

## High Speed, Low Power, Current Feedback Video Operational Amplifier with Output Disable

June 1994

### 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 . . . . . 360MHz (Typ)
- High Slew Rate. . . . . 1000V/μs (Typ)
- Excellent Gain Flatness (to 50MHz) . . . . ±0.07dB (Typ)
- Excellent Differential Gain . . . . . 0.02% (Typ)
- Excellent Differential Phase . . . . . 0.03 Deg. (Typ)
- High Output Current . . . . . 60mA (Typ)
- Output Enable / Disable Time . . . . . 180ns/35ns (Typ)

### Applications

- Multiplexed Flash A/D Driver
- RGB Multiplexers / Preamps for Multimedia Systems
- Video Switching and Routing
- Pulse and Video Amplifiers
- Wideband Amplifiers
- RF/IF Signal Processing
- Medical Imaging Systems

### Description

The HFA1145/883 is a high speed, low power current feedback amplifier built with Intersil' proprietary complementary bipolar UHF-1 process.

This amplifier features a TTL/CMOS compatible disable control, pin 8, which when pulled low, reduces the supply current and forces 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.

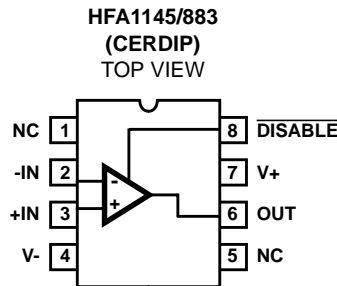
Multiplexed A/D applications will also find the HFA1145/883 useful as the A/D driver/multiplexer.

The HFA1145/883 is a low power, high performance upgrade for the CLC410.

### Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1145MJ/883	-55°C to +125°C	8 Lead CerDIP

### Pinout



## Specifications HFA1145/883

### 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 <sub>A</sub> ≤ +150°C
Lead Temperature (Soldering 10s) .....	+300°C

### Thermal Information

Thermal Resistance	$\theta_{JA}$	$\theta_{JC}$
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 <sub>SUPPLY</sub> (±V <sub>S</sub> ) .....	±5V	R <sub>L</sub> ≥ 50Ω
Operating Temperature Range .....	-55°C ≤ T <sub>A</sub> ≤ +125°C	

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS**

Device Tested at: V<sub>SUPPLY</sub> = ±5V, A<sub>V</sub> = +1, R<sub>F</sub> = 510Ω, R<sub>SOURCE</sub> = 0Ω, R<sub>L</sub> = 100Ω, V<sub>OUT</sub> = 0V,  $\overline{DIS}$  = Floated, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Input Offset Voltage	V <sub>IO</sub>	V <sub>CM</sub> = 0V	1	+25°C	-5	5	mV
			2, 3	+125°C, -55°C	-10	10	mV
Common Mode Rejection Ratio	CMRR	ΔV <sub>CM</sub> = ±1.8V V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25°C	47	-	dB
			2	+125°C	44	-	dB
		3	-55°C	44	-	dB	
Power Supply Rejection Ratio	PSRRP	ΔV <sub>SUPPLY</sub> = ±1.8V V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25°C	50	-	dB
			2	+125°C	46	-	dB
		3	-55°C	46	-	dB	
	PSRRN	ΔV <sub>SUPPLY</sub> = ±1.8V V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	50	-	dB
			2	+125°C	46	-	dB
		3	-55°C	46	-	dB	
Non-Inverting Input (+IN) Current	I <sub>BSP</sub>	V <sub>CM</sub> = 0V	1	+25°C	-15	15	μA
			2, 3	+125°C, -55°C	-25	25	μA
+IN Current Common Mode Sensitivity	CMS <sub>IBP</sub>	ΔV <sub>CM</sub> = ±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	
+IN Resistance	+R <sub>IN</sub>	Note 2	1	+25°C	800	-	kΩ
			2, 3	+125°C, -55°C	350	-	kΩ

## Specifications HFA1145/883

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)**

Device Tested at:  $V_{SUPPLY} = \pm 5V$ ,  $A_V = +1$ ,  $R_F = 510\Omega$ ,  $R_{SOURCE} = 0\Omega$ ,  $R_L = 100\Omega$ ,  $V_{OUT} = 0V$ ,  $\overline{DIS} = \text{Floated}$ , Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS	
					MIN	MAX		
+IN Current Power Supply Sensitivity	PPSS <sub>IBP</sub>	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 6.8V, V_- = -5V$ $V_+ = 3.2V, V_- = -5V$	1	+25°C	-	1	$\mu A/V$	
			2	+125°C	-	3	$\mu A/V$	
		3	-55°C	-	3	$\mu A/V$		
	NPSS <sub>IBP</sub>	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 5V, V_- = -6.8V$ $V_+ = 5V, V_- = -3.2V$	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 <sub>BSN</sub>	$V_{CM} = 0V$	1	+25°C	-7.5	7.5	$\mu A$	
			2, 3	+125°C, -55°C	-25	25	$\mu A$	
-IN Current Common Mode Sensitivity	CMS <sub>IBN</sub>	$\Delta V_{CM} = \pm 1.8V$ $V_+ = 3.2V, V_- = -6.8V$ $V_+ = 6.8V, V_- = -3.2V$	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 <sub>IBN</sub>	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 6.8V, V_- = -5V$ $V_+ = 3.2V, V_- = -5V$	1	+25°C	-	5	$\mu A/V$	
			2	+125°C	-	8	$\mu A/V$	
		3	-55°C	-	8	$\mu A/V$		
	NPSS <sub>IBN</sub>	$\Delta V_{SUPPLY} = \pm 1.8V$ $V_+ = 5V, V_- = -6.8V$ $V_+ = 5V, V_- = -3.2V$	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 <sub>OP100</sub>	$A_V = -1$ $R_L = 100\Omega$	$V_{IN} = -3.2V$	1	+25°C	3	-	V
			$V_{IN} = -3V$	2, 3	+125°C, -55°C	2.8	-	V
	V <sub>ON100</sub>	$A_V = -1$ $R_L = 100\Omega$	$V_{IN} = +3.2V$	1	+25°C	-	-3	V
			$V_{IN} = +3V$	2, 3	+125°C, -55°C	-	-2.8	V
Output Voltage Swing	V <sub>OP50</sub>	$A_V = -1$ $R_L = 50\Omega$	$V_{IN} = -2.7V$	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 <sub>ON50</sub>	$A_V = -1$ $R_L = 50\Omega$	$V_{IN} = +2.7V$	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 <sub>OUT</sub>	Note 3	1	+25°C	50	-	mA	
			2	+125°C	40	-	mA	
			3	-55°C	28	-	mA	
	-I <sub>OUT</sub>	Note 3	1	+25°C	-	-50	mA	
			2	+125°C	-	-40	mA	
			3	-55°C	-	-28	mA	

## Specifications HFA1145/883

**TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)**

Device Tested at:  $V_{SUPPLY} = \pm 5V$ ,  $A_V = +1$ ,  $R_F = 510\Omega$ ,  $R_{SOURCE} = 0\Omega$ ,  $R_L = 100\Omega$ ,  $V_{OUT} = 0V$ ,  $\overline{DIS} = \text{Floated}$ , Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
Quiescent Power Supply Current	$I_{CC}$	$R_L = 100\Omega$	1	+25°C	5.6	6.1	mA
			2, 3	+125°C, -55°C	5.2	6.5	mA
	$I_{EE}$	$R_L = 100\Omega$	1	+25°C	-6.1	-5.6	mA
			2, 3	+125°C, -55°C	-6.5	-5.2	mA
Disabled Power Supply Current	$DISI_{CC}$	$R_L = 100\Omega$ , $V_{\overline{DIS}} = 0V$	1	+25°C	-	4	mA
			2, 3	+125°C, -55°C	-	4	mA
	$DISI_{EE}$	$R_L = 100\Omega$ , $V_{\overline{DIS}} = 0V$	1	+25°C	-4	-	mA
			2, 3	+125°C, -55°C	-4	-	mA
Disabled Output Leakage Current	DOLC	$V_{\overline{DIS}} = 0V$ , $V_{IN} = \pm 2.5V$ , $V_{OUT} = \mp 2.5V$	1	+25°C	-10	10	$\mu A$
			2, 3	+125°C, -55°C	-10	10	$\mu A$
Disable Input Current	DILLC	$V_{\overline{DIS}} = 0V$	1	+25°C	-	200	$\mu A$
			2, 3	+125°C, -55°C	-	200	$\mu A$
	DILHC	$V_{\overline{DIS}} = 5V$	1	+25°C	-	15	$\mu A$
			2, 3	+125°C, -55°C	-	15	$\mu A$
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:  $I_{OUT} = V_{OUT}/50\Omega$ .

**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:**

- PDA applies to Subgroup 1 only.

**Die Characteristics****DIE DIMENSIONS:**

59 x 58.2 x 19 mils  $\pm$  1 mils  
 1500 x 1480 x 483 $\mu$ m  $\pm$  25.4 $\mu$ 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 $\text{\AA}$

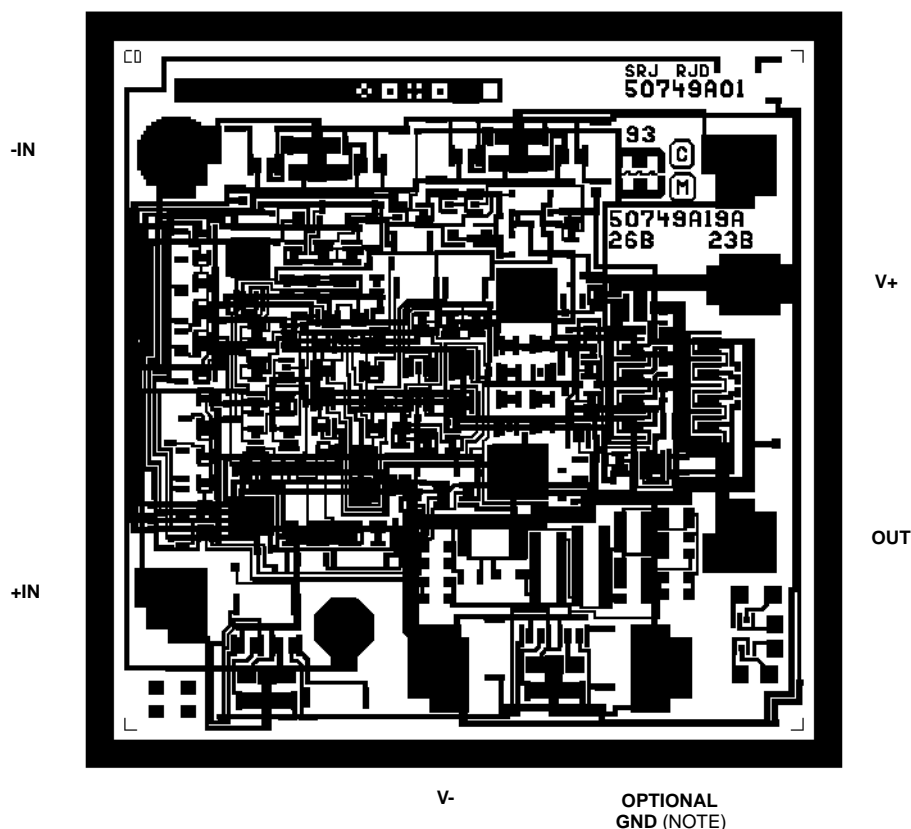
**SUBSTRATE POTENTIAL (Powered Up):** Floating (Recommend Connection to V-)

**WORST CASE CURRENT DENSITY:** TBD

**TRANSISTOR COUNT:** 75

**Metallization Mask Layout**

HFA1145/883



NOTE: This pad is not bonded out on packaged units. Die users may set a GND reference, via this pad, to ensure the TTL compatibility of the DIS input when using asymmetrical supplies (e.g. V+ = 10V, V- = 0V).

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