

PRELIMINARY

June 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.

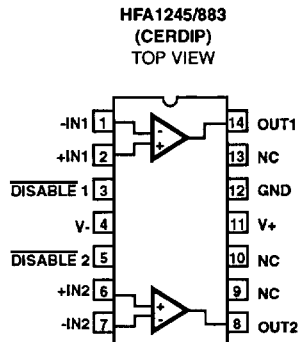
Multiplexed A/D applications will also find the HFA1245/883 useful as the A/D driver/multiplexer.

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	θ_{JA}	θ_{JC}
CerDIP Package	75°C/W	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	ΔV _{CM} = ±1.8V V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25°C	45	-	dB
			2	+125°C	42	-	dB
		3	-55°C	42	-	dB	
Power Supply Rejection Ratio	PSRRP	ΔV _{SUPPLY} = ±1.8V V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25°C	48	-	dB
			2	+125°C	45	-	dB
			3	-55°C	45	-	dB
	PSRRN	ΔV _{SUPPLY} = ±1.2V V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	1	+25°C	48	-	dB
			2	+125°C	45	-	dB
			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}	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
		3	-55°C	-	2.85	μA/V	

3
OPERATIONAL AMPLIFIERS

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} = 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	$\mu A/V$	
		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	$\mu A/V$	
		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	$\mu A/V$	
		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	$\mu A/V$	
		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	$\mu A/V$	
		3	-55°C	-	8	$\mu A/V$		
Output Voltage Swing	V_{OP100}	$A_V = -1$ $R_L = 100\Omega$	$V_{IN} = -3.2V$	1	+25°C	3	-	V
			$V_{IN} = -3V$	2, 3	+125°C, -55°C	2.8	-	V
	V_{ON100}	$A_V = -1$ $R_L = 100\Omega$	$V_{IN} = +3.2V$	1	+25°C	-	-3	V
			$V_{IN} = +3V$	2, 3	+125°C, -55°C	-	-2.8	V

Specifications HFA1245/883

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

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

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS	
					MIN	MAX		
Output Voltage Swing	V_{OP50}	$A_V = -1$ $R_L = 50\Omega$	$V_{IN} = -2.7V$	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}	$A_V = -1$ $R_L = 50\Omega$	$V_{IN} = +2.7V$	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
	$-I_{OUT}$			1	+25°C	-	-50	mA
				2	+125°C	-	-40	mA
				3	-55°C	-	-28	mA
Quiescent Power Supply Current	I_{CC}	$R_L = 100\Omega$		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}	$R_L = 100\Omega$		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	$DISI_{CC}$	$R_L = 100\Omega$, $V_{\overline{DIS}} = 0V$		1	+25°C	-	4	mA/Op Amp
				2, 3	+125°C, -55°C	-	4.25	mA/Op Amp
	$DISI_{EE}$	$R_L = 100\Omega$, $V_{\overline{DIS}} = 0V$		1	+25°C	-4	-	mA/Op Amp
				2, 3	+125°C, -55°C	-4.25	-	mA/Op Amp
Disabled Output Leakage Current	DOLC	$V_{\overline{DIS}} = 0V$, $V_{IN} = \pm 2.5V$, $V_{OUT} = \mp 2.5V$		1	+25°C	-10	10	μA
				2, 3	+125°C, -55°C	-10	10	μA
Disable Input Current	DILLC	$V_{\overline{DIS}} = 0V$		1	+25°C	-	200	μA
				2, 3	+125°C, -55°C	-	200	μA
	DILHC	$V_{\overline{DIS}} = 5V$		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

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

GLASSIVATION:

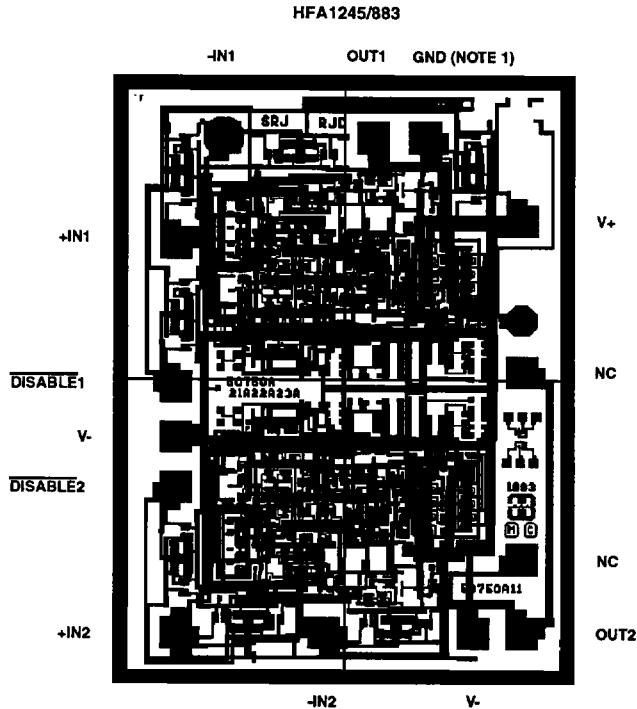
Type: Nitride
 Thickness: 4kÅ ± 0.5kÅ

WORST CASE CURRENT DENSITY: TBD

TRANSISTOR COUNT: 150

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

Metallization Mask Layout



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.