

PRELIMINARY

Juen 1994

Dual, High Speed, Low Power, Video Operational Amplifier with Output Disable

Features

- This Circuit is Processed in Accordance to MIL-STD-883 and is Fully Conformant Under the Provisions of Paragraph 1.2.1.
- Low Supply Current. 5.9mA (Typ)
- Wide -3dB Bandwidth 530MHz (Typ)
- High Slew Rate. 1050V/ μ s (Typ)
- Excellent Gain Flatness (to 50MHz) ± 0.11 dB (Typ)
- Excellent Differential Gain 0.02% (Typ)
- Excellent Differential Phase 0.03 Deg. (Typ)
- High Output Current 60mA (Typ)
- Individual Output Enable/Disable
- Output Enable / Disable Time 160ns/20ns (Typ)

Applications

- Multiplexed Flash A/D Driver
- RGB Multiplexers and Preamps
- Video Switching and Routing
- Pulse and Video Amplifiers
- Wideband Amplifiers
- Hand Held and Miniaturized RF Equipment
- Battery Powered Communications

Description

The HFA1245/883 is a dual high speed, low power current feedback amplifier built with Harris' proprietary complementary bipolar UHF-1 process.

This amplifier features individual TTL/CMOS compatible disable controls, which when pulled low, reduce the supply current and force the output into a high impedance state. This allows easy implementation of simple, low power video switching and routing systems. Component and composite video systems also benefit from this op amp's excellent gain flatness, and good differential gain and phase specifications.

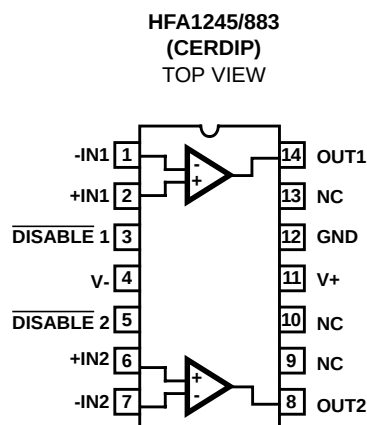
Multiplexed A/D applications will also find the HFA1245/883 useful as the A/D driver/multiplexer.

The HFA1245/883 is a low power, high performance upgrade for the popular HA5022/883.

Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1245MJ/883	-55°C to +125°C	14 Lead CerDIP

Pinout



Specifications HFA1245/883

Absolute Maximum Ratings

Voltage Between V+ and V- 12V
 Differential Input Voltage 5V
 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 ≤ T_A ≤ +150°C
 Lead Temperature (Soldering 10s) +300°C

Thermal Information

Thermal Resistance
 CerDIP Package θ_{JA} 75°C/W θ_{JC} 20°C/W
 Maximum Package Power Dissipation at +75°C
 CerDIP Package 1.33W
 Package Power Dissipation Derating Factor above +75°C
 CerDIP Package 13.3mW/°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} (±V_S) ±5V R_L ≥ 50Ω
 Operating Temperature Range -55°C ≤ T_A ≤ +125°C

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, R_F = 560Ω, R_{SOURCE} = 0Ω, R_L = 100Ω, V_{OUT} = 0V, $\overline{DIS}$ = Floated, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Input Offset Voltage	V _{IO}	V _{CM} = 0V	1	+25°C	-5	5	mV
			2, 3	+125°C, -55°C	-10	10	mV
Channel-to-Channel Input Offset Voltage Mismatch	ΔV_{IO}	V _{CM} = 0V	1	+25°C	-7.5	7.5	mV
			2, 3	+125°C, -55°C	-15	15	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	45	-	dB
			2	+125°C	42	-	dB
		$\Delta V_{CM} = \pm 1.2V$ V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	42	-	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	48	-	dB
			2	+125°C	45	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55°C	45	-	dB
	PSRRN	$\Delta V_{SUPPLY} = \pm 1.8V$ V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	48	-	dB
			2	+125°C	45	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55°C	45	-	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
+IN Current Common Mode Sensitivity	CMS _{IBP}	$\Delta V_{CM} = \pm 1.8V$ 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
		$\Delta V_{CM} = \pm 1.2V$ V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	-	2.85	μA/V

Specifications HFA1245/883

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: $V_{SUPPLY} = \pm 5V$, $A_V = +1$, $R_F = 560\Omega$, $R_{SOURCE} = 0\Omega$, $R_L = 100\Omega$, $V_{OUT} = 0V$, $\overline{DIS} = \text{Floated}$, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
+IN Resistance	$+R_{IN}$	Note 2	1	+25°C	800	-	k Ω
			2, 3	+125°C, -55°C	350	-	k Ω
+IN Current Power Supply Sensitivity	PPSS _{IBP}	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 6.8V$, $V_- = -5V$ $V_+ = 3.2V$, $V_- = -5V$	1	+25°C	-	1	$\mu A/V$
			2	+125°C	-	3	$\mu A/V$
		$\Delta V_{SUPPLY} = \pm 1.2V$ $V_+ = 6.2V$, $V_- = -5V$ $V_+ = 3.8V$, $V_- = -5V$	3	-55°C	-	3	$\mu A/V$
	NPSS _{IBP}	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 5V$, $V_- = -6.8V$ $V_+ = 5V$, $V_- = -3.2V$	1	+25°C	-	1	$\mu A/V$
			2	+125°C	-	3	$\mu A/V$
		$\Delta V_{SUPPLY} = \pm 1.2V$ $V_+ = 5V$, $V_- = -6.2V$ $V_+ = 5V$, $V_- = -3.8V$	3	-55°C	-	3	$\mu A/V$
Inverting Input (-IN) Current	I_{BSN}	$V_{CM} = 0V$	1	+25°C	-7.5	7.5	μA
			2, 3	+125°C, -55°C	-25	25	μA
Channel-to-Channel -IN Current Mismatch	ΔI_{BSN}	$V_{CM} = 0V$	1	+25°C	-10	10	μA
			2, 3	+125°C, -55°C	-30	30	μA
-IN Current Common Mode Sensitivity	CMS _{IBN}	$\Delta V_{CM} = \pm 1.8V$ $V_+ = 3.2V$, $V_- = -6.8V$ $V_+ = 6.8V$, $V_- = -3.2V$	1	+25°C	-	6	$\mu A/V$
			2	+125°C	-	8	$\mu A/V$
		$\Delta V_{CM} = \pm 1.2V$ $V_+ = 3.8V$, $V_- = -6.2V$ $V_+ = 6.2V$, $V_- = -3.8V$	3	-55°C	-	8	$\mu A/V$
-IN Current Power Supply Sensitivity	PPSS _{IBN}	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 6.8V$, $V_- = -5V$ $V_+ = 3.2V$, $V_- = -5V$	1	+25°C	-	5	$\mu A/V$
			2	+125°C	-	8	$\mu A/V$
		$\Delta V_{SUPPLY} = \pm 1.2V$ $V_+ = 6.2V$, $V_- = -5V$ $V_+ = 3.8V$, $V_- = -5V$	3	-55°C	-	8	$\mu A/V$
	NPSS _{IBN}	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 5V$, $V_- = -6.8V$ $V_+ = 5V$, $V_- = -3.2V$	1	+25°C	-	5	$\mu A/V$
			2	+125°C	-	8	$\mu A/V$
		$\Delta V_{SUPPLY} = \pm 1.2V$ $V_+ = 5V$, $V_- = -6.2V$ $V_+ = 5V$, $V_- = -3.8V$	3	-55°C	-	8	$\mu A/V$
Output Voltage Swing	V_{OP100}	$A_V = -1$ $R_L = 100\Omega$ $V_{IN} = -3.2V$ $V_{IN} = -3V$	1	+25°C	3	-	V
			2, 3	+125°C, -55°C	2.8	-	V
	V_{ON100}	$A_V = -1$ $R_L = 100\Omega$ $V_{IN} = +3.2V$ $V_{IN} = +3V$	1	+25°C	-	-3	V
			2, 3	+125°C, -55°C	-	-2.8	V

Specifications HFA1245/883

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: $V_{SUPPLY} = \pm 5V$, $A_V = +1$, $R_F = 560\Omega$, $R_{SOURCE} = 0\Omega$, $R_L = 100\Omega$, $V_{OUT} = 0V$, $\overline{DIS} = \text{Floated}$, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS		GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
						MIN	MAX	
Output Voltage Swing	V _{OP50}	A _V = -1 R _L = 50Ω	V _{IN} = -2.7V	1	+25°C	2.5	-	V
			V _{IN} = -2.25V	2	+125°C	2.0	-	V
			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
			V _{IN} = +2.25V	2	+125°C	-	-2.0	V
			V _{IN} = +2.25V	3	-55°C	-	-1.4	V
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
Disabled Power Supply Current	DISI _{CC}	R _L = 100Ω, V _{DIS} = 0V		1	+25°C	-	4	mA/Op Amp
				2, 3	+125°C, -55°C	-	4.25	mA/Op Amp
	DISI _{EE}	R _L = 100Ω, V _{DIS} = 0V		1	+25°C	-4	-	mA/Op Amp
				2, 3	+125°C, -55°C	-4.25	-	mA/Op Amp
Disabled Output Leakage Current	DOLC	V _{DIS} = 0V, V _{IN} = ±2.5V, V _{OUT} = ∓ 2.5V		1	+25°C	-10	10	μA
				2, 3	+125°C, -55°C	-10	10	μA
Disable Input Current	DILLC	V _{DIS} = 0V		1	+25°C	-	200	μA
				2, 3	+125°C, -55°C	-	200	μA
	DILHC	V _{DIS} = 5V		1	+25°C	-	15	μA
				2, 3	+125°C, -55°C	-	15	μA
Disable Input Logic Levels	DILLV			1	+25°C	-	0.8	V
				2, 3	+125°C, -55°C	-	0.8	V
	DILHV			1, 2	+25°C, +125°C	2.0	-	V
				3	-55°C	2.4	-	V

NOTES:

- 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.
- Guaranteed from +IN Common Mode Rejection Test, by: $+R_{IN} = 1/CMS_{IBP}$.
- Guaranteed from V_{OUT} Test with $R_L = 50\Omega$, by: $I_{OUT} = V_{OUT}/50\Omega$.

Specifications HFA1245/883

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 $\pm$ 1 mils
 1750 x 2330 x 483 μ m $\pm$ 25.4 μ m

METALLIZATION:

Type: Metal 1: AlCu(2%)/TiW Type: Metal 2: AlCu(2%)
 Thickness: Metal 1: 8k $\text{\AA}$ $\pm$ 0.4k $\text{\AA}$ Thickness: Metal 2: 16k $\text{\AA}$ $\pm$ 0.8k $\text{\AA}$

GLASSIVATION:

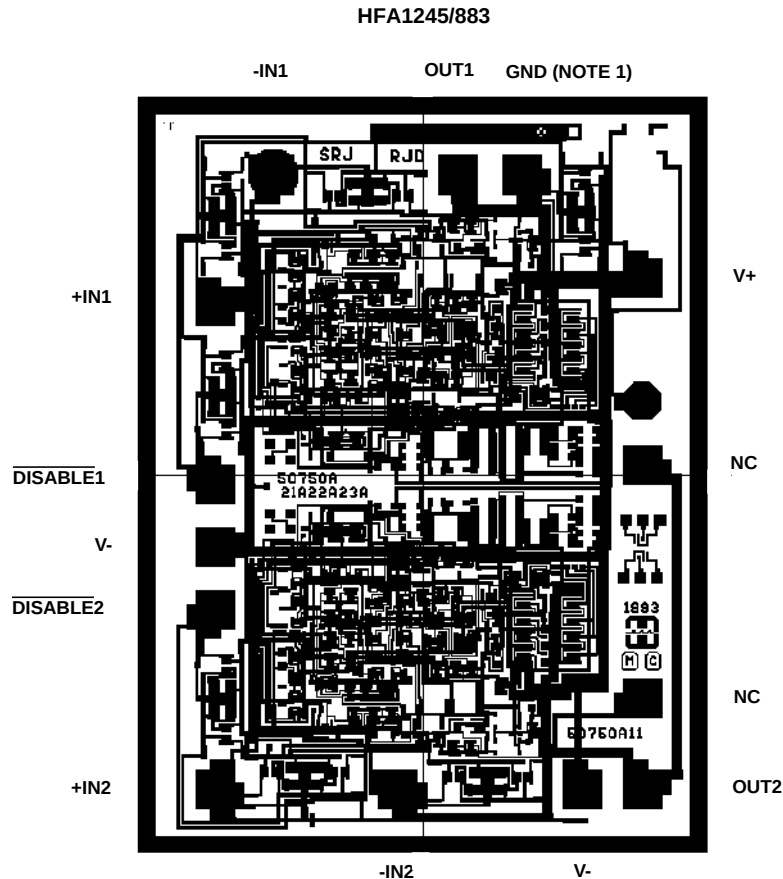
Type: Nitride
 Thickness: 4k $\text{\AA}$ $\pm$ 0.5k $\text{\AA}$

WORST CASE CURRENT DENSITY: TBD

TRANSISTOR COUNT: 150

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

Metallization Mask Layout



NOTE:

1. This is an optional GND pad. Users may set a GND reference, via this pad, to ensure the TTL compatibility of the DISABLE inputs when using asymmetrical supplies (e.g. V+ = 10V, V- = 0V). See the "Application Information" section for details.