HARRIS SEMICONDUCTOR
A DIVISION OF HARRIS CORPORATION

HA-2510/2512/2515

High Slew Rate Operational Amplifiers

FEATURES

- HIGH SLEW RATE — 60V/μs
- FAST SETTLING — 250ns
- WIDE POWER BANDWIDTH — 1,000kHz
- HIGH GAIN BANDWIDTH — 12MHz
- HIGH INPUT IMPEDANCE — 100MΩ
- LOW OFFSET CURRENT — 10nA
- INTERNALLY COMPENSATED

APPLICATIONS

- DATA ACQUISITION SYSTEMS
- R.F. AMPLIFIERS
- VIDEO AMPLIFIERS
- SIGNAL GENERATORS
- PULSE AMPLIFICATION

DESCRIPTION

The HA-2510/2512/2515 are a series of high performance operational amplifiers which set the standards for maximum slew rate, highest accuracy and widest bandwidth for internally compensated monolithic devices. In addition to excellent dynamic characteristics, these dielectrically isolated amplifiers also offer low offset current and high input impedance.

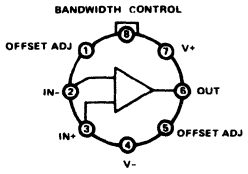
The $\pm$60V/ μs slew rate and 250ns (0.1%) settling time of these amplifiers is ideally suited for high speed D/A, A/D, and pulse amplification designs. HA-2510/2512/2515's superior 12MHz gain bandwidth and 1000kHz power bandwidth is extremely useful in R.F. and video applications. For accurate signal conditioning these amplifiers also provide 10nA offset current, coupled with 100MΩ input impedance, and offset trim capability.

The HA-2510/2512 are available in metal can (TO-99) and 14-pin flat packages. HA-2510 and HA-2512 are specified from -55°C to +125°C. HA-2515 is specified over the 0°C to +75°C range, and is available in the TO-99 package.

PINOUT

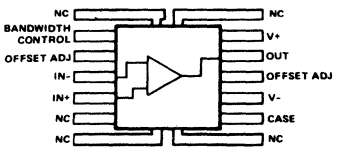
TO-99 TOP VIEW

Package Code 2A

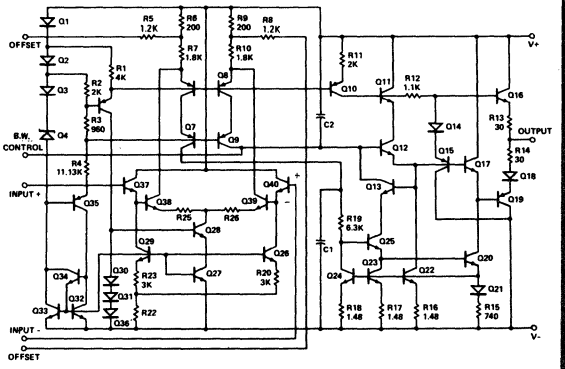


TO-86 TOP VIEW

Package Code 9V
(HA-2510/2512 Only)



SCHEMATIC



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow IC Handling Procedures specified on pg. 1-4.

SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

Voltage Between V^+ and V^- Terminals	40.0V	Peak Output Current	50mA
Differential Input Voltage	±15.0V	Internal Power Dissipation	300mW
Operating Temperature Range		Storage Temperature Range	$-65^oC \leq T_A \leq +150^oC$
HA-2510/HA-2512	$-55^oC \leq T_A \leq +125^oC$		
HA-2515	$0^oC \leq T_A \leq +75^oC$		

ELECTRICAL CHARACTERISTICS

V+ = +15V D.C., V– = 15V D.C.

PARAMETER	TEMP.	HA-2510 -55^oC to $+125^oC$ LIMITS			HA-2512 -55^oC to $+125^oC$ LIMITS			HA-2515 0^oC to $+75^oC$ LIMITS			UNITS
		MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.	
INPUT CHARACTERISTICS											
* Offset Voltage	+25°C		4	8		5	10		5	10	mV
	Full			11			14			14	mV
Offset Voltage Average Drift	Full		20			25			30		µV/°C
* Bias Current	+25°C		100	200		125	250		125	250	nA
	Full			400			500			500	nA
* Offset Current	+25°C		10	25		20	50		20	50	nA
	Full			50			100			100	nA
Input Resistance	+25°C	50	100		40	100		40	100		MΩ
Common Mode Range	Full	±10.0			±10.0			±10.0			V
TRANSFER CHARACTERISTICS											
* Large Signal Voltage Gain (Note 1,4)	+25°C	10K	15K		7.5K	15K		7.5K	15K		V/V
	Full	7.5K			5K			5K			V/V
* Common Mode Rejection Ratio (Note 2)	Full	80	90		74	90		74	90		dB
Gain Bandwidth Product (Note 3)	+25°C		12			12			12		MHz
OUTPUT CHARACTERISTICS											
Output Voltage Swing (Note 1)	Full	±10.0	±12.0		±10.0	±12.0		±10.0	±12.0		V
* Output Current (Note 4)	+25°C	±10	±20		±10	±20		±10	±20		mA
Full Power Bandwidth (Note 4)	+25°C	750	1000		600	1000		600	1000		kHz
TRANSIENT RESPONSE											
Rise Time (Notes 1, 5, 6 & 8)	+25°C		25	50		25	50		25	50	ns
Overshoot (Notes 1, 5, 7 & 8)	+25°C		25	40		25	50		25	50	%
* Slew Rate (Notes 1, 4, 5 & 8)	+25°C	±50	±65		±40	±60		±40	±60		V/µs
Settling Time (Notes 1, 4, 5 & 8)	+25°C		0.25			0.25			0.25		µs
POWER SUPPLY CHARACTERISTICS											
* Supply Current	+25°C		4	6		4	6		4	6	mA
* Power Supply Rejection Ratio (Note 9)	Full	80	90		74	90		74	90		dB

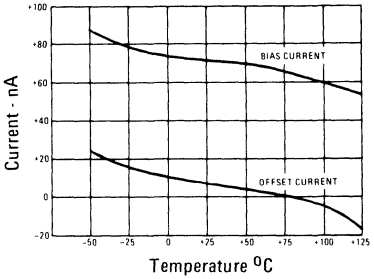
NOTES:
1. R_L = 2K
2. $V_{CM} = \pm 5.0V$
3. $A_V > 10$
4. $V_O = \pm 10.0V$
5. C_L = 50pF
6. $V_O = \pm 400mV$
7. $V_O = \pm 600mV$
8. See transient response test circuits and waveforms page four.
9. $\Delta V = \pm 5.0V$

*100% Tested For DASH 8

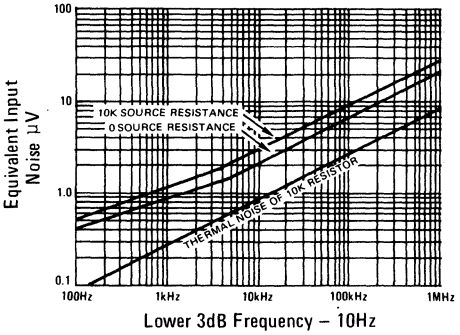
PERFORMANCE CURVES

V+ = 15VDC, V- = 15VDC, T_A = 25°C UNLESS OTHERWISE STATED.

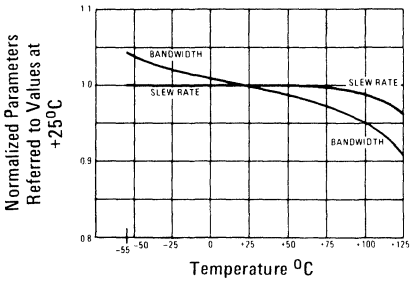
INPUT BIAS AND OFFSET CURRENT
vs TEMPERATURE



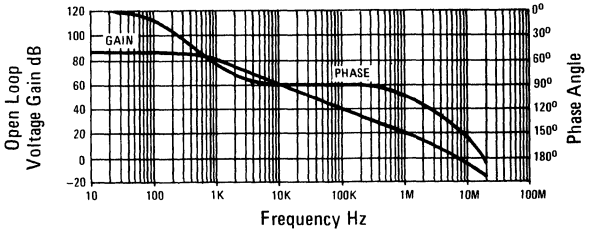
EQUIVALENT INPUT NOISE
vs BANDWIDTH



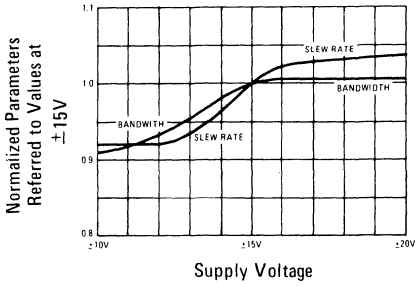
NORMALIZED AC PARAMETERS
vs TEMPERATURE



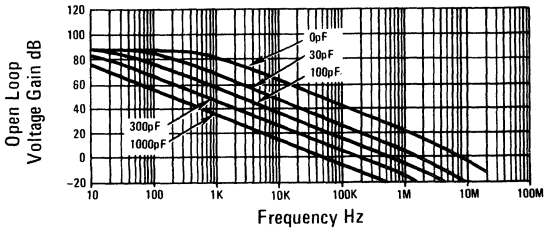
OPEN LOOP FREQUENCY AND PHASE RESPONSE



NORMALIZED AC PARAMETERS
vs SUPPLY VOLTAGE

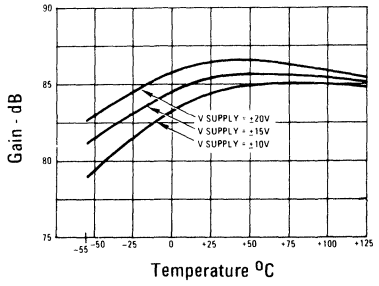


OPEN-LOOP FREQUENCY RESPONSE FOR VARIOUS VALUES OF CAPACITORS FROM BANDWIDTH CONTROL PIN TO GROUND

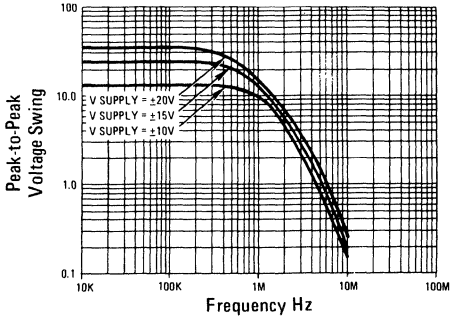


NOTE: External compensation components are not required for stability, but may be added to reduce bandwidth if desired.

OPEN LOOP VOLTAGE GAIN
vs TEMPERATURE



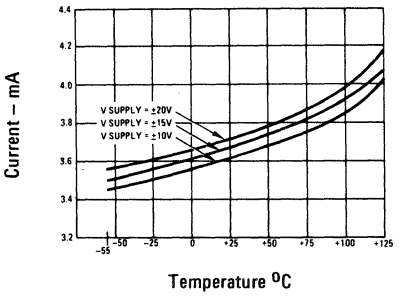
OUTPUT VOLTAGE SWING
vs FREQUENCY AT +25°C



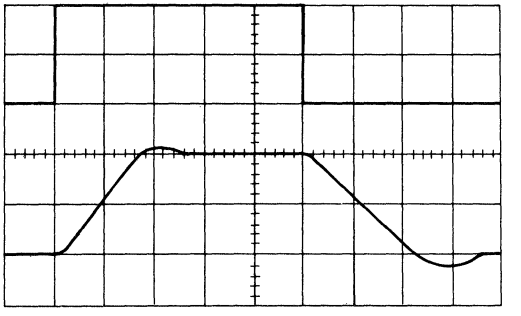
2

PERFORMANCE CURVES (continued)

POWER SUPPLY CURRENT
VS
TEMPERATURE



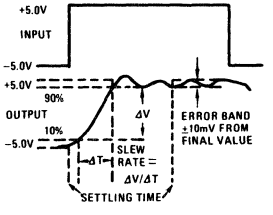
VOLTAGE FOLLOWER PULSE RESPONSE



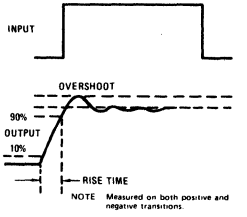
R_L = 2K Ω , C_L = 50pF
Upper Trace: Input
Lower Trace: Output

Vertical = 5V/Div.
Horizontal = 100n/Div.
T_A = +25°C, V_S = ±15.0V

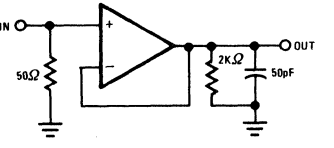
SLEW RATE AND
SETTLING TIME



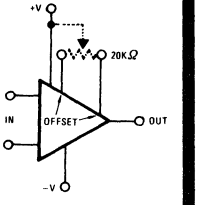
TRANSIENT RESPONSE



SLEW RATE AND
TRANSIENT RESPONSE



SUGGESTED
OFFSET ZERO
ADJUST HOOK-UP



DEFINITIONS

INPUT OFFSET VOLTAGE – That voltage which must be applied between the input terminals through two equal resistances to force the output voltage to zero.

INPUT OFFSET CURRENT – The difference in the currents into the two input terminals when the output is at zero voltage.

INPUT BIAS CURRENT – The average of the currents flowing into the input terminals when the output is at zero voltage.

INPUT COMMON MODE VOLTAGE – The average referred to ground of the voltages at the two input terminals.

COMMON MODE RANGE – The range of voltages which is exceeded at either input terminal will cause the amplifier to cease operating.

COMMON MODE REJECTION RATIO – The ratio of a specified range of input common mode voltage to the peak-to-peak change in input offset voltage over this range.

OUTPUT VOLTAGE SWING – The peak symmetrical output voltage swing, referred to ground, that can be obtained without clipping.

INPUT RESISTANCE – The ratio of the change in input voltage to the change in input current.

OUTPUT RESISTANCE – The ratio of the change in output voltage to the change in output current.

VOLTAGE GAIN – The ratio of the change in output voltage to the change in input voltage producing it.

UNITY GAIN BANDWIDTH – The frequency at which the voltage gain of the amplifier is unity.