High Performance Video Op Amp

AD811

FEATURES

High speed
- **140 MHz bandwidth (3 dB, G = +1)**
- **120 MHz bandwidth (3 dB, G = +2)**
- **35 MHz bandwidth (0.1 dB, G = +2)**
- **2500 V/µs slew rate**
- **25 ns settling time to 0.1% (for a 2 V step)**
- **65 ns settling time to 0.01% (for a 10 V step)**

Excellent video performance (R_L =150 Ω)
- **0.01% differential gain, 0.01° differential phase**
- **Voltage noise of 1.9 nV/$\sqrt{Hz}$**

Low distortion: THD = −74 dB @ 10 MHz

Excellent dc precision: 3 mV max input offset voltage

Flexible operation
- **Specified for ±5 V and ±15 V operation**
- **±2.3 V output swing into a 75 Ω load (V_S = ±5 V)**

APPLICATIONS

Video crosspoint switchers, multimedia broadcast systems

HDTV compatible systems

Video line drivers, distribution amplifiers

ADC/DAC buffers

DC restoration circuits

Medical
- **Ultrasound**
- **PET**
- **Gamma**
- **Counter applications**

GENERAL DESCRIPTION

A wideband current feedback operational amplifier, the AD811 is optimized for broadcast-quality video systems. The −3 dB bandwidth of 120 MHz at a gain of +2 and the differential gain and phase of 0.01% and 0.01° (R_L = 150 Ω) make the AD811 an excellent choice for all video systems. The AD811 is designed to meet a stringent 0.1 dB gain flatness specification to a bandwidth of 35 MHz (G = +2) in addition to low differential gain and phase errors. This performance is achieved whether driving one or two back-terminated 75 Ω cables, with a low power supply current of 16.5 mA. Furthermore, the AD811 is specified over a power supply range of ±4.5 V to ±18 V.

(Continued on page 3)

CONNECTION DIAGRAMS

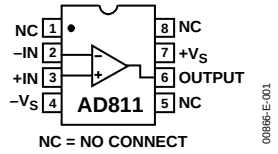

Figure 1. 8-Lead Plastic (N-8), CERDIP (Q-8), SOIC (R-8)

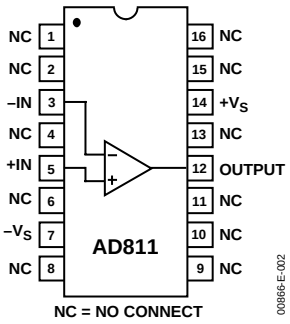

Figure 2. 16-Lead SOIC (R-16)

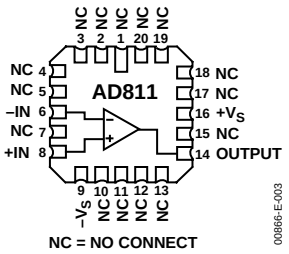

Figure 3. 20-Terminal LCC (E-20A)

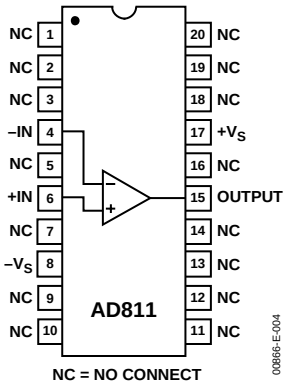

Figure 4. 20-Lead SOIC (R-20)

Rev. E

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TABLE OF CONTENTS

REVISION HISTORY

7/04—Data Sheet Changed from Rev. D to Rev. E

Updated Format ..... Universal
Change to Maximum Power Dissipation Section 7
Changes to Ordering Guide 20
Updated Outline Dimensions 20

GENERAL DESCRIPTION (continued)

The AD811 is also excellent for pulsed applications where transient response is critical. It can achieve a maximum slew rate of greater than 2500 V/µs with a settling time of less than 25 ns to 0.1% on a 2 V step and 65 ns to 0.01% on a 10 V step.

The AD811 is ideal as an ADC or DAC buffer in data acquisition systems due to its low distortion up to 10 MHz and its wide unity gain bandwidth. Because the AD811 is a current feedback amplifier, this bandwidth can be maintained over a wide range of gains. The AD811 also offers low voltage and current noise of 1.9 nV/$\sqrt{\text{Hz}}$ and 20 pA/$\sqrt{\text{Hz}}$, respectively, and excellent dc accuracy for wide dynamic range applications.

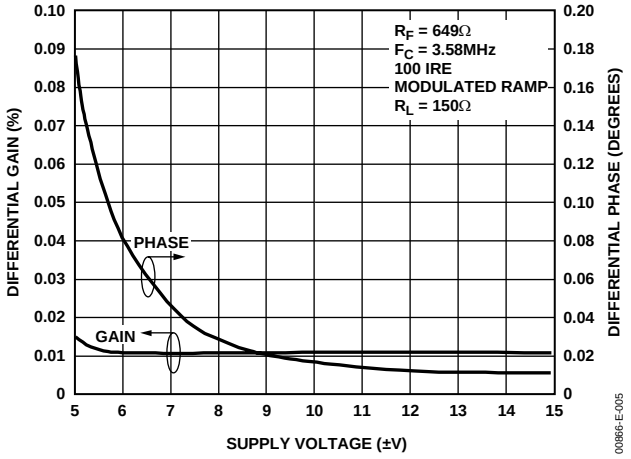

Figure 5. Differential Gain and Phase

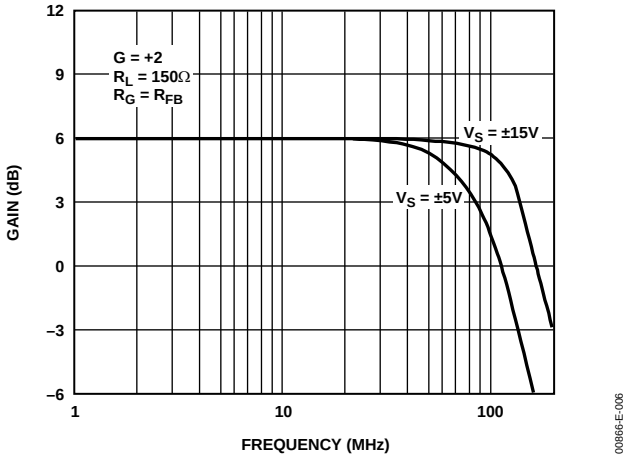

Figure 6. Frequency Response

SPECIFICATIONS

@ T_A = +25°C, V_S = ±15 V dc, R_{LOAD} = 150 Ω, unless otherwise noted.

Table 1.

Parameter	Conditions	V_S	AD811J/A[1] Min	AD811J/A[1] Typ	AD811J/A[1] Max	AD811S[2] Min	AD811S[2] Typ	AD811S[2] Max	Unit
DYNAMIC PERFORMANCE									
Small Signal Bandwidth (No Peaking)									
−3 dB									
G = +1	R_{FB} = 562 Ω	±15 V		140			140		MHz
G = +2	R_{FB} = 649 Ω	±15 V		120			120		MHz
G = +2	R_{FB} = 562 Ω	±15 V		80			80		MHz
G = +10	R_{FB} = 511 Ω	±15 V		100			100		MHz
0.1 dB Flat									
G = +2	R_{FB} = 562 Ω	±15		25			25		MHz
	R_{FB} = 649 Ω	±15		35			35		MHz
Full Power Bandwidth[3]	V_{OUT} = 20 V p-p	±15		40			40		MHz
Slew Rate	V_{OUT} = 4 V p-p	±15		400			400		V/µs
	V_{OUT} = 20 V p-p	±15		2500			2500		V/µs
Settling Time to 0.1%	10 V Step, A_V = − 1	±15		50			50		ns
Settling Time to 0.01%	10 V Step, A_V = − 1	±15		65			65		ns
Settling Time to 0.1%	2 V Step, A_V = − 1	±15		25			25		ns
Rise Time, Fall Time	R_{FB} = 649, A_V = +2	±15		3.5			3.5		ns
Differential Gain	f = 3.58 MHz	±15		0.01			0.01		%
Differential Phase	f = 3.58 MHz	±15		0.01			0.01		Degree
THD @ f_C = 10 MHz	V_{OUT} = 2 V p-p, A_V = +2	±15		−74			−74		dBc
Third-Order Intercept[4]	@ f_C = 10 MHz	±15		36			36		dBm
		±15		43			43		dBm
INPUT OFFSET VOLTAGE		±5 V, ±15 V		0.5	3		0.5	3	mV
	T_{MIN} to T_{MAX}				5			5	mV
Offset Voltage Drift				5			5		µV/°C
INPUT BIAS CURRENT									
−Input		±5 V, ±15 V		2	5		2	5	µA
	T_{MIN} to T_{MAX}				15			30	µA
+Input		±5 V, ±1 5 V		2	10		2	10	µA
	T_{MIN} to T_{MAX}				20			25	µA
TRANSRESISTANCE	T_{MIN} to T_{MAX}								
	V_{OUT} = ±10 V								
	R_L = ∞	±15 V	0.75	1.5		0.75	1.5		MΩ
	R_L = 200 Ω	±15 V	0.5	0.75		0.5	0.75		MΩ
	V_{OUT} = ±2.5 V								
	R_L = 150 Ω	±5 V	0.25	0.4		0.125	0.4		MΩ

[1] The AD811JR is specified with ±5 V power supplies only, with operation up to ±12 V.
[2] See the Analog Devices military data sheet for 883B tested specifications.
[3] FPBW = slew rate/(2 π V_{PEAK}).
[4] Output power level, tested at a closed-loop gain of two.

Parameter	Conditions	V_s	AD811J/A[1] Min	Typ	Max	AD811S[2] Min	Typ	Max	Unit
COMMON-MODE REJECTION									
V_{OS} (vs. Common Mode)									
T_{MIN} to T_{MAX}	V_{CM} = ±2.5 V	±5 V	56	60		50	60		dB
T_{MIN} to T_{MAX}	V_{CM} = ±10 V	±15 V	60	66		56	66		dB
Input Current (vs. Common Mode)	T_{MIN} to T_{MAX}			1	3		1	3	µA/V
POWER SUPPLY REJECTION	V_S = ±4.5 V to ±18 V								
V_{OS}	T_{MIN} to T_{MAX}		60	70		60	70		dB
+Input Current	T_{MIN} to T_{MAX}			0.3	2		0.3	2	µA/V
−Input Current	T_{MIN} to T_{MAX}			0.4	2		0.4	2	µA/V
INPUT VOLTAGE NOISE	f = 1 kHz			1.9			1.9		nV/√Hz
INPUT CURRENT NOISE	f = 1 kHz			20			20		pA/√Hz
OUTPUT CHARACTERISTICS									
Voltage Swing, Useful Operating Range[3]		±5 V		±2.9			±2.9		V
		±15 V		±12			±12		V
Output Current	T_J = 25°C			100			100		mA
Short-Circuit Current				150			150		mA
Output Resistance	(Open Loop @ 5 MHz)			9			9		Ω
INPUT CHARACTERISTIC									
+Input Resistance				1.5			1.5		MΩ
−Input Resistance				14			14		Ω
Input Capacitance	+Input			7.5			7.5		pF
Common-Mode Voltage Range		±5 V		±3			±3		V
		±15 V		±13			±13		V
POWER SUPPLY									
Operating Range			±4.5		±18	±4.5		±18	V
Quiescent Current		±5 V		14.5	16.0		14.5	16.0	mA
		±15 V		16.5	18.0		16.5	18.0	mA
TRANSISTOR COUNT	Number of Transistors			40			40		

[1] The AD811JR is specified with ±5 V power supplies only, with operation up to ±12 V.
[2] See the Analog Devices military data sheet for 883B tested specifications.
[3] Useful operating range is defined as the output voltage at which linearity begins to degrade.