Slew Rate Operational Amplifier

EHA2520 Macromodel

```

* Connections:  + input
*               |
*               | - input
*               |
*               | + Vsupply
*               |
*               | - Vsupply
*               |
*               | output
*               |
*               | comp
*               |
.subckt M2520 3      2      7      4      6      8
* Input Stage
ie 37 4 425uA
r6 36 37 1.6K
r7 38 37 1.6K
rc1 7 30 1.7K
rc2 7 39 1.7K
q1 30 3 36 qn
q2 39 2 38 qna
ediff 33 0 39 30 1.00
rdiff 33 0 1Meg
* Compensation Section
ga 0 8 33 0 0.5m
rh 8 0 79.6Meg
ch 8 0 1.5pF
rc 8 40 1K
cc 40 0 1pF
* Poles
ep 41 0 40 0 1
rpa 41 42 1K
cpa 42 0 2pF
rpb 42 43 1K
cpb 43 0 4pF
* Output Stage
iso1 7 50 1.0mA
ios2 51 4 1.0mA
q3 4 43 50 qp
q4 7 43 51 qn
q5 7 50 52 qn
q6 4 51 53 qp
ros1 52 6 25
ros2 6 53 25
* Power Supply Current
ips 7 4 1mA
* Models
.model qn npn(is=800.0e-18 bf=2e3 tf=0.2nS)
.model qna npn(is=864e-18 bf=2.5e3 tf=0.2nS)
.model qp pnp(is=800e-18 bf=2e3 tf=0.2nS)
.ends

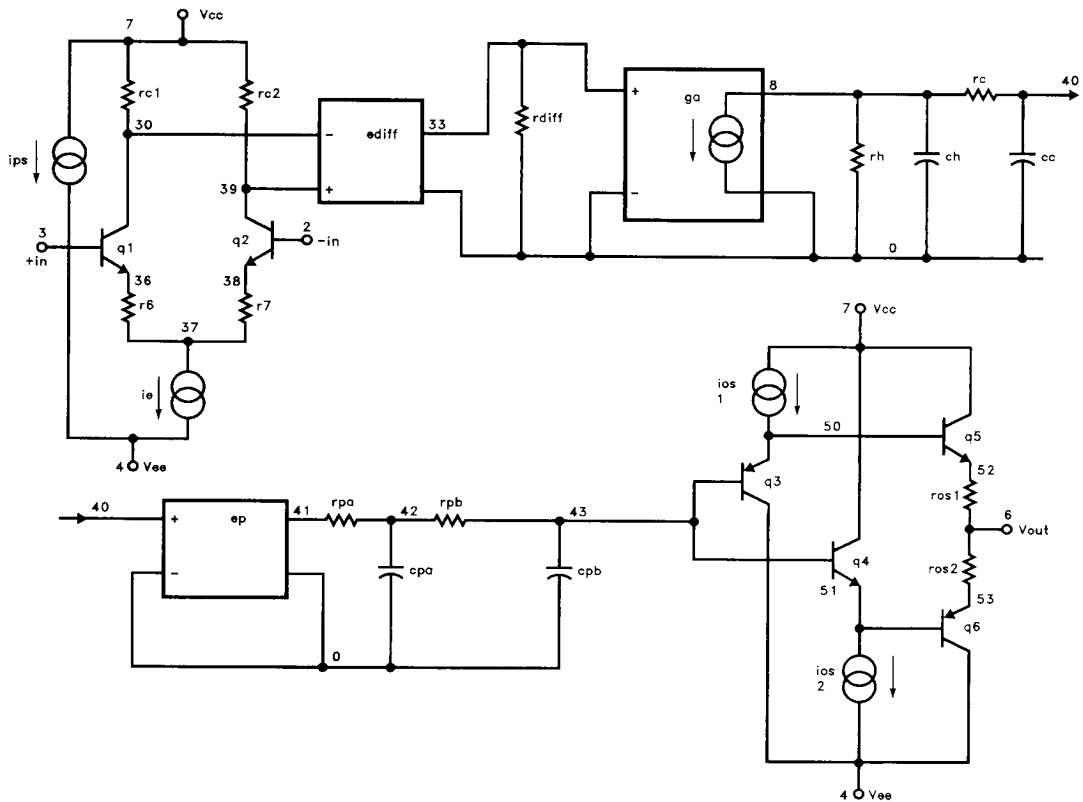
```

EHA2500 Series

High Slew Rate Operational Amplifier

EHA2520/2522/2525

EHA2520 Macromodel — Contd.



2500-13

1