HARRIS SEMICONDUCTOR

HFA1100/883

July 1994

850MHz Current Feedback Amplifier

Features

- This Circuit is Processed in Accordance to MIL-STD-883 and is Fully Conformant Under the Provisions of Paragraph 1.2.1.
- Low Distortion (HD3, 30MHz) ..... -84dBc (Typ)
- Wide -3dB Bandwidth ..... 850MHz (Typ)
- Very High Slew Rate ..... 2300V/μs (Typ)
- Fast Settling (0.1%) ..... 11ns (Typ)
- Excellent Gain Flatness (to 50MHz) ..... 0.05dB (Typ)
- High Output Current ..... 65mA (Typ)
- Fast Overdrive Recovery ..... <10ns (Typ)

Applications

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

Description

The HFA1100/883 is a high speed, wideband, fast settling current feedback amplifier. Built with Harris' proprietary, complementary bipolar UHF-1 process, it is the fastest monolithic amplifier available from any semiconductor manufacturer.

The HFA1100/883's wide bandwidth, fast settling characteristic, and low output impedance, make this amplifier ideal for driving fast A/D converters.

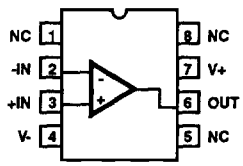
Component and composite video systems will also benefit from this amplifier's performance, as indicated by the excellent gain flatness, and 0.03%/0.05 Deg. Differential Gain/Phase specifications (R_L = 75Ω).

Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1100MJ/883	-55°C to +125°C	8 Lead CerDIP

Pinout

HFA1100/883
(CERDIP)
TOP VIEW



CAUTION: These devices are sensitive to electrostatic discharge. Users should follow proper I.C. Handling Procedures.

Spec Number 511104-883
File Number 3615.1

Absolute Maximum Ratings

Voltage Between V+ and V- 12V
Differential Input Voltage 5V
Voltage at Either Input Terminal ..... V+ to V-
Output Current (50% Duty Cycle) ..... ±55mA
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: $V_{SUPPLY} = \pm 5V$, $A_V = +1$, $R_F = 510\Omega$, $R_{SOURCE} = 0\Omega$, $R_L = 100\Omega$, $V_{OUT} = 0V$, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
Input Offset Voltage	V_{IO}	$V_{CM} = 0V$	1	+25°C	-6	6	mV
			2, 3	+125°C, -55°C	-10	10	mV
Common Mode Rejection Ratio	CMRR	$\Delta V_{CM} = \pm 2V$ V+ = 3V, V- = -7V V+ = 7V, V- = -3V	1	+25°C	40	-	dB
			2, 3	+125°C, -55°C	38	-	dB
Power Supply Rejection Ratio	PSRRP	$\Delta V_{SUPPLY} = \pm 1.25V$ V+ = 6.25V, V- = -5V V+ = 3.75V, V- = -5V	1	+25°C	45	-	dB
			2, 3	+125°C, -55°C	42	-	dB
	PSRRN	$\Delta V_{SUPPLY} = \pm 1.25V$ V+ = 5V, V- = -6.25V V+ = 5V, V- = -3.75V	1	+25°C	45	-	dB
			2, 3	+125°C, -55°C	42	-	dB
Non-Inverting Input (+IN) Current	I_{BSP}	$V_{CM} = 0V$	1	+25°C	-40	40	µA
			2, 3	+125°C, -55°C	-65	65	µA
+IN Current Common Mode Sensitivity	CMS_{IBP}	$\Delta V_{CM} = \pm 2V$ V+ = 3V, V- = -7V V+ = 7V, V- = -3V	1	+25°C	-	40	µA/V
			2, 3	+125°C, -55°C	-	50	µA/V
+IN Resistance	$+R_{IN}$	Note 1	1	+25°C	25	-	kΩ
			2, 3	+125°C, -55°C	20	-	kΩ
Inverting Input (-IN) Current	I_{BSN}	$V_{CM} = 0V$	1	+25°C	-50	50	µA
			2, 3	+125°C, -55°C	-75	75	µA
-IN Current Common Mode Sensitivity	CMS_{IBN}	$\Delta V_{CM} = \pm 2V$ V+ = 3V, V- = -7V V+ = 7V, V- = -3V	1	+25°C	-	7	µA/V
			2, 3	+125°C, -55°C	-	10	µA/V
-IN Current Power Supply Sensitivity	$PPSS_{IBN}$	$\Delta V_{SUPPLY} = \pm 1.25V$ V+ = 6.25V, V- = -5V V+ = 3.75V, V- = -5V	1	+25°C	-	15	µA/V
			2, 3	+125°C, -55°C	-	27	µA/V
	$NPSS_{IBN}$	$\Delta V_{SUPPLY} = \pm 1.25V$ V+ = 5V, V- = -6.25V V+ = 5V, V- = -3.75V	1	+25°C	-	15	µA/V
			2, 3	+125°C, -55°C	-	27	µA/V
Output Voltage Swing	V_{OP100}	$A_V = -1$, $R_L = 100\Omega$, $V_{IN} = -3.5V$	1	+25°C	3	-	V
		$A_V = -1$, $R_L = 100\Omega$, $V_{IN} = -3V$	2, 3	+125°C, -55°C	2.5	-	V
	V_{ON100}	$A_V = -1$, $R_L = 100\Omega$, $V_{IN} = +3.5V$	1	+25°C	-	-3	V
		$A_V = -1$, $R_L = 100\Omega$, $V_{IN} = +3V$	2, 3	+125°C, -55°C	-	-2.5	V

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, R_F = 510Ω, 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 Voltage Swing	V_{OP50}	A_V = -1, R_L = 50Ω, V_{IN} = -3V	1, 2	+25°C, +125°C	2.5	-	V
		A_V = -1, R_L = 50Ω, V_{IN} = -2V	3	-55°C	1.5	-	V
	V_{ON50}	A_V = -1, R_L = 50Ω, V_{IN} = +3V	1, 2	+25°C, +125°C	-	-2.5	V
		A_V = -1, R_L = 50Ω, V_{IN} = +2V	3	-55°C	-	-1.5	V
Output Current	$+I_{OUT}$	Note 2	1, 2	+25°C, +125°C	50	-	mA
			3	-55°C	30	-	mA
	$-I_{OUT}$	Note 2	1, 2	+25°C, +125°C	-	-50	mA
			3	-55°C	-	-30	mA
Quiescent Power Supply Current	I_{CC}	R_L = 100Ω	1	+25°C	14	26	mA
			2, 3	+125°C, -55°C	-	33	mA
	I_{EE}	R_L = 100Ω	1	+25°C	-26	-14	mA
			2, 3	+125°C, -55°C	-33	-	mA

NOTES:

1. Guaranteed from +IN Common Mode Rejection Test, by: $+R_{IN} = 1/CMS_{IBP}$.
2. 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. See AC Specifications in Table 3

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Characterized at: V_{SUPPLY} = ±5V, A_V = +2, R_F = 360Ω, R_L = 100Ω, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
-3dB Bandwidth	BW(-1)	A_V = -1, R_F = 430Ω, V_{OUT} = 200mV_{P-P}	1	+25°C	300	-	MHz
	BW(+1)	A_V = +1, R_F = 510Ω, V_{OUT} = 200mV_{P-P}	1	+25°C	550	-	MHz
	BW(+2)	A_V = +2, V_{OUT} = 200mV_{P-P}	1	+25°C	350	-	MHz
Gain Flatness	GF30	A_V = +2, R_F = 510Ω, f ≤ 30MHz, V_{OUT} = 200mV_{P-P}	1	+25°C	-	±0.04	dB
	GF50	A_V = +2, R_F = 510Ω, f ≤ 50MHz, V_{OUT} = 200mV_{P-P}	1	+25°C	-	±0.10	dB
	GF100	A_V = +2, R_F = 510Ω, f ≤ 100MHz, V_{OUT} = 200mV_{P-P}	1	+25°C	-	±0.30	dB

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Characterized at: V_{SUPPLY} = ±5V, A_V = +2, R_F = 360Ω, R_L = 100Ω, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
Slew Rate	+SR(+1)	A_V = +1, R_F = 510Ω, V_{OUT} = $5V_{P-P}$	1, 2	+25°C	1200	-	V/µs
	-SR(+1)	A_V = +1, R_F = 510Ω, V_{OUT} = $5V_{P-P}$	1, 2	+25°C	1100	-	V/µs
	+SR(+2)	A_V = +2, V_{OUT} = $5V_{P-P}$	1, 2	+25°C	1650	-	V/µs
	-SR(+2)	A_V = +2, V_{OUT} = $5V_{P-P}$	1, 2	+25°C	1500	-	V/µs
Rise and Fall Time	T_R	A_V = +2, V_{OUT} = $0.5V_{P-P}$	1, 2	+25°C	-	1	ns
	T_F	A_V = +2, V_{OUT} = $0.5V_{P-P}$	1, 2	+25°C	-	1	ns
Overshoot	+OS	A_V = +2, V_{OUT} = $0.5V_{P-P}$	1, 3	+25°C	-	25	%
	-OS	A_V = +2, V_{OUT} = $0.5V_{P-P}$	1, 3	+25°C	-	20	%
Settling Time	TS(0.1)	A_V = +2, R_F = 510Ω V_{OUT} = 2V to 0V, to 0.1%	1	+25°C	-	20	ns
	TS(0.05)	A_V = +2, R_F = 510Ω V_{OUT} = 2V to 0V, to 0.05%	1	+25°C	-	33	ns
2nd Harmonic Distortion	HD2(30)	A_V = +2, f = 30MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-48	dBc
	HD2(50)	A_V = +2, f = 50MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-45	dBc
	HD2(100)	A_V = +2, f = 100MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-35	dBc
3rd Harmonic Distortion	HD3(30)	A_V = +2, f = 30MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-65	dBc
	HD3(50)	A_V = +2, f = 50MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-60	dBc
	HD3(100)	A_V = +2, f = 100MHz, V_{OUT} = $2V_{P-P}$	1	+25°C	-	-40	dBc

NOTES:

1. Parameters listed in Table 3 are controlled via design or process parameters and are not directly tested at final production. These parameters are lab characterized upon initial design release, or upon design changes. These parameters are guaranteed by characterization based upon data from multiple production runs which reflect lot-to-lot and within lot variation.
2. Measured between 10% and 90% points.
3. For 200ps input transition times. Overshoot decreases as input transition times increase, especially for A_V = +1. Please refer to Performance Curves.

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:
63 x 44 x 19 mils ± 1 mils
1600µm x 1130µm 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:
2.0×10^5 A/cm^2 at 47.5mA

TRANSISTOR COUNT: 52

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

Metallization Mask Layout