élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

EHA2500 Series

T-79-07-10

High Slew Rate Operational Amplifier

Features

- High slew rate—100 V/μs
- 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/μs—and the widest bandwidths available. The EHA252X series is stable with closed loop gains as low as three.

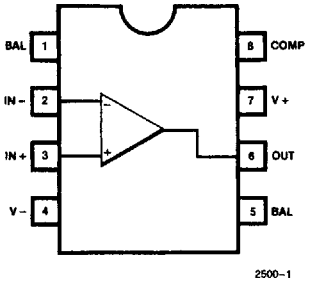
These devices are fabricated using Elantec's DInamic Dielectrically Isolated process that has excellent PNPs and NPNs that allow higher bandwidths than standard junction isolated process.

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.

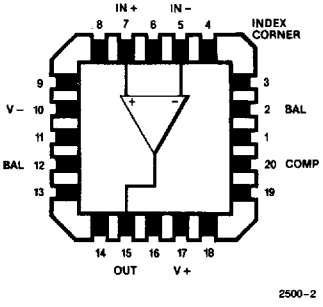
Elantec's facilities comply with MIL-I-45208A and other applicable quality specifications. For information on Elantec's military processing, request our brochure: *Elantec's Military Processing—Monolithic Products.*

Connection Diagrams

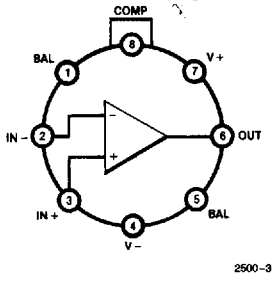
EHA3-, EHA7-



EHA4-



EHA2-



Top Views

EHA2500 Series

High Slew Rate Operational Amplifier

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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/μs	t_{SET} (Typ) μs	PSRR, CMRR (Min) dB	R_{IN} (Min) MΩ	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	

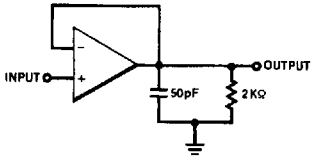
SUFFIX	
−2	−55°C to +125°C
−3	
−4	−25°C to +85°C
−5	0°C to +75°C
−6	100% 25°C Probe (Dice Only)
−7	
/883B	See Elantec's "Military Processing—Monolithic Products".
−9	

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.*

AC Test Circuits

EHA250X and EHA251X



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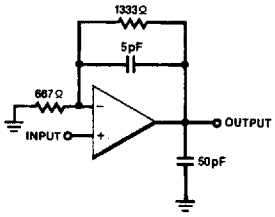
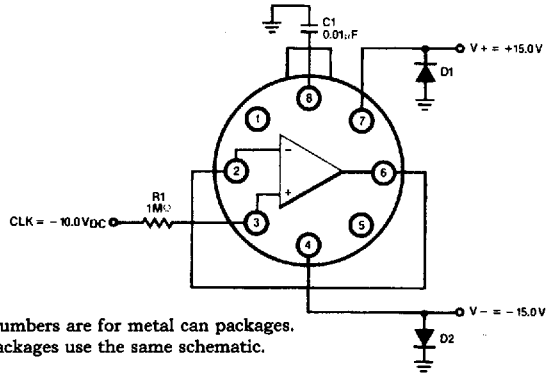
EHA252X



2500-5

Burn-In Circuit



Pin numbers are for metal can packages.
All packages use the same schematic.

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Top View

EHA2500/2502/2505

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High Slew Rate Operational Amplifier

Absolute Maximum Ratings

V_S	Supply Voltage	±20V	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	±15V		EHA2500/02	−55°C to +125°C
P_D	Maximum Power Dissipation	See Curves		EHA2505	0°C to +75°C
I_{OP}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	−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 QCX0001.
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_S = 50Ω, R_L = 100 kΩ, V_{CM} = 0V, V_{OUT} = 0V, $T_{MIN} \le T_A \le T_{MAX}$, 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°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	µV/°C
I_B	Bias Current (Note 1)	T_A = 25°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°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°C	25	50		IV	20	50		IV	20	50		IV	MΩ
V_{CMR}	Common-Mode Range		±10			I	±10			I	±10			II	V
CMRR	Common-Mode Rejection Ratio (Note 2)	ΔV_{CM} = ±10V	80	90		I	74	90		I	74	90		II	dB
PSRR	Power Supply Rejection Ratio (Note 3)	ΔV_S = ±5V	80	90		I	74	90		I	74	90		II	dB

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\ k\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \le T_A \le T_{MAX}$, 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)	$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25°C$	20	30		I	15	25		I	15	25		I	V/mV
		$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$	15			I	10			I	10			III	V/mV
V_{OUT}	Output Voltage Swing	$R_L = 2\ k\Omega$	±10	±20		I	±10	±12		I	±10	±12		II	V
I_{OUT}	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25°C$	±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)	$T_A = 25°C$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

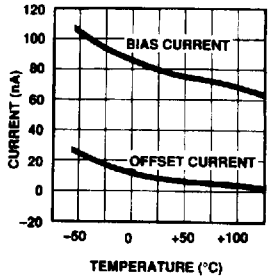
$V_S = \pm 15V$, $A_V = 1$, $R_S = 50\Omega$, $R_L = 2\ k\Omega$, $C_L = 50\ pF$, $V_{OUT} = \pm 200\ mV$, $T_{MIN} \le T_A \le T_{MAX}$, unless otherwise specified (See AC test circuit)

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	$V_{OUT} = \pm 5V$, $T_A = 25°C$	±25	±30		I	±20	±30		I	±20	±30		I	V/μs
		$V_{OUT} = \pm 5V$	±20			I	±15			I	±15			III	V/μs
GBW	Gain Bandwidth Products	$A_V \ge 10$, $T_A = 25°C$		12		V		12		V		12		V	MHz
FPBW	Full Power Bandwidth (Note 6)	$V_{OUT} = \pm 10V$, $T_A = 25°C$	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%	$V_{OUT} = \pm 5V$, $T_A = 25°C$		0.33		V		0.33		V		0.33		V	μs

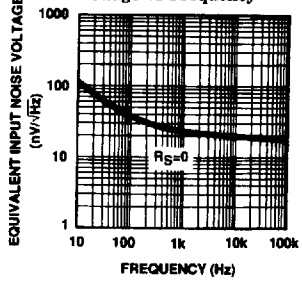
Note 1: Both input currents, I_{B+}, and I_{B-}, are tested individually.
Note 2: For CMRR+, $V_{CM} = 0V$ to $+10V$ and for CMRR−, $V_{CM} = 0V$ to $-10V$.
Note 3: PSRR+, $V_{S+} = +10V$ to $+20V$ with $V_{S-} = -15V$. For PSRR−, $V_{S-} = -10V$ to $-20V$ with $V_{S+} = +15V$.
Note 4: For $A_{VOL}+$, $V_{OUT} = 0V$ 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, $FPBW = SR/(2\pi V_P)$.

Typical Performance Curves

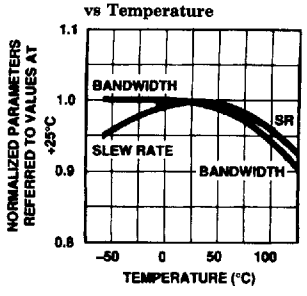
Input Bias and Offset Current vs Temperature



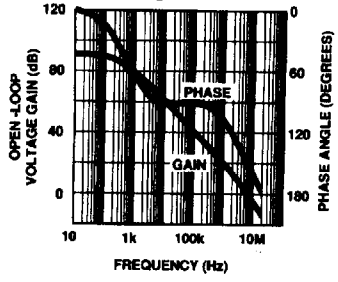
Equivalent Input Noise Voltage vs Frequency



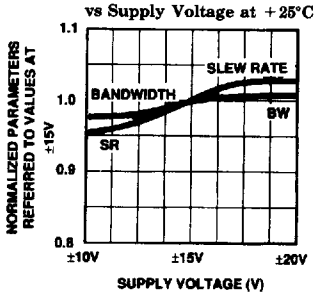
Normalized AC Parameters vs Temperature



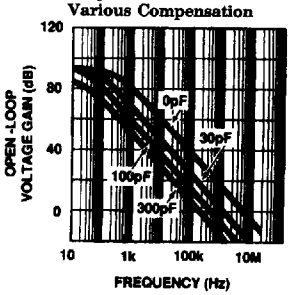
Open-Loop Frequency and Phase Response



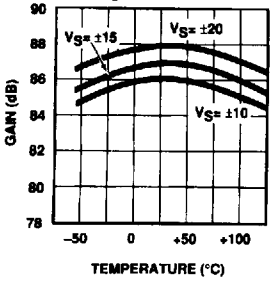
Normalized AC Parameters vs Supply Voltage at +25°C



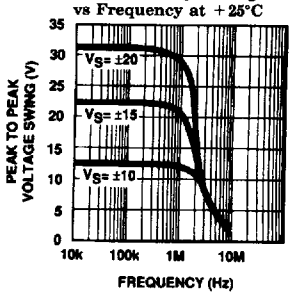
Open-Loop Frequency Response For Various Compensation



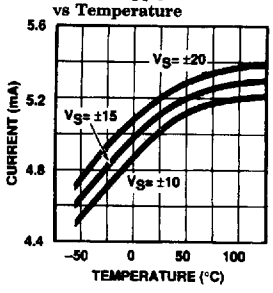
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



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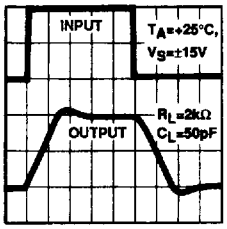
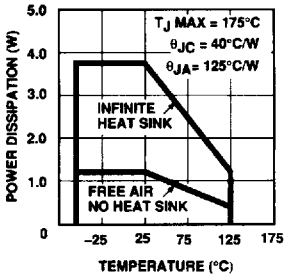
Typical Performance Curves — Contd.

Voltage Follower
Pulse Response

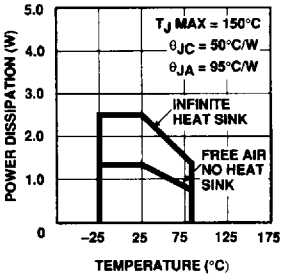


VERTICAL=5V/DIV
HORIZONTAL=200ns/DIV

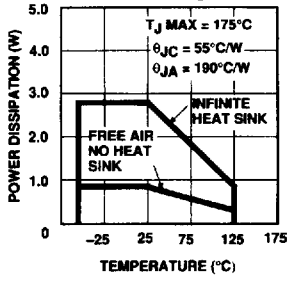
8-Lead CerDIP Maximum
Power Dissipation
vs Ambient Temperature



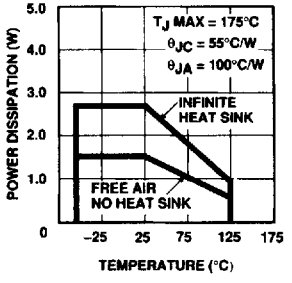
8-Lead Plastic DIP
Maximum Power Dissipation
vs Ambient Temperature



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



20-Pad LCC
Maximum Power Dissipation
vs Ambient Temperature



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EHA2510/2512/2515

High Slew Rate Operational Amplifier

ELANTEC INC

Absolute Maximum Ratings

V_S	Supply Voltage	±20V	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	±15V		EHA2510/12	−55°C to +125°C
P_D	Maximum Power Dissipation	See Curves		EHA2515	0°C to +75°C
I_{OP}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	−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_S = 50Ω, R_L = 100 kΩ, V_{CM} = 0V, V_{OUT} = 0V, $T_{MIN} \le T_A \le T_{MAX}$, 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°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	µV/°C
I_B	Bias Current (Note 1)	T_A = 25°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°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°C	50	100		IV	40	100		IV	40	100		IV	MΩ
V_{CMR}	Common-Mode Range		±10			I	±10			I	±10			II	V
CMRR	Common-Mode Rejection Ratio (Note 2)	ΔV_{CM} = ±10V	80	90		I	74	90		I	74	90		II	dB
PSRR	Power Supply Rejection Ratio (Note 3)	ΔV_S = ±5V	80	90		I	74	90		I	74	90		II	dB

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\ k\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \le T_A \le T_{MAX}$, 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	
A_{VOL}	Large Signal Voltage Gain (Note 4)	$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25°C$	10	15		I	7.5	15		I	7.5	15		I	V/mV
		$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$	7.5			I	5			I	5			III	V/mV
V_{OUT}	Output Voltage Swing	$R_L = 2\ k\Omega$	±10	±12		I	±10	±12		I	±10	±12		II	V
I_{OUT}	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25°C$	±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)	$T_A = 25°C$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

$V_S = \pm 15V$, $A_V = 1$, $R_S = 50\Omega$, $R_L = 2\ k\Omega$, $C_L = 50\ pF$, $V_{OUT} = \pm 200\ mV$, $T_{MIN} \le T_A \le T_{MAX}$, 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	$T_A = 25°C$		25	50	I		25	50	I		25	50	I	ns
					60	I			60	I			60	III	ns
SR	Slew Rate	$V_{OUT} = \pm 5V$, $T_A = 25°C$	±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	$A_V \ge 10$, $T_A = 25°C$		12		V		12		V		12		V	MHz
FPBW	Full Power Bandwidth (Note 6)	$V_{OUT} = \pm 10V$, $T_A = 25°C$	750	1000		IV	600	1000		IV	600	1000		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%	$V_{OUT} = \pm 5V$		0.25		V		0.25		V		0.25		V	μs

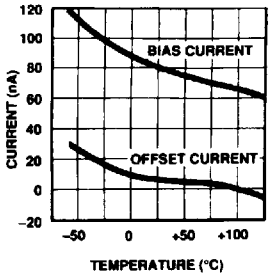
Note 1: Both input currents, I_{B+}, and I_{B-}, are tested individually.
Note 2: For CMRR+, V_{CM} = 0V to +10V and for CMRR−, V_{CM} = 0V to −10V.
Note 3: PSRR+, V_{S+} = +10V to +20V with V_{S-} = −15V. For PSRR−, V_{S-} = −10V to −20V with V_{S+} = +15V.
Note 4: For $A_{VOL}+$, V_{OUT} = 0V to +10V 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 = $SR/(2\pi V_P)$.

EHA2510/2512/2515

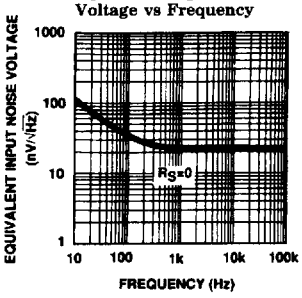
High Slew Rate Operational Amplifier

Typical Performance Curves

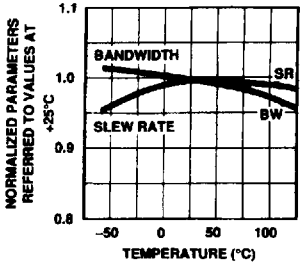
Input Bias and Offset Current vs Temperature



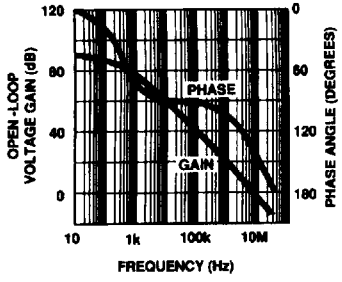
Equivalent Input Noise Voltage vs Frequency



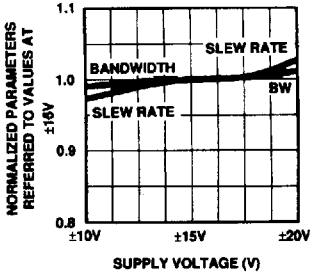
Normalized AC Parameters vs Temperature



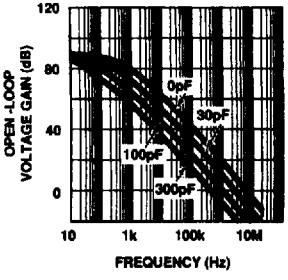
Open-Loop Frequency and Phase Response



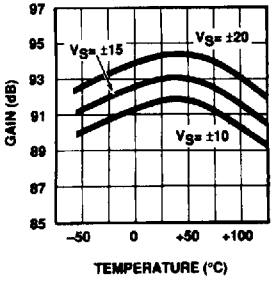
Normalized AC Parameters vs Supply Voltage at +25°C



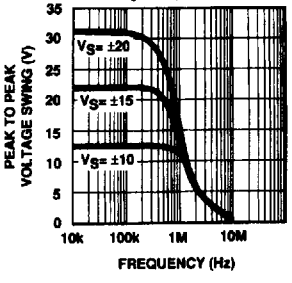
Open-Loop Frequency Response For Various Compensation



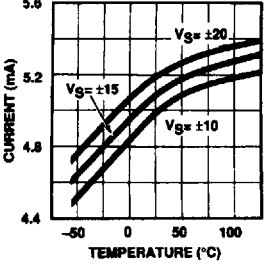
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



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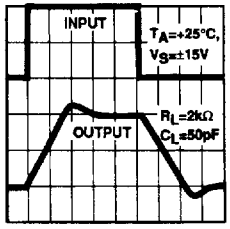
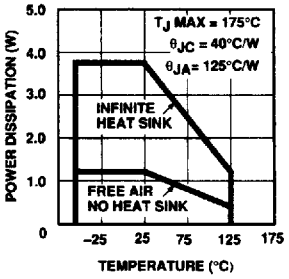
Typical Performance Curves — Contd.

Voltage Follower
Pulse Response

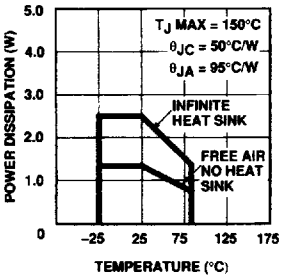


VERTICAL=5V/DIV
HORIZONTAL=100 ns/DIV

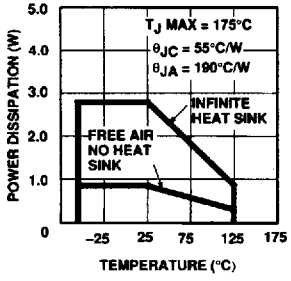
8-Lead CerDIP Maximum
Power Dissipation
vs Ambient Temperature



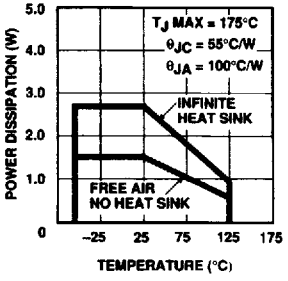
8-Lead Plastic DIP
Maximum Power Dissipation
vs Ambient Temperature



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



20-Pad LCC
Maximum Power Dissipation
vs Ambient Temperature



2500-10

EHA2520/2522/2525

High Slew Rate Operational Amplifier

ELANTEC INC

Absolute Maximum Ratings

V_S	Supply Voltage	±20V	T_A	Operating Temperature Range	
V_{IN}	Differential Input Voltage	±15V		EHA2520/22	−55°C to +125°C
P_D	Maximum Power Dissipation	See Curves		EHA2525	0°C to +75°C
I_{OUT}	Peak Output Current	50 mA	T_{ST}	Storage Temperature	−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_S = 50Ω, R_L = 100 kΩ, V_{CM} = 0V, V_{OUT} = 0V, $T_{MIN} \le T_A \le T_{MAX}$, 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°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	µV/°C
I_B	Bias Current (Note 1)	T_A = 25°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°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°C	50	100		IV	40	100		IV	40	100		IV	MΩ
V_{CMR}	Common-Mode Range		±10			I	±10			I	±10			II	V
CMRR	Common-Mode Rejection Ratio (Note 2)	ΔV_{CM} = ±10V	80	90		I	74	90		I	74	90		II	dB
PSRR	Power Supply Rejection Ratio (Note 3)	ΔV_S = ±5V	80	90		I	74	90		I	74	90		II	dB

DC Electrical Characteristics

$V_S = \pm 15V$, $R_S = 50\Omega$, $R_L = 100\ k\Omega$, $V_{CM} = 0V$, $V_{OUT} = 0V$, $T_{MIN} \le T_A \le T_{MAX}$, 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)	$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$, $T_A = 25°C$	10	15		I	7.5	15		I	7.5	15		I	V/mV
		$R_L = 2\ k\Omega$, $V_{OUT} = \pm 10V$	7.5			I	5			I	5			III	V/mV
V_{OUT}	Output Voltage Swing	$R_L = 2\ k\Omega$	±10	±12		I	±10	±12		I	±10	±12		II	V
I_{OUT}	Output Current	$V_{OUT} = \pm 10V$, $T_A = 25°C$	±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)	$T_A = 25°C$		4	6	I		4	6	I		4	6	I	mA
					6.5	I			7	I			7	III	mA

AC Electrical Characteristics

$V_S = \pm 15V$, $A_V = 3$, $R_S = 50\Omega$, $R_L = 2\ k\Omega$, $C_L = 50\ pF$, $V_{OUT} = \pm 200\ mV$, $T_{MIN} \le T_A \le T_{MAX}$, 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	$T_A = 25°C$		25	50	III		25	50	III		25	50	III	ns
					55	IV			60	IV			60	IV	ns
SR	Slew Rate	$V_{OUT} = \pm 5V$, $T_A = 25°C$	±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	$A_V \ge 10$, $T_A = 25°C$	10	20		IV	10	20		IV	10	20		IV	MHz
FPBW	Full Power Bandwidth (Note 6)	$V_{OUT} = \pm 10V$, $T_A = 25°C$	1500	2000		IV	1200	1600		IV	1200	1600		IV	kHz
O.S.	Overshoot	$T_A = 25°C$		25	40	III		25	50	III		25	50	III	%
					45	IV			60	IV			60	IV	%
t_s	Settling Time to 0.1%	$V_{OUT} = \pm 5V$, $T_A = 25°C$		0.20		V		0.20		V		0.20		V	μs

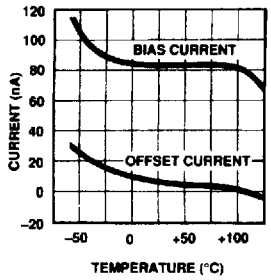
Note 1: Both input currents, I_{B+}, and I_{B-}, are tested individually.
Note 2: For CMRR+, V_{CM} = 0V to +10V and for CMRR−, V_{CM} = 0V to −10V.
Note 3: PSRR+, V_{S+} = +10V to +20V with V_{S-} = −15V. For PSRR−, V_{S-} = −10V to −20V with V_{S+} = +15V.
Note 4: For $A_{VOL}+$, V_{OUT} = 0V to +10V 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

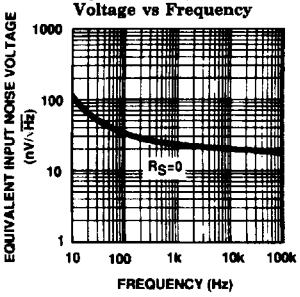
High Slew Rate Operational Amplifier

Typical Performance Curves

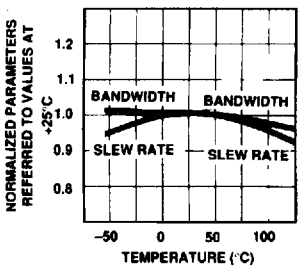
Input Bias and Offset Current vs Temperature



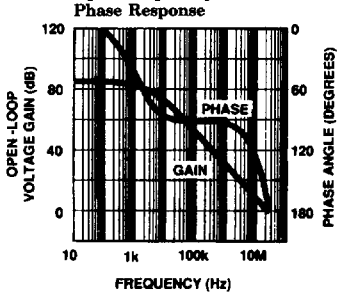
Equivalent Input Noise Voltage vs Frequency



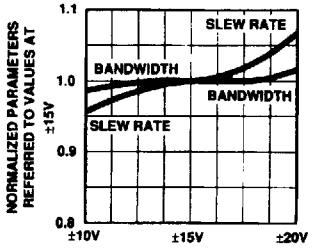
Normalized AC Parameters vs Temperature



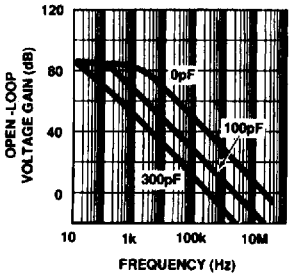
Open-Loop Frequency and Phase Response



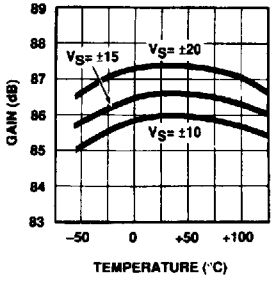
Normalized AC Parameters vs Supply Voltage at +25°C



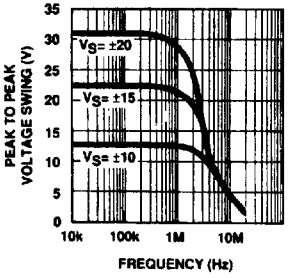
Open-Loop Frequency Response For Various Compensation



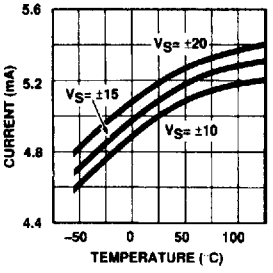
Open-Loop Voltage Gain vs Temperature



Output Voltage Swing vs Frequency at +25°C



Power Supply Current vs Temperature



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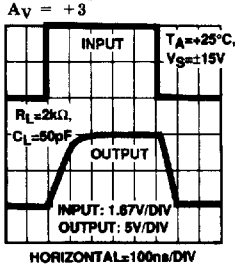
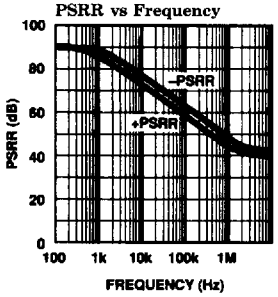
Typical Performance Curves — Contd.

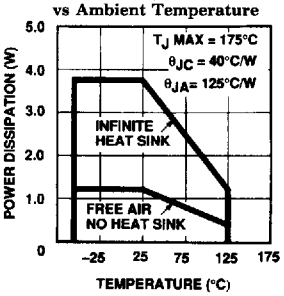
Pulse Response,
$A_V = +3$



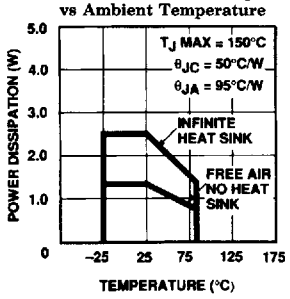
PSRR vs Frequency



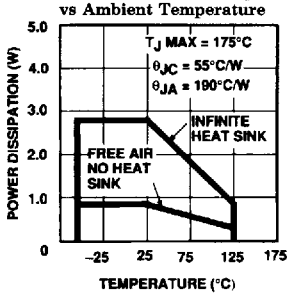
8-Lead CerDIP Maximum Power Dissipation vs Ambient Temperature



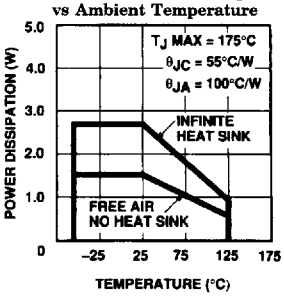
8-Lead Plastic DIP Maximum Power Dissipation vs Ambient Temperature



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



20-Pad LCC Maximum Power Dissipation vs Ambient Temperature

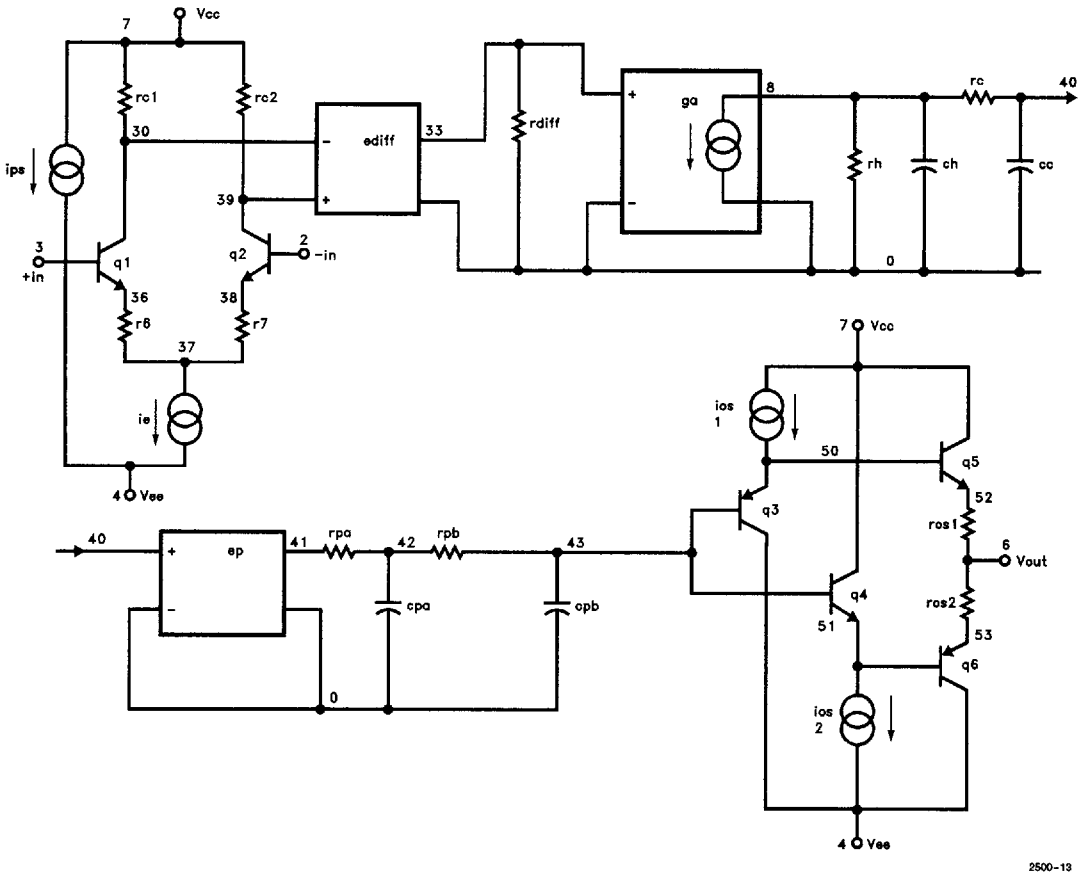


2500-12

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
```

EHA2500 Macromodel — Contd.



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
```

EHA2520 Macromodel — Contd.