HARRIS SEMICONDUCTOR

HFA1135/883

High Speed, Low Power Current Feedback Amplifier with Programmable Output Limiting

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.**
- **User Programmable Output Voltage Limiting**
- **Fast Overdrive Recovery..... <1ns (Typ)**
- **Low Supply Current..... 6.9mA (Typ)**
- **Wide -3dB Bandwidth ..... 360MHz (Typ)**
- **High Slew Rate..... 1200V/μs (Typ)**
- **High Input Impedance..... 2MΩ (Typ)**
- **Excellent Gain Flatness (to 50MHz).... ±0.07dB (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 HFA1135/883 is a high speed, low power current feedback amplifier built with Harris' proprietary complementary bipolar UHF-1 process. This amplifier features user programmable output limiting, via the V_H and V_L pins.

The HFA1135/883 is the ideal choice for high speed, low power applications requiring output limiting (e.g. flash A/D drivers), especially those requiring fast overdrive recovery times. The limiting function allows the designer to set the maximum and minimum output levels to protect downstream stages from damage or input saturation. The sub-nanosecond overdrive recovery time ensures a quick return to linear operation following an overdrive condition.

Component and composite video systems also benefit from this op amp's performance, as indicated by the gain flatness, and differential gain and phase specifications.

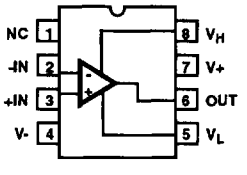
The HFA1135 is a low power, high performance upgrade for the CLC501 and CLC502.

Ordering Information

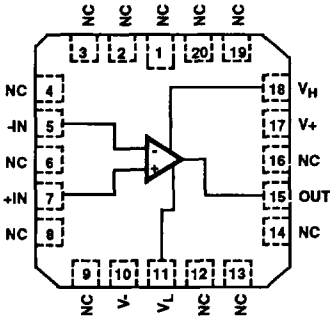
PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1135MJ/883	-55°C to +125°C	8 Lead CerDIP
HFA1135ML/883	-55°C to +125°C	20 Lead Ceramic LCC

Pinouts

HFA1135/883
(CERDIP)
TOP VIEW



HFA1135/883
(CLCC)
TOP VIEW



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

Spec Number **511115-883**
File Number **3725**

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 ..... $-65°C \le T_A \le +150°C$
Lead Temperature (Soldering 10s) ..... +300°C

Thermal Information

Thermal Resistance	θ_{JA}	θ_{JC}
CerDIP Package	115°C/W	30°C/W
Ceramic LCC Package	75°C/W	23°C/W

Maximum Package Power Dissipation at +75°C
CerDIP Package 0.87W
Ceramic LCC Package 1.33W
Package Power Dissipation Derating Factor above +75°C
CerDIP Package ..... 8.7mW/°C
Ceramic LCC 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} ($\pm V_S$) ..... ±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	-5	5	mV
			2, 3	+125°C, -55°C	-10	10	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	47	-	dB
			2	+125°C	44	-	dB
		$\Delta V_{CM} = \pm 1.2V$ V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	44	-	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	50	-	dB
			2	+125°C	46	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55°C	46	-	dB
	PSRRN	$\Delta V_{SUPPLY} = \pm 1.8V$ V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	50	-	dB
			2	+125°C	46	-	dB
		$\Delta V_{SUPPLY} = \pm 1.2V$ V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55°C	46	-	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
+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
+IN Resistance	$+R_{IN}$	Note 2	1	+25°C	800	-	kΩ
			2, 3	+125°C, -55°C	350	-	kΩ

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
+IN Current Power Supply Sensitivity	$PPSS_{IBP}$	ΔV_{SUPPLY} = ±1.8V V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25°C	-	1	µA/V
			2	+125°C	-	3	µA/V
		ΔV_{SUPPLY} = ±1.2V V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55°C	-	3	µA/V
	$NPSS_{IBP}$	ΔV_{SUPPLY} = ±1.8V V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	-	1	µA/V
			2	+125°C	-	3	µA/V
		ΔV_{SUPPLY} = ±1.2V V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55°C	-	3	µA/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
-IN Current Common Mode Sensitivity	CMS_{IBN}	ΔV_{CM} = ±1.8V V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25°C	-	6	µA/V
			2	+125°C	-	8	µA/V
		ΔV_{CM} = ±1.2V V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55°C	-	8	µA/V
-IN Current Power Supply Sensitivity	$PPSS_{IBN}$	ΔV_{SUPPLY} = ±1.8V V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25°C	-	5	µA/V
			2	+125°C	-	8	µA/V
		ΔV_{SUPPLY} = ±1.2V V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55°C	-	8	µA/V
	$NPSS_{IBN}$	ΔV_{SUPPLY} = ±1.8V V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25°C	-	5	µA/V
			2	+125°C	-	8	µA/V
		ΔV_{SUPPLY} = ±1.2V V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55°C	-	8	µA/V
Output Voltage Swing	V_{OP100}	A_V = -1, R_L = 100Ω, 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 = 100Ω, 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_{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

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
Quiescent Power Supply Current	I_{CC}	R_L = 100Ω	1	+25°C	6.6	7.1	mA
			2, 3	+125°C, -55°C	6.2	7.5	mA
	I_{EE}	R_L = 100Ω	1	+25°C	-7.1	-6.6	mA
			2, 3	+125°C, -55°C	-7.5	-6.2	mA
Clamp Accuracy	V_HCLMP	A_V = -1, V_{IN} = -2V, V_H = 1V	1	+25°C	-125	125	mV
			2, 3	+125°C, -55°C	-150	150	mV
	V_LCLMP	A_V = -1, V_{IN} = +2V, V_L = -1V	1	+25°C	-125	125	mV
			2, 3	+125°C, -55°C	-150	150	mV
Clamp Input Current	V_HBIAS	V_H = 1V	1	+25°C	-	200	µA
			2, 3	+125°C, -55°C	-	200	µA
	V_LBIAS	V_L = -1V	1	+25°C	-200	-	µA
			2, 3	+125°C, -55°C	-200	-	µA

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

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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:
59 x 58.2 x 19 mils ± 1 mils
1500 x 1480 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: 89

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

Metallization Mask Layout

HFA1135/883