HFA1115/883

High Speed, Low Power, Output Limiting Closed Loop Buffer Amplifier

July 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**
- **User Programmable For Closed-Loop Gains of +1, -1 or +2 Without Use of External Resistors**
- **Standard Operational Amplifier Pinout**
- **Fast Overdrive Recovery. . . . . <1ns (Typ)**
- **Low Supply Current. . . . . 6.9mA (Typ)**
- **Excellent Gain Accuracy. . . . . 0.99V/V (Typ)**
- **Wide -3dB Bandwidth . . . . . 225MHz (Typ)**
- **Fast Slew Rate . . . . . .1135V/μs (Typ)**
- **High Input Impedance . . . . . 1MΩ (Typ)**
- **Excellent Gain Flatness (to 50MHz) . . . . . ±0.1dB (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 HFA1115/883 is a high speed closed loop Buffer featuring both user programmable gain and output limiting. Manufactured in Intersil' proprietary complementary bipolar UHF-1 process, the HFA1115/883 also offers a wide -3dB bandwidth of 225MHz, very fast slew rate, excellent gain flatness and high output current.

This buffer is the ideal choice for high frequency applications requiring output limiting, especially those needing ultra fast overload recovery times. The limiting function allows the designer to set the maximum positive and negative output levels, thereby protecting later stages from damage or input saturation. The HFA1115/883 also allows for voltage gains of +2, +1, and -1, without the use of external resistors. Gain selection is accomplished via connections to the inputs, as described in the "Application Information" text. The result is a more flexible product, fewer part types in inventory, and more efficient use of board space.

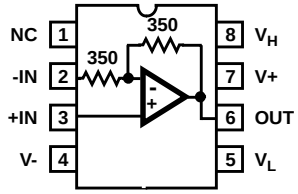
Compatibility with existing op amp pinouts provides flexibility to upgrade low gain amplifiers, while decreasing component count. Unlike most buffers, the standard pinout provides an upgrade path should a higher closed loop gain be needed at a future date.

Ordering Information

PART NUMBER	TEMPERATURE RANGE	PACKAGE
HFA1115MJ/883	-55°C to +125°C	8 Lead CerDIP

Pinout

HFA1115/883
(CERDIP)
TOP VIEW



Spec Number **511109-883**
File Number **3724**

Absolute Maximum Ratings

Voltage Between V+ and V- 12V
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^{o}C
ESD Rating . . . . . > 2000V
Storage Temperature Range . . . . . -65^{o}C ≤ T_A ≤ +150^{o}C
Lead Temperature (Soldering 10s) . . . . . +300^{o}C

Thermal Information

Thermal Resistance	θ_{JA}	θ_{JC}
CerDIP Package	115^{o}C/W	30^{o}C/W

Maximum Package Power Dissipation at +75^{o}C
CerDIP Package 0.87W
Package Power Dissipation Derating Factor above +75^{o}C
CerDIP Package . . . . . 8.7mW/^{o}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 $R_L \geq 50\Omega$
Operating Temperature Range . . . . . -55^{o}C ≤ T_A ≤ +125^{o}C

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, 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 Offset Voltage	V_{OS}	V_{CM} = 0V	1	+25^{o}C	-10	10	mV
			2, 3	+125^{o}C, -55^{o}C	-20	20	mV
Common Mode Rejection Ratio	CMRR	ΔV_{CM} = ±1.8V V+ = 3.2V, V- = -6.8V V+ = 6.8V, V- = -3.2V	1	+25^{o}C	42	-	dB
			2	+125^{o}C	39	-	dB
		ΔV_{CM} = ±1.2V V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55^{o}C	39	-	dB
Power Supply Rejection Ratio	PSRRP	ΔV_{SUPPLY} = ±1.8V V+ = 6.8V, V- = -5V V+ = 3.2V, V- = -5V	1	+25^{o}C	45	-	dB
			2	+125^{o}C	42	-	dB
		ΔV_{SUPPLY} = ±1.2V V+ = 6.2V, V- = -5V V+ = 3.8V, V- = -5V	3	-55^{o}C	42	-	dB
	PSRRN	ΔV_{SUPPLY} = ±1.8V V+ = 5V, V- = -6.8V V+ = 5V, V- = -3.2V	1	+25^{o}C	45	-	dB
			2	+125^{o}C	42	-	dB
		ΔV_{SUPPLY} = ±1.2V V+ = 5V, V- = -6.2V V+ = 5V, V- = -3.8V	3	-55^{o}C	42	-	dB
Non-Inverting Input (+IN) Current	I_{BSP}	V_{CM} = 0V	1	+25^{o}C	-15	15	µA
			2, 3	+125^{o}C, -55^{o}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^{o}C	-	1.25	µA/V
			2	+125^{o}C	-	2.85	µA/V
		ΔV_{CM} = ±1.2V V+ = 3.8V, V- = -6.2V V+ = 6.2V, V- = -3.8V	3	-55^{o}C	-	2.85	µA/V
+IN Resistance	$+R_{IN}$	Note 2	1	+25^{o}C	800	-	kΩ
			2, 3	+125^{o}C, -55^{o}C	350	-	kΩ

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

Device Tested at: V_{SUPPLY} = ±5V, A_V = +1, R_{SOURCE} = 0Ω, R_L = 100Ω, V_{OUT} = 0V, Unless Otherwise Specified.

PARAMETERS	SYMBOL	CONDITIONS	GROUP A SUBGROUPS	TEMPERATURE	LIMITS MIN	LIMITS MAX	UNITS
Gain	A_{VP1}	A_V = +1, V_{IN} = -1V to +1V	1	+25°C	0.98	1.02	V/V
			2, 3	+125°C, -55°C	0.975	1.025	V/V
	A_{VM1}	A_V = -1, V_{IN} = -1V to +1V	1	+25°C	-0.98	-1.02	V/V
			2, 3	+125°C, -55°C	-0.975	-1.025	V/V
	A_{VP2}	A_V = +2, V_{IN} = -1V to +1V	1	+25°C	1.96	2.04	V/V
			2, 3	+125°C, -55°C	1.95	2.05	V/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
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} = -1.6V, V_H = 1V	1	+25°C	-125	125	mV
			2, 3	+125°C, -55°C	-125	125	mV
	V_LCLMP	A_V = -1, V_{IN} = +1.6V, V_L = -1V	1	+25°C	-125	125	mV
			2, 3	+125°C, -55°C	-125	125	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:

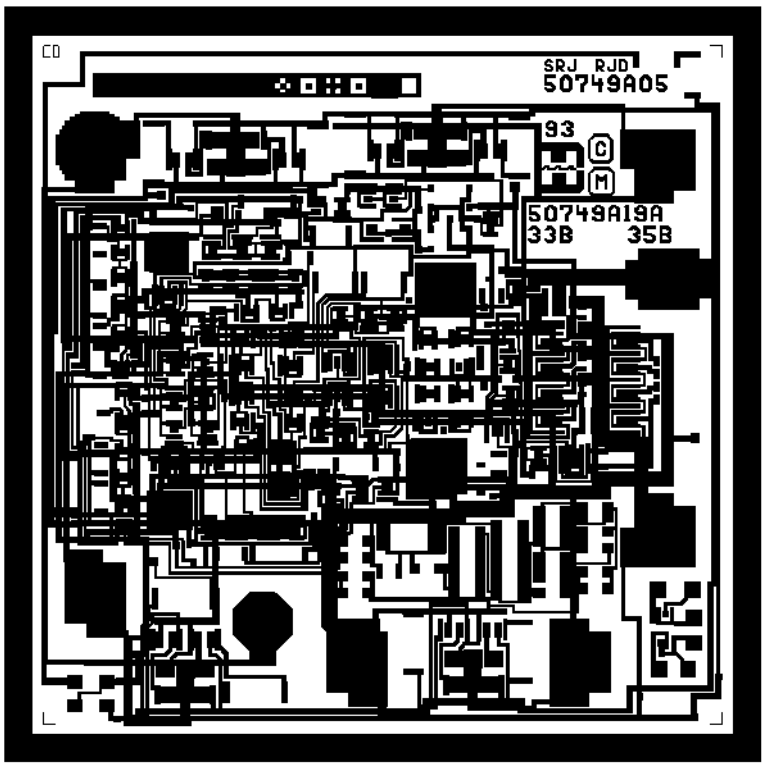
TBD

TRANSISTOR COUNT: 89

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

Metallization Mask Layout

HFA1115/883



All Intersil semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.