

FEATURES

Low noise

0.9 nV/ $\sqrt{\text{Hz}}$ typ (1.2 nV/ $\sqrt{\text{Hz}}$ max) input voltage noise at 1 kHz

50 nV p-p input voltage noise, 0.1 Hz to 10 Hz

Low distortion

-120 dB total harmonic distortion at 20 kHz

Excellent AC characteristics

800 ns settling time to 16 bits (10 V step)

110 MHz gain bandwidth (G = 1000)

8 MHz bandwidth (G = 10)

280 kHz full power bandwidth at 20 V p-p

20 V/ μs slew rate

Excellent DC precision

80 μV max input offset voltage

1.0 $\mu\text{V}/^\circ\text{C}$ V_{os} drift

Specified for $\pm 5\text{ V}$ and $\pm 15\text{ V}$ power supplies

High output drive current of 50 mA

APPLICATIONS

Professional audio preamplifiers

IR, CCD, and sonar imaging systems

Spectrum analyzers

Ultrasound preamplifiers

Seismic detectors

$\Sigma\Delta$ ADC/DAC buffers

CONNECTION DIAGRAM

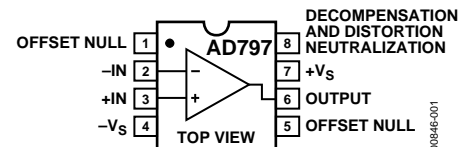


Figure 1. 8-Lead Plastic Dual In-Line Package [PDIP] and 8-Lead Standard Small Outline Package [SOIC_N]

GENERAL DESCRIPTION

The AD797 is a very low noise, low distortion operational amplifier ideal for use as a preamplifier. The low noise of 0.9 nV/ $\sqrt{\text{Hz}}$ and low total harmonic distortion of -120 dB at audio bandwidths give the AD797 the wide dynamic range necessary for preamps in microphones and mixing consoles.

Furthermore, the AD797's excellent slew rate of 20 V/ μs and 110 MHz gain bandwidth make it highly suitable for low frequency ultrasound applications.

The AD797 is also useful in IR and sonar imaging applications where the widest dynamic range is necessary. The low distortion and 16-bit settling time of the AD797 make it ideal for buffering the inputs to $\Sigma\Delta$ ADCs or the outputs of high resolution DACs especially when used in critical applications such as seismic detection and spectrum analyzers. Key features such as a 50 mA output current drive and the specified power supply voltage range of $\pm 5\text{ V}$ to $\pm 15\text{ V}$ make the AD797 an excellent general-purpose amplifier.

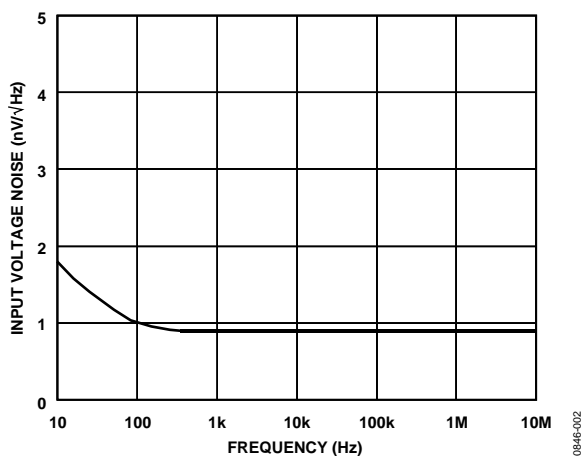


Figure 2. AD797 Voltage Noise Spectral Density

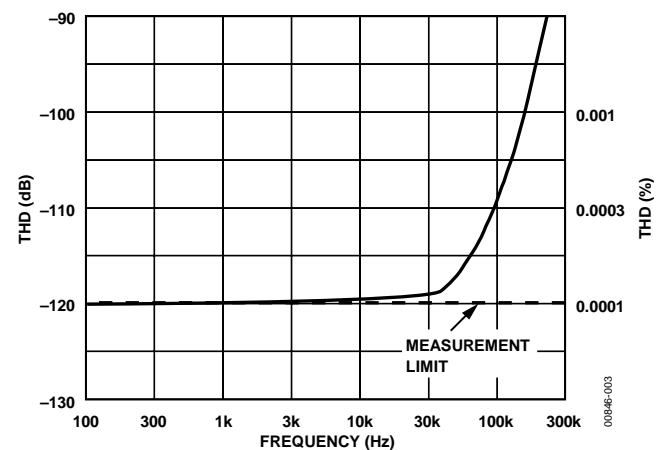


Figure 3. THD vs. Frequency

Rev. E

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REVISION HISTORY**7/05—Rev. D to Rev. E**

Updated Figure 1 Caption	1
Deleted Metallization Photo	6
Changes to Equation 1	12
Updated Outline Dimensions	19
Changes to Ordering Guide	20

10/02—Rev. C to Rev. D

Deleted 8-Lead Cerdip Package (Q-8).....	Universal
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SPECIFICATIONS

@ $T_A = +25^\circ\text{C}$ and $V_S = \pm 15\text{ V}$ dc, unless otherwise noted.

Table 1.

Parameter	Conditions	V	AD797A			AD797B			Unit
			Min	Typ	Max	Min	Typ	Max	
INPUT OFFSET VOLTAGE		$\pm 5\text{ V}, \pm 15\text{ V}$	25	80		10	40	μV	
Offset Voltage Drift	T_{MIN} to T_{MAX}	$\pm 5\text{ V}, \pm 15\text{ V}$	50	125/180		30	60	$\mu\text{V}/^\circ\text{C}$	
INPUT BIAS CURRENT		$\pm 5\text{ V}, \pm 15\text{ V}$	0.25	1.5		0.25	0.9	μA	
	T_{MIN} to T_{MAX}		0.5	3.0		0.25	2.0	μA	
INPUT OFFSET CURRENT		$\pm 5\text{ V}, \pm 15\text{ V}$	100	400		80	200	nA	
	T_{MIN} to T_{MAX}		120	600/700		120	300	nA	
OPEN-LOOP GAIN	$V_{\text{OUT}} = \pm 10\text{ V}$ $R_{\text{LOAD}} = 2\text{ k}\Omega$	$\pm 15\text{ V}$	1	20		2	20	$\text{V}/\mu\text{V}$	
	T_{MIN} to T_{MAX} $R_{\text{LOAD}} = 600\ \Omega$		1	6		2	10	$\text{V}/\mu\text{V}$	
	T_{MIN} to T_{MAX} $R_{\text{LOAD}} = 600\ \Omega$		1	15		2	15	$\text{V}/\mu\text{V}$	
	T_{MIN} to T_{MAX} @ 20 kHz^1		14000	20000		14000	20000	V/V	
DYNAMIC PERFORMANCE									
Gain Bandwidth Product	$G = 1000$	$\pm 15\text{ V}$		110		110		MHz	
	$G = 1000^2$	15 V		450		450		MHz	
-3 dB Bandwidth	$G = 10$	$\pm 15\text{ V}$		8		8		MHz	
Full Power Bandwidth ¹	$V_O = 20\text{ V p-p}$, $R_{\text{LOAD}} = 1\text{ k}\Omega$	$\pm 15\text{ V}$		280		280		kHz	
Slew Rate	$R_{\text{LOAD}} = 1\text{ k}\Omega$	$\pm 15\text{ V}$	12.5	20		12.5	20	$\text{V}/\mu\text{s}$	
Settling Time to 0.0015%	10 V step	$\pm 15\text{ V}$		800	1200		800	1200	ns
COMMON-MODE REJECTION	$V_{\text{CM}} = \text{CMVR}$	$\pm 5\text{ V}, \pm 15\text{ V}$	114	130		120	130	dB	
	T_{MIN} to T_{MAX}		110	120		114	120	dB	
POWER SUPPLY REJECTION	$V_S = \pm 5\text{ V}$ to $\pm 18\text{ V}$		114	130		120	114	dB	
	T_{MIN} to T_{MAX}		110	120		130	120	dB	
INPUT VOLTAGE NOISE	$f = 0.1\text{ Hz}$ to 10 Hz	$\pm 15\text{ V}$		50		50		nV p-p	
	$f = 10\text{ Hz}$	$\pm 15\text{ V}$		1.7		1.7	2.5	$\text{nV}/\sqrt{\text{Hz}}$	
	$f = 1\text{ kHz}$	$\pm 15\text{ V}$		0.9	1.2	0.9	1.2	$\text{nV}/\sqrt{\text{Hz}}$	
	$f = 10\text{ Hz}$ to 1 MHz	$\pm 15\text{ V}$		1.0	1.3	1.0	1.2	$\mu\text{V rms}$	
INPUT CURRENT NOISE	$f = 1\text{ kHz}$	$\pm 15\text{ V}$		2.0		2.0		$\text{pA}/\sqrt{\text{Hz}}$	
INPUT COMMON-MODE VOLTAGE RANGE		$\pm 15\text{ V}$	± 11	± 12		± 11	± 12	V	
		$\pm 5\text{ V}$	± 2.5	± 3		± 2.5	± 3	V	
OUTPUT VOLTAGE SWING	$R_{\text{LOAD}} = 2\text{ k}\Omega$	$\pm 15\text{ V}$	± 12	± 13		± 12	± 13	V	
	$R_{\text{LOAD}} = 600\ \Omega$	$\pm 15\text{ V}$	± 11	± 13		± 11	± 13	V	
	$R_{\text{LOAD}} = 600\ \Omega$	$\pm 5\text{ V}$	± 2.5	± 3		± 2.5	± 3	V	
Short-Circuit Current	$\pm 5\text{ V}, \pm 15\text{ V}$		80			80		mA	
Output Current ³	$\pm 5\text{ V}, \pm 15\text{ V}$		30	50		30	50	mA	
TOTAL HARMONIC DISTORTION	$R_{\text{LOAD}} = 1\text{ k}\Omega$, $C_N = 50\text{ pF}$ $f = 250\text{ kHz}$, 3 V rms	$\pm 15\text{ V}$		-98	-90		-98	-90	dB
	$R_{\text{LOAD}} = 1\text{ k}\Omega$ $f = 20\text{ kHz}$, 3 V rms	$\pm 15\text{ V}$		-120	-110		-120	-110	dB
INPUT CHARACTERISTICS									
Input Resistance (Differential)				7.5		7.5		$\text{k}\Omega$	
Input Resistance (Common Mode)				100		100		$\text{M}\Omega$	
Input Capacitance (Differential) ⁴				20		20		pF	
Input Capacitance (Common Mode)				5		5		pF	

AD797

Parameter	Conditions	V	AD797A			AD797B			Unit
			Min	Typ	Max	Min	Typ	Max	
OUTPUT RESISTANCE	$A_V = +1$, $f = 1$ kHz			3			3	m Ω	
POWER SUPPLY									
Operating Range			± 5		± 18	± 5		± 18	V
Quiescent Current		± 5 V, ± 15 V		8.2	10.5		8.2	10.5	mA

¹ Full Power Bandwidth = Slew Rate/ $2\pi V_{PEAK}$.

² Specified using external decoupling capacitor; see Applications section.

³ Output current for $|V_S - V_{OUT}| > 4$ V, $A_{OL} > 200$ k Ω .

⁴ Differential input capacitance consists of 1.5 pF package capacitance and 18.5 pF from the input differential pair.

ABSOLUTE MAXIMUM RATINGS

Table 2.

Parameter	Ratings
Supply Voltage	$\pm 18\text{ V}$
Internal Power Dissipation @ 25°C ¹	
Input Voltage	$\pm V_S$
Differential Input Voltage ²	$\pm 0.7\text{ V}$
Output Short-Circuit Duration	Indefinite Within Max Internal Power Dissipation
Storage Temperature Range (Cerdip)	-65°C to $+150^\circ\text{C}$
Storage Temperature Range (N, R Suffix)	-65°C to $+125^\circ\text{C}$
Operating Temperature Range	
AD797A/B	-40°C to $+85^\circ\text{C}$
Lead Temperature Range (Soldering 60 sec)	300°C

¹ Internal Power Dissipation:

8-Lead SOIC = $0.9\text{ W} (T_A - 25^\circ\text{C}) / \theta_{JA}$

8-Lead Plastic DIP and Cerdip = $1.3\text{ W} - (T_A - 25^\circ\text{C}) / \theta_{JA}$

Thermal Characteristics

8-Lead Plastic DIP Package: $\theta_{JA} = 95^\circ\text{C/W}$

8-Lead Small Outline Package: $\theta_{JA} = 155^\circ\text{C/W}$

² The AD797's inputs are protected by back-to-back diodes. To achieve low noise, internal current limiting resistors are not incorporated into the design of this amplifier. If the differential input voltage exceeds $\pm 0.7\text{ V}$, the input current should be limited to less than 25 mA by series protection resistors.

Note, however, that this degrades the low noise performance of the device.

Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational section of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although these products feature proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.

