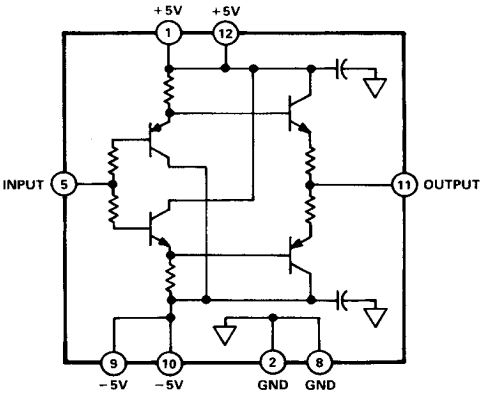
Wide Bandwidth, High-Speed Buffer Amplifier

HOS-200

FEATURES
Wide Bandwidth/Good Drive
Fast Rise Time
Low Power
±5V Supplies

APPLICATIONS
Current Boosters
High-Speed A/D Input Buffers
Instrumentation Amplifiers
Coaxial Cable Drivers
High-Speed Line Drivers

HOS-200 FUNCTIONAL BLOCK DIAGRAM



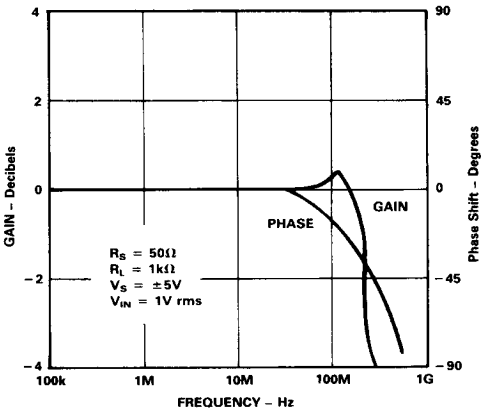
GENERAL DESCRIPTION

The HOS-200AH and HOS-200SH Buffer Amplifiers are high-speed, voltage follower/buffers designed to provide up to 100mA of continuous current at frequencies from dc to 200MHz. AC performance is enchanced with slew rates exceeding 1500V/μs. Both units exhibit excellent phase linearity and low distortion, making them ideal for raster graphic and other video-speed applications.

These devices are designed to fit into a broad range of buffer applications, such as video impedance transformation; high-impedance input buffers for A/D converters and comparators; and high-speed line drivers for nuclear instrumentation amplifiers. The HOS-200 will drive 50Ω and 75Ω cables, and can serve as a yoke driver in high-resolution CRT displays.

The versatility of the HOS-200 makes it particularly well suited for use with the Analog Devices series of raster graphic video DACs, such as the monolithic AD9700 and the hybrid HDG Series. The HOS-200 follower/buffer can also economically enhance the output drive of monolithic op amps.

MIL-STD-1772 approval has been granted to the Analog Devices manufacturing facility that produces the parts, which are also available with MIL processing. The HOS-200AH operates from −25°C to +85°C; the HOS-200SH is specified for −55°C to +125°C.



HOS-200 Phase and Gain Response

SPECIFICATIONS (typical @ +25°C with $\pm V_S = \pm 5V$ unless otherwise specified)

Model	HOS-200AH	HOS-200SH
ABSOLUTE MAXIMUM RATINGS		
Peak Voltage Between Supply Terminals (V_S+ to V_S-)	30V	*
Continuous Voltage Between Supply Terminals (V_S+ to V_S-)	16V	*
Power Dissipation	See Derating Graph	*
Input Voltage	$\pm V_S$	*
Continuous Output Current	±100mA	*
Peak Output Current	±250mA	*
Operating Temperature Range (Case)	−25°C to +85°C	−55°C to +125°C
Junction Temperature	+150°C	*
Storage Temperature Range	−65°C to +150°C	*
Lead Temperature (soldering, 10sec)	+300°C	*

DC ELECTRICAL CHARACTERISTICS

Parameter	Conditions	Min	Typ	Max	−55°C	+25°C	+125°C	Units
Input Bias Current	$V_{IN}=0V$; $R_S=10k\Omega$		8	25	30 (max)	20 (max)	20 (max)	µA
Input Impedance	$V_{IN}=1V$ rms; f = 1kHz;							
	$R_L=1k$	100	200			100(min)		kΩ
Voltage Gain	$V_{IN}=1V$; $R_L=1k$	0.975	0.985		0.975 (min)	0.975 (min)	0.975 (min)	V/V
	$V_{IN}=1V$; $R_L=100\Omega$	0.900	0.915			0.900 (min)		V/V
Offset Voltage	$R_S=50\Omega$		12	25	18 (max)	15 (max)	15 (max)	mV
Offset Voltage T_C[1]	$R_S=50\Omega$		25		25 (typ)	5 (typ)	5 (typ)	µV/°C
Output Impedance	$V_{IN}=1V$ rms; f = 1kHz		8	12		12 (max)		Ω
	$R_S=500\Omega$; $R_L=1k\Omega$							
Output Voltage Swing	$R_S=500\Omega$; $R_L=1k\Omega$	4.0	4.25		3.75 (min)	4.0 (min)	4.0 (min)	V
Output Current (Continuous)	$V_{OUT}=0V$	100				100 (min)		mA
Supply Current	$V_{IN}=0V$; $V_S=\pm 5V$		12	16	16 (max)	16 (max)	20 (max)	mA
Power Consumption	$V_{IN}=0V$; $V_S=\pm 5V$		120	160	160 (max)	160 (max)	200 (max)	mW
Power Supply Rejection								
Ratio (PSRR)	$\Delta V_S=\pm 2.5V$	40	45			40 (min)		dB

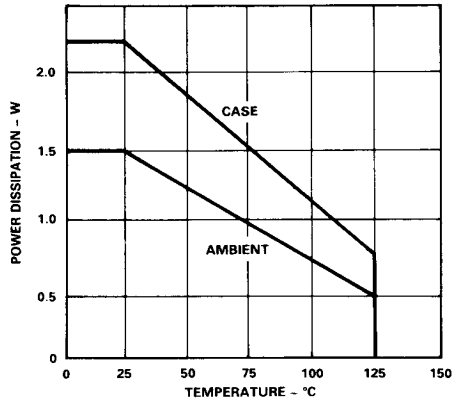
AC ELECTRICAL CHARACTERISTICS[2]

Parameter	Conditions	Min	Typ	Max	−55°C	+25°C	+125°C	Units
Slew Rate	$V_{IN}=\pm 2.5V$	1000	1500			1000 (min)		V/µs
Bandwidth (−3dB)	$V_{IN}=1V$ rms		200			200		MHz
Rise Time	$\Delta V_{IN}=0.5V$		1.5			1.5		ns
Propagation Delay	$\Delta V_{IN}=0.5V$		1.5			1.5		ns
Phase Nonlinearity	BW = 1 to 20MHz		2			2		degree
Harmonic Distortion			<0.1			<0.1		%
THERMAL RESISTANCE[3]								
Junction to Air, θ_{JA} (Free Air)			90			90		°C/W
Junction to Case, θ_{JC}			40			40		°C/W
MTBF[4]						$>1.1\times10^7$		hours
PACKAGE OPTION[5]								
TO-8 (H-12A)								

NOTES
[1]Input offset voltage T_C is typically less than 5µV/°C from +25°C to high temperature extreme.
[2]These specifications measured under following conditions: $T_C=+25°C$; $\pm V_S=\pm 5V$; $R_S=0\Omega$; $R_L=1k\Omega$.
[3]Recommended maximum junction temperature is +150°C.
[4]MTBF calculated using MIl Handbook 217; Ground; Fixed; Temperature (case) = 35°C.
[5]See Section 16 for package outline information.
Specifications subject to change without notice.

PIN DESIGNATIONS

PIN	FUNCTION
1	V+
2	GROUND
3	NC
4	NC
5	INPUT
6	NC
7	NC
8	GROUND
9	V−
10	V−
11	OUTPUT
12	V+



HOS-200 Power Derating

ENHANCING HOS-200 PERFORMANCE

The HOS-200 is an excellent building block in high slew rate, pulse-oriented systems. Output loading in these types of systems is often highly capacitive because of coaxial cables and twisted pair lines; but the powerful drive capability of the HOS-200 makes it a good choice for inclusion in the system.

Its effectiveness can be extended further through the use of a small series resistance (5Ω–300Ω) in the output of the unit. This has two effects: it shields the HOS-200 from the load capacitance, which might otherwise be outside the design limits of the amplifier; and also tailors the pulse response. The output response can also be enhanced with a small (100pF–300pF) capacitor connected between the input and output.

LAYOUT CONSIDERATIONS

Like any high-speed device, the HOS-200 amplifier will benefit from the use of good high-frequency design practices. The undesirable effects of stray capacitance and high frequency coupling can be minimized with close attention to circuit layout.

A low-impedance ground plane under the HOS-200 can reduce the effects of distributed capacitance; and provide a greater degree of shielding for the device. Lead lengths in and out of the HOS-200 should be kept as short as practicable to minimize impedances and limit the effects of signal reflections.

Direct soldering of the unit into the circuit is recommended to avoid the inter-lead capacitance of sockets and the reduction in performance which can result. If socket mount *must* be used, individual pin sockets are preferable to device sockets.

The HOS-200 contains internal power supply decoupling capacitors, but further improvement in performance can often be achieved with external decoupling capacitors connected as closely as possible to the power supply pins of the amplifier. Typically, a combination of a 0.1μF ceramic disk capacitor and a 100pF tantalum capacitor is connected to each supply pin.

Each power supply voltage has been provided with two pins on the HOS-200; +5V is connected to pins 1 and 12, and −5V is connected to pins 9 and 10. Each pair of pins is connected internally, but should also be connected externally to its mate and the appropriate power supply. Pins 2 and 8 are ground pins which are connected internally, but should also be connected together externally before the connection to the low-impedance ground recommended above.

HEAT SINKING

An efficient heat sink is required for the HOS-200SH if the user expects to obtain maximum output drive at temperatures up to +125°C. One possibility is the Thermalloy-2204A, but other appropriate devices are also available.

The case of the HOS-200 is electrically isolated from the circuit containing the amplifier. This means the case can be connected to system ground(s) for additional heat dissipation, and shielding. Pins 3, 4, 6, and 7 are designated as "no connection" and can also be connected to the low-impedance ground to help dissipate heat.

SUGGESTED APPLICATIONS

Figures 1 and 2 are possible application ideas using the HOS-200 amplifier.The circuits which are shown are not intended as the only possible applications for this device; they are simply intended to illustrate some possibilities offered by the unit.

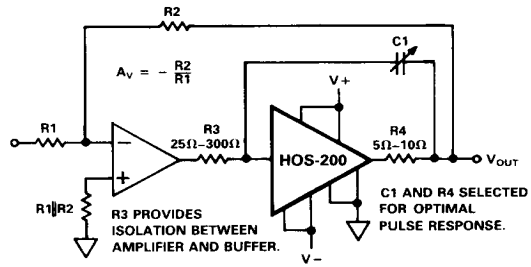


Figure 1. Increased Output Current Drive

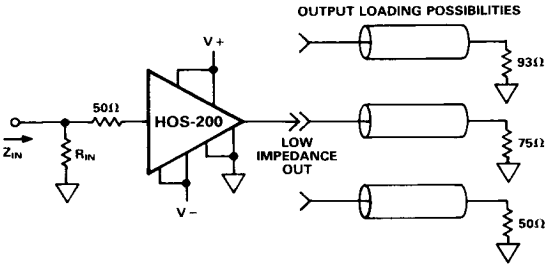


Figure 2. Impedance Transformations for 50Ω, 75Ω, and 93Ω Cables

PERFORMANCE GRAPHS

Figures 3 through 9 depict typical performance of the HOS-200 amplifier for a number of characteristics. As in the parameters shown in the SPECIFICATIONS section of the data sheet, the data shown in the graphs are typical performance at +25°C, unless noted otherwise.

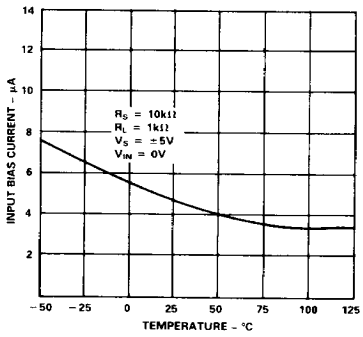


Figure 3. Input Bias Current vs. Temperature

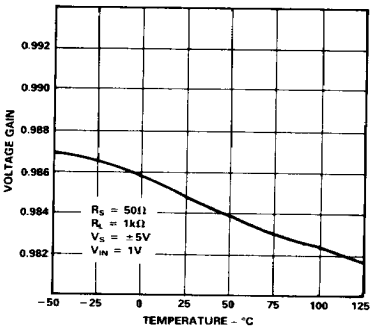


Figure 4. Gain vs. Temperature

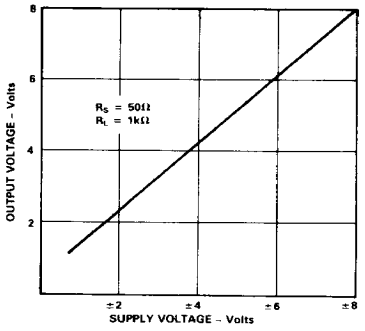


Figure 5. Output Voltage vs. Supply Voltage

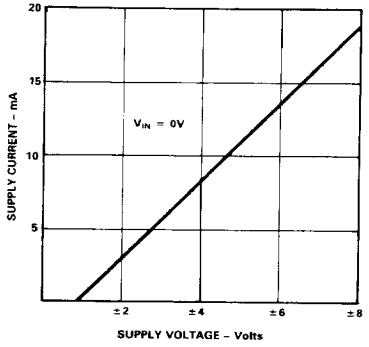


Figure 6. Supply Current vs. Supply Voltage

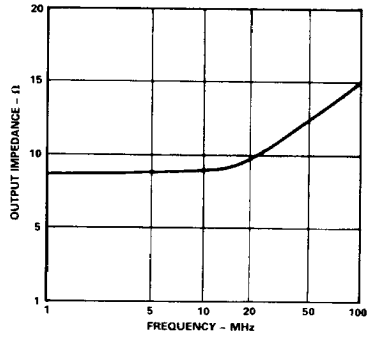


Figure 7. Output Impedance vs. Frequency

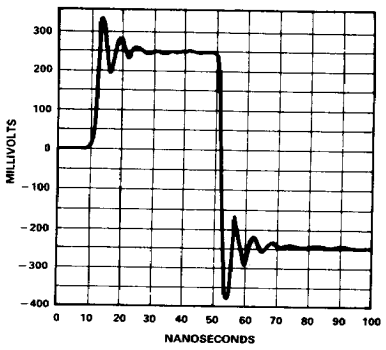


Figure 8. Small-Signal Settling (±250mV Square Wave Input)

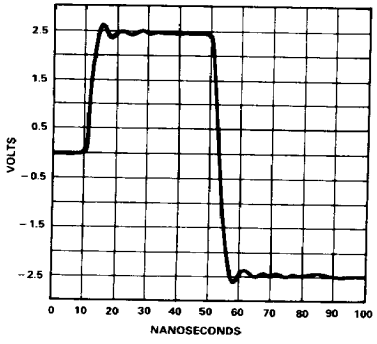


Figure 9. Large-Signal Settling (±2.5V Square Wave Input)

ORDERING INFORMATION

The model HOS-200AH operates over an industrial temperature range of −25°C to +85°C. The model HOS-200SH is designed for a military temperature range of −55°C to +125°C. The Computer Labs Division of Analog Devices, which produces the HOS-200 has been certified as meeting the standards established by MIL-STD-1772. Contact the division for details regarding parts with MIL processing.