

AD821

FEATURES

True Single Supply Operation:
Input and Output Voltage Ranges
Include Ground
Output Voltage Swing to 50mV of Each Rail
Low Power: 400 μ A Supply Current max
250 μ V Input Offset Voltage
1.3MHz Gain Bandwidth Product
3V/ μ s Slew Rate
Single and Dual Supply Capability

APPLICATIONS

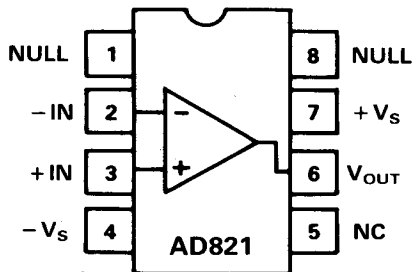
Battery Powered Precision Instrumentation
Strain Gage Signal Conditioners
Instrumentation Amplifiers
Thermocouple Amplifiers
Multiple Limit Threshold Detection
12- to 14-Bit Data Acquisition Systems
Available in 8-Pin Plastic Mini-DIP, SOIC and
Hermetic Cerdip Packages
Dual Version – AD822, Quad Version – AD824 Also
Available

PRODUCT DESCRIPTION

The AD821 is a precision, low-power, single supply, precision op amp that can operate from a single supply of ± 4.75 to ± 36 V or dual supplies of ± 2.4 V to ± 18 V. It has true single supply capability with its input voltage range including the negative rail, allowing the AD821 to accommodate input signals down to ground in the single supply mode. Its output voltage swing extends to within 50mV of each rail providing the maximum possible output dynamic range to the user.

Low input offset voltage (250 μ V max), low offset voltage drift (3 μ V/ $^{\circ}$ C max), low input bias current (<10pA) and low supply currents (400 μ A max) mark the AD821 with true dc precision at low power operating conditions. Combined with unity gain bandwidth of 1.3MHz and 3V/ μ s slew rate, the AD821 offers the best combination of ac and dc specs to the single supply op amp user. Performance in 12- to 14-bit applications is ensured with the AD821's low noise 26nV/ $\sqrt{\text{Hz}}$, high open-loop gain (10⁷V/mV) and 4 μ s settling to 0.01%.

AD821 FUNCTIONAL BLOCK DIAGRAM



8-Pin Plastic Mini-DIP
SO and Cerdip

The AD821 is an excellent choice for battery powered precision instrumentation applications – wherein the extended input and output range afford the AD821 its versatility in these applications.

The AD821 is available in five performance grades. The AD821J and AD821K are rated over the commercial temperature range of 0 to 70° C. The AD821A and AD821B are rated over the industrial temperature range of -40° C to $+85^{\circ}$ C. The AD821S is rated over the military temperature range of -55° C to $+125^{\circ}$ C and is available processed to MIL-STD-883B, Rev. C.

Extended reliability PLUS screening is available, specified over the commercial and industrial temperature range. PLUS screening includes a 168 hour burn-in, as well as other environmental and physical tests.

PRODUCT HIGHLIGHTS

1. True single supply operation – input voltage range includes the negative rail.
2. Output voltage range extends to 50mV of each rail.
3. Low power, low supply current.
4. Common-mode rejection of 90dB and open-loop gain of 10⁷V/mV ensure 12- to 14-bit accuracy in high-speed data acquisition circuits.
5. Dual version – AD822, quad version – AD824 also available.

SPECIFICATIONS (@ +25°C unless otherwise noted)

Model	Conditions ¹	AD821J/A/S			AD821B/K			Units
		Min	Typ	Max	Min	Typ	Max	
INPUT CHARACTERISTICS								
Input Offset Voltage ²	$V_{CM} = 0$ Condition 1, $V_O = 0V$ Condition 2, $V_O = 1.4V$ T_{min} to T_{max}	0.3 0.3	1* 1*	1* 1.5/1.6/2*	0.1 0.1	0.25* 0.25*		mV mV mV
Input Offset Voltage Drift Input Bias Current ³	T_{min} to T_{max}	15	30	10* 0.68/2/30	10	20	3* 0.5/1.3	$\mu V/^\circ C$ pA
Input Offset Current	T_{min} to T_{max} Differential	5	15	0.34/0.96/15	3	7	0.16/0.45	nA pA
Input Resistance Input Capacitance Common-Mode Voltage Range	Condition 1 Condition 2	$-V_S$ $-V_S$		$+V_S - 1$ $+V_S - 1$	$-V_S$ $-V_S$	$+V_S - 1$ $+V_S - 1$		Ω pF V
Differential Voltage Range ⁴	Condition 1 Condition 2	$-V_S - 0.6$ $-V_S - 0.6$		$+V_S + 0.6$ $+V_S + 0.6$	$-V_S - 0.6$ $-V_S - 0.6$	$+V_S + 0.6$ $+V_S + 0.6$		V V
Common-Mode Rejection	Condition 1 $V_{CM} = \pm 12V, V_O = 0V$ Condition 2 $V_{CM} = 0$ to 2.5V, $V_O = 1.4V$	80* 80*			90* 90*			dB dB
Power Supply Rejection Ratio	Condition 1 Condition 2 4.5 < $+V_S$ < 5.5, $V_O = 1.4V$	80* 80*			90* 90*			dB dB
Input Noise Voltage	$f = 10Hz$ $f = 100Hz$ $f = 1kHz$ $f = 10kHz$ $f = 100kHz$ $f = 1kHz$	90 90 50 33 21			90 90 50 33 21			nV/\sqrt{Hz} nV/\sqrt{Hz} nV/\sqrt{Hz} nV/\sqrt{Hz} nV/\sqrt{Hz} pA/\sqrt{Hz}
Input Noise Current	$f = 1kHz$	0.01			0.01			pA/\sqrt{Hz}
OUTPUT CHARACTERISTICS								
Output Voltage Swing	Condition 1, Condition 2 2k Ω Load 10k Ω Load Condition 2 1mA Sink Source or Sink	150mV max from Each Rail 100mV max from Each Rail 100mV max from Ground 30			150mV max from Each Rail 100mV max from Each Rail 100mV max from Ground 30			V mA
Short-Circuit Current								
GAIN								
Open Loop	Condition 1 $V_O = \pm 14V$ 2k Ω Load 10k Ω Load Condition 2 $V_O = 0.5V$ to 4.5V 2k Ω Load 10k Ω Load	500 1,000 1,000	1,000 10,000 1,000		500 1,000 1,000	1,000 10,000 1,000		V/mV V/mV V/mV V/mV
DYNAMIC CHARACTERISTICS								
Gain Bandwidth Product			1.3			1.3		MHz
Rated Performance								
Full Power Bandwidth			48			48		kHz
Slew Rate			3			3		V/ μs
Settling Time	10V Step to 0.1%		4			4		μs
POWER SUPPLY								
Operating Voltage Range	Differential	+ 4*		+ 36*	+ 4*		+ 36*	V
Quiescent Current				400*			400*	μA
TEMPERATURE RANGE								
Rated Performance								
Commercial (0 to +70°C)			AD821JN, AD821JR			AD821KN		
Industrial (-25°C to +85°C)			AD821AQ			AD821BQ		
Military (-55°C to +125°C)			AD821SQ					
PACKAGE OPTIONS⁵								
Plastic (N-8)			AD821JN			AD821KN		
Cerdip (Q-8)			AD821AQ, AD821SQ			AD821BQ		
SOIC (R-8)			AD821JR					

NOTES

*Indicates parameter guaranteed and tested.

¹Condition 1: +15V power supply; Condition 2: +5V power supply.

²Input offset voltage specifications are guaranteed after 5 minutes of operation at $T_A = 25^\circ C$.

³Bias 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.

⁴Defined as voltage between inputs.

⁵See Section 16 for package outline information.

Specifications subject to change without notice.



ABSOLUTE MAXIMUM RATINGS

Supply Voltage	± 36V
Output Short-Circuit Duration	Indefinite
Internal Power Dissipation	
Plastic	TBD
Cerdip	1.6W
SOIC	TBD
Storage Temperature Range	- 65°C to + 150°C
Operating Temperature Range	
AD821J/R	0 to + 70°C
AD821A/B	- 40°C to + 85°C
AD821S	- 55°C to + 125°C
Maximum Junction Temperature	+ 150°C
Lead Temperature Range (Soldering 10sec)	+ 260°C

**PRELIMINARY
TECHNICAL
DATA**