HARRIS SEMICONDUCTOR

HFA1212/883

PRELIMINARY

June 1994

Dual, High Speed, Low Power, Video Closed Loop Buffer

Features

- **This Circuit is Processed in Accordance to MIL-STD-883 and is Fully Conformant Under the Provisions of Paragraph 1.2.1.**
- **User Programmable For Closed-Loop Gains of +1, -1 or +2 Without Use of External Resistors**
- **Standard Operational Amplifier Pinout**
- **Low Supply Current..... 5.9mA/Op Amp (Typ)**
- **Excellent Gain Accuracy.....0.99V/V (Typ)**
- **Wide -3dB Bandwidth ..... 340MHz (Typ)**
- **Fast Slew Rate ..... 1155V/μs (Typ)**
- **High Input Impedance..... 1MΩ (Typ)**
- **Excellent Gain Flatness (to 50MHz).... ±0.02dB (Typ)**
- **Fast Overdrive Recovery.....<10ns (Typ)**

Applications

- **Flash A/D Driver**
- **Video Switching and Routing**
- **Pulse and Video Amplifiers**
- **Wideband Amplifiers**
- **RF/IF Signal Processing**
- **Medical Imaging Systems**

Description

The HFA1212/883 is a dual closed loop Buffer featuring user programmable gain and high speed performance. Manufactured on Harris' proprietary complementary bipolar UHF-1 process, this device offers wide -3dB bandwidth of 340MHz, very fast slew rate, excellent gain flatness and high output current.

A unique feature of the pinout allows the user to select a voltage gain of +1, -1, or +2, without the use of any external components. Gain selection is accomplished via connections to the inputs, as described in the "Application Information" section. The result is a more flexible product, fewer part types in inventory, and more efficient use of board space.

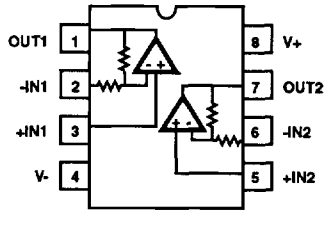
Compatibility with existing op amp pinouts provides flexibility to upgrade low gain amplifiers, while decreasing component count. Unlike most buffers, the standard pinout provides an upgrade path should a higher closed loop gain be needed at a future date.

Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1212MJ/883	-55°C to +125°C	8 Lead CerDIP

Pinout

HFA1212/883
(CERDIP)
TOP VIEW



3 OPERATIONAL AMPLIFIERS

CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper I.C. Handling Procedures.
Copyright © Harris Corporation 1994

Spec Number **511111-883**
File Number **3742**

Absolute Maximum Ratings

Voltage Between V+ and V- 12V
Voltage at Either Input Terminal ..... V+ to V-
Output Current (Note 1) ..... Short Circuit Protected
Output Current (50% Duty Cycle, Note 1) 60mA
Junction Temperature ..... +175°C
ESD Rating ..... > 2000V
Storage Temperature Range ..... $-65°C \le T_A \le +150°C$
Lead Temperature (Soldering 10s) ..... +300°C

Thermal Information

Thermal Resistance	θ_{JA}	θ_{JC}
CerDIP Package	115°C/W	30°C/W

Maximum Package Power Dissipation at +75°C
CerDIP Package 0.87W
Package Power Dissipation Derating Factor above +75°C
CerDIP Package ..... 8.7mW/°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Operating Conditions

Operating V_{SUPPLY} ($\pm V_S$) ..... ±5V $R_L \ge 50\Omega$
Operating Temperature Range ..... $-55°C \le T_A \le +125°C$

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at: $V_{SUPPLY} = \pm 5V$, $A_V = +1$, $R_{SOURCE} = 0\Omega$, $R_L = 100\Omega$, $V_{OUT} = 0V$, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
Output Offset Voltage	V_{OS}	$V_{CM} = 0V$	1	+25°C	-10	10	mV
			2, 3	+125°C, -55°C	-20	20	mV
Channel-to-Channel Output Offset Voltage Mismatch	ΔV_{OS}	$V_{CM} = 0V$	1	+25°C	-15	15	mV
			2, 3	+125°C, -55°C	-30	30	mV
Common Mode Rejection Ratio	CMRR	$\Delta V_{CM} = \pm 1.8V$ V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25°C	42	-	dB
			2	+125°C	39	-	dB
		$\Delta V_{CM} = \pm 1.2V$ V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	39	-	dB
Power Supply Rejection Ratio	PSRRP	$\Delta V_{SUPPLY} = \pm 1.8V$ V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25°C	45	-	dB
			2	+125°C	42	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55°C	42	-	dB
	PSRRN	$\Delta V_{SUPPLY} = \pm 1.8V$ V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	45	-	dB
			2	+125°C	42	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55°C	42	-	dB
Non-Inverting Input (+IN) Current	I_{BSP}	$V_{CM} = 0V$	1	+25°C	-15	15	µA
			2, 3	+125°C, -55°C	-25	25	µA
Channel-to-Channel +IN Current Mismatch	ΔI_{BSP}	$V_{CM} = 0V$	1	+25°C	-15	15	µA
			2, 3	+125°C, -55°C	-25	25	µA

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, R_{SOURCE} = 0Ω, R_L = 100Ω, V_{OUT} = 0V, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
+IN Current Common Mode Sensitivity	CMS_{IBP}	ΔV_{CM} = ±1.8V V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25°C	-	1.25	µA/V
			2	+125°C	-	2.85	µA/V
		ΔV_{CM} = ±1.2V V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	-	2.85	µA/V
+IN Resistance	$+R_{IN}$	Note 2	1	+25°C	800	-	kΩ
			2, 3	+125°C, -55°C	350	-	kΩ
Gain	A_{VP1}	A_V = +1 V_{IN} = -1V to +1V	1	+25°C	0.98	1.02	V/V
			2, 3	+125°C, -55°C	0.975	1.025	V/V
	A_{VM1}	A_V = -1 V_{IN} = -1V to +1V	1	+25°C	-0.98	-1.02	V/V
			2, 3	+125°C, -55°C	-0.975	-1.025	V/V
	A_{VP2}	A_V = +2 V_{IN} = -1V to +1V	1	+25°C	1.96	2.04	V/V
			2, 3	+125°C, -55°C	1.95	2.05	V/V
Channel-to-Channel Gain Mismatch	ΔA_{VP1}	A_V = +1 V_{IN} = -1V to +1V	1	+25°C	-0.02	0.02	V/V
			2, 3	+125°C, -55°C	-0.025	0.025	V/V
	ΔA_{VM1}	A_V = -1 V_{IN} = -1V to +1V	1	+25°C	-0.025	0.025	V/V
			2, 3	+125°C, -55°C	-0.025	0.025	V/V
	ΔA_{VP2}	A_V = +2 V_{IN} = -1V to +1V	1	+25°C	-0.04	0.04	V/V
			2, 3	+125°C, -55°C	-0.05	0.05	V/V
Output Voltage Swing	V_{OP100}	A_V = -1, R_L = 100Ω, V_{IN} = -3.2V	1	+25°C	3	-	V
		A_V = -1, R_L = 100Ω, V_{IN} = -3V	2, 3	+125°C, -55°C	2.8	-	V
	V_{ON100}	A_V = -1, R_L = 100Ω, V_{IN} = +3.2V	1	+25°C	-	-3	V
		A_V = -1, R_L = 100Ω, V_{IN} = +3V	2, 3	+125°C, -55°C	-	-2.8	V
Output Voltage Swing	V_{OP50}	A_V = -1, R_L = 50Ω, V_{IN} = -2.7V	1	+25°C	2.5	-	V
		A_V = -1, R_L = 50Ω, V_{IN} = -2.25V	2	+125°C	2.0	-	V
		A_V = -1, R_L = 50Ω, V_{IN} = -2.25V	3	-55°C	1.4	-	V
	V_{ON50}	A_V = -1, R_L = 50Ω, V_{IN} = +2.7V	1	+25°C	-	-2.5	V
		A_V = -1, R_L = 50Ω, V_{IN} = +2.25V	2	+125°C	-	-2.0	V
		A_V = -1, R_L = 50Ω, V_{IN} = +2.25V	3	-55°C	-	-1.4	V

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, R_{SOURCE} = 0Ω, R_L = 100Ω, V_{OUT} = 0V, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
Output Current	$+I_{OUT}$	Note 3	1	+25°C	50	-	mA
			2	+125°C	40	-	mA
			3	-55°C	28	-	mA
	$-I_{OUT}$	Note 3	1	+25°C	-	-50	mA
			2	+125°C	-	-40	mA
			3	-55°C	-	-28	mA
Quiescent Power Supply Current	I_{CC}	R_L = 100Ω	1	+25°C	5.6	6.1	mA/Op Amp
			2, 3	+125°C, -55°C	5.2	6.5	mA/Op Amp
	I_{EE}	R_L = 100Ω	1	+25°C	-6.1	-5.6	mA/Op Amp
			2, 3	+125°C, -55°C	-6.5	-5.2	mA/Op Amp

NOTES:

1. Output is short circuit protected to ground. Brief short circuits to ground will not degrade reliability, however continuous (100% duty cycle) output current must not exceed 30mA for maximum reliability.
2. Guaranteed from +IN Common Mode Rejection Test, by: $+R_{IN} = 1/CMS_{IBP}$.
3. Guaranteed from V_{OUT} Test with R_L = 50Ω, by: $I_{OUT} = V_{OUT}/50Ω$.

TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS

Table 2 Intentionally Left Blank.

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS

Table 3 Intentionally Left Blank.

TABLE 4. ELECTRICAL TEST REQUIREMENTS

MIL-STD-883 TEST REQUIREMENTS	SUBGROUPS (SEE TABLE 1)
Interim Electrical Parameters (Pre Burn-In)	1
Final Electrical Test Parameters	1(Note 1), 2, 3
Group A Test Requirements	1, 2, 3
Groups C and D Endpoints	1

NOTE:

1. PDA applies to Subgroup 1 only.

Die Characteristics

DIE DIMENSIONS:
69 x 92 x 19 mils ± 1 mils
1750 x 2330 x 483µm ± 25.4µm

METALLIZATION:
Type: Metal 1: AlCu(2%)/TiW
Thickness: Metal 1: 8kÅ ± 0.4kÅ
Type: Metal 2: AlCu(2%)
Thickness: Metal 2: 16kÅ ± 0.8kÅ

GLASSIVATION:
Type: Nitride
Thickness: 4kÅ ± 0.5kÅ

WORST CASE CURRENT DENSITY:
TBD

TRANSISTOR COUNT: 150

SUBSTRATE POTENTIAL (Powered Up): Floating (Recommend Connection to V-)

Metallization Mask Layout

HFA1212/883