

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

June 1994

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AMPLIFIERS

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 subnanosecond overdrive recovery time ensures a quick return to linear operation following an overdrive condition.

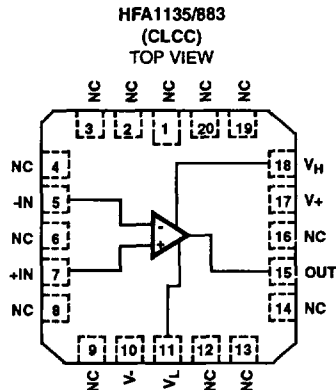
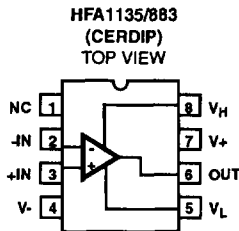
Component and composite video systems also benefit from this op amp's performance, as indicated by the gain flatness, and differential gain and phase specifications.

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



Specifications HFA1135/883

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	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} (±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 = 510Ω, R_{SOURCE} = 0Ω, R_L = 100Ω, V_{OUT} = 0V, 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
Common Mode Rejection Ratio	CMRR	ΔV _{CM} = ±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 _{SUPPLY} = ±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 _{SUPPLY} = ±1.2V V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	1	+25°C	50	-	dB
			2	+125°C	46	-	dB
			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}	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
+IN Resistance	+R _{IN}	Note 2	1	+25°C	800	-	kΩ
			2, 3	+125°C, -55°C	350	-	kΩ

Specifications HFA1135/883

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

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

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS		UNITS
					MIN	MAX	
+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
-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}	$A_V = -1$ $R_L = 100\Omega$ $V_{IN} = -3.2V$ $V_{IN} = -3V$	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
Output Voltage Swing	V _{OP50}	$A_V = -1$ $R_L = 50\Omega$ $V_{IN} = -2.7V$ $V_{IN} = -2.25V$ $V_{IN} = -2.25V$	1	+25°C	2.5	-	V
			2	+125°C	2.0	-	V
			3	-55°C	1.4	-	V
	V _{ON50}	$A_V = -1$ $R_L = 50\Omega$ $V_{IN} = +2.7V$ $V_{IN} = +2.25V$ $V_{IN} = +2.25V$	1	+25°C	-	-2.5	V
			2	+125°C	-	-2.0	V
			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

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TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: $V_{SUPPLY} = \pm 5V$, $A_V = +1$, $R_F = 510\Omega$, $R_{SOURCE} = 0\Omega$, $R_L = 100\Omega$, $V_{OUT} = 0V$, 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	6.6	7.1	mA
			2, 3	+125°C, -55°C	6.2	7.5	mA
	I_{EE}	$R_L = 100\Omega$	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:

- 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

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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:

- 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 μ m \pm 25.4 μ m

METALLIZATION:

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

GLASSIVATION:

Type: Nitride
Thickness: 4k \AA \pm 0.5k \AA

WORST CASE CURRENT DENSITY:

TBD

TRANSISTOR COUNT: 89

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

Metallization Mask Layout

HFA1135/883

