

FEATURES

Low Noise

- 2.5 μV p-p max, 0.1 Hz to 10 Hz
- 10 nV/ $\sqrt{\text{Hz}}$ max at 10 kHz
- 14 fA p-p Current Noise 0.1 Hz to 10 Hz

High DC Accuracy

- 300 μV max Offset Voltage
- 3 $\mu\text{V}/^\circ\text{C}$ max Drift
- 2 pA max Input Bias Current
- 114 dB Open Loop Gain
- Low Power: 1.5 mA max per Amplifier

Good AC Performance

- 1 V/ μs Slew Rate
- 2 MHz Unity Gain Bandwidth

Available in 8-Pin Plastic Mini-DIP, Cerdip and Surface Mount (SOIC) Packages

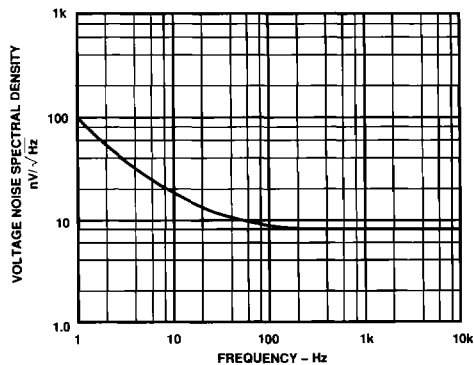
APPLICATIONS

- Low Noise Photodiode Preamps
- CT Scanners
- Precision I/V Converters

PRODUCT DESCRIPTION

The AD796 is a low noise, precision, FET input, dual monolithic operational amplifier. Each amplifier offers both the low voltage noise and low offset drift of a bipolar input op amp and the very low bias current of a FET input device. The $10^{14} \Omega$ common-mode impedance insures that input bias current is essentially independent of common-mode voltage variations.

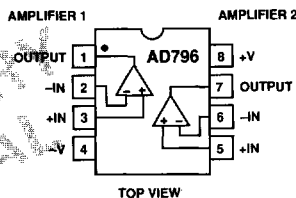
The AD796 has both excellent dc performance and a guaranteed and tested maximum input voltage noise. Each amplifier features 2 pA maximum input bias current and 300 μV maximum offset voltage (AD796B) along with 1.5 mA max power supply current.



Voltage Noise Spectral Density

CONNECTION DIAGRAM

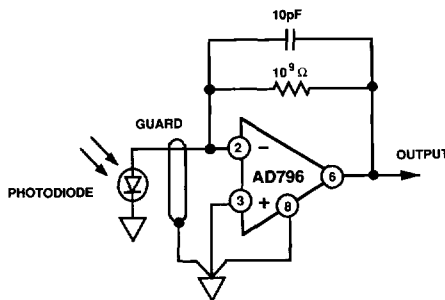
Plastic Mini-DIP (N) Package, Cerdip (Q) Package, and SOIC (R) Package



The AD796 features a guaranteed low input noise of 2.5 μV p-p (0.1 Hz to 10 Hz) and a 10 nV/ $\sqrt{\text{Hz}}$ max noise level at 10 kHz. The AD796 has a fully specified and tested input offset voltage drift of only 3 $\mu\text{V}/^\circ\text{C}$ max which is trimmed at the wafer level to keep device cost low.

The AD796 is the ideal choice for many high input impedance, low noise applications. It is available in three performance grades. The AD796A and AD796B are rated over the industrial temperature of -40°C to $+85^\circ\text{C}$. The AD796S is rated over the military temperature range of -55°C to $+125^\circ\text{C}$ and is available processed to MIL-STD-883B.

The AD796 is available in 8-pin plastic mini-DIP, cerdip, and surface mount (SOIC).



The AD796 Used as a Sensitive Photodiode Preamplifier

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AD796—SPECIFICATIONS (@ +25°C and ±15 V dc, unless otherwise noted)

Parameter	Conditions	AD796A			AD796B			AD796S			Units
		Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
INPUT OFFSET VOLTAGE ¹	Initial Offset Offset vs. Temperature vs. Supply		100	500	50	300	100	500	100	500	μV
		$T_{MIN}-T_{MAX}$	300	1000	100	400	500	1500	4	10	μV/°C
			3	12	2	3	4	10			
	vs. Supply (PSRR)	$T_{MIN}-T_{MAX}$	90	110	94	110	90	110	86	95	dB
INPUT BIAS CURRENT ²	Either Input	$V_{CM} = 0$ V	1.5	2.5	1.5	2	2	5			pA
	Either Input (at $T_{MAX} = 70^{\circ}$ C)	$V_{CM} = 0$ V	34/96		34/96		2050				pA
	Either Input	$V_{CM} = +10$ V	1.5		1.5		1.5				pA
	Offset Current	$V_{CM} = 0$ V	0.1	1.0	0.1	0.5	0.1	1.0			pA
	Offset Current (at $T_{MAX} = 70^{\circ}$ C)	$V_{CM} = 0$ V	2/6		2/6		100				pA
INPUT VOLTAGE NOISE	0.1 Hz to 10 Hz		1.0	3.3	1.0	2.5	1.0	3.3			μV p-p
	f = 10 Hz		20	50	20	40	20	50			nV/√Hz
	f = 100 Hz		10	30	10	20	10	30			nV/√Hz
	f = 1 kHz		7	15	7	10	7	15			nV/√Hz
	f = 10 kHz		8	10	8	10	8	10			nV/√Hz
INPUT CURRENT NOISE	f = 0.1 Hz to 10 Hz		14		14		18				fA p-p
	f = 0.1 kHz to 20 kHz		0.7		0.7		0.8				fA/√Hz
FREQUENCY RESPONSE	Unity Gain, Small Signal	G = -1	2		2		2				MHz
	Full Power Response	$V_O = 20$ V p-p $R_{LOAD} = 2$ kΩ	12.8	16	12.8	16	12.8	16			kHz
	Slew Rate, Unity Gain	$V_{OUT} = 20$ V p-p $R_{LOAD} = 2$ kΩ	1		1		1				V/μs
SETTLING TIME ³	To 0.1%		11		11		11				μs
	To 0.01%		12		12		12				μs
	Overload Recovery ⁴	50% Overdrive	5		5		5				μs
	Total Harmonic	f = 1 kHz									
INPUT IMPEDANCE	Differential	$V_{DIFF} = \pm 1$ V	$10^{12} 1$		$10^{12} 1$		$10^{12} 1$				Ω pF
	Common Mode		$10^{14} 2.2$		$10^{14} 2.2$		$10^{14} 2.2$				Ω pF
INPUT VOLTAGE RANGE	Differential ⁵		±20		±20		±20				V
	Common-Mode Voltage		±10	±11	±10	±11	±10	±11			V
	Over Max Operating Range		±10		±10		±10				V
	Common-Mode Rejection Ratio	$V_{CM} = \pm 10$ V T_{MIN} to T_{MAX}	90	110	94	110	90	110	86	100	
OPEN-LOOP GAIN	$V_O = \pm 10$ V $R_{LOAD} \geq 2$ kΩ	100	110	100	110	114	130				dB
	$T_{MIN}-T_{MAX}$			100		110					dB
OUTPUT CHARACTERISTICS	Voltage	$R_{LOAD} \geq 2$ kΩ $T_{MIN}-T_{MAX}$	±10	±11	±10	±11	±10	±11			V
	Current	$V_{OUT} = \pm 10$ V Short Circuit	±5	±10	±5	±10	±5	±10	±5	±10	
POWER SUPPLY	Rated Performance		±5	±15	±5	±15	±5	±15			V
	Operating Range		±5	±18	±5	±18	±5	±18			V
	Quiescent Current		2.5	3	2.5	3	2.5	3			mA

NOTES

¹Input offset voltage specifications are guaranteed after 5 minutes of operation at $T_A = +25^{\circ}$ C.

²Bias current specifications are guaranteed maximum at either input after 5 minutes of operation at $T_A = +25^{\circ}$ C. For higher temperature, the current doubles every 10°C.

³Gain = -1, $R_{LOAD} = 2$ kΩ.

⁴Defined as the time required for the amplifier's output to return to normal operation after removal of a 50% overload from the amplifier input.

⁵Defined as the maximum continuous voltage between the inputs such that neither input exceeds ±10 V from ground.

All min and max specifications are guaranteed.

Specifications subject to change without notice.

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ABSOLUTE MAXIMUM RATINGS¹

Supply Voltage	±18 V
Internal Power Dissipation ² (@ $T_A = +25^\circ\text{C}$)	
8-Pin Header Package	500 mW
8-Pin Mini-DIP Package	750 mW
8-Pin SOIC Package	650 mW
Input Voltage	± V_S
Output Short Circuit Duration	Indefinite
Differential Input Voltage	+ V_S and - V_S
Storage Temperature Range (Q)	-65°C to +150°C
Storage Temperature Range (N)	-65°C to +125°C
Storage Temperature Range (R)	-65°C to +125°C
Operating Temperature Range	
AD796A/B	-40°C to +85°C
AD796S	-55°C to +125°C
Lead Temperature Range (Soldering 60 secs)	+300°C

NOTES

¹Stresses 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.

²8-Pin Plastic Mini-DIP Package: $\theta_{JA} = 100^\circ\text{C/Watt}$
 8-Pin Small Outline Package: $\theta_{JA} = 155^\circ\text{C/Watt}$
 8-Pin Cerdip Package: $\theta_{JA} = 110^\circ\text{C/Watt}$

ORDERING GUIDE

Model	Temperature Range	Package Option*
AD796AN	-40°C to +85°C	N-8
AD796BN	-40°C to +85°C	N-8
AD796AR	-40°C to +85°C	R-8
AD796SQ-883B	-55°C to +125°C	Q-08

*N = Plastic mini-DIP, Q-8 = Cerdip, R = SOIC package. See outline information see Package Information section.

