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Low-Noise High-Speed Amplifier For 16 Bit Systems

Preliminary Data Sheet

AD8021

FEATURES

Extremely Low Noise

2.1nV/ $\sqrt{\text{Hz}}$ typ and 1.5 pA/ $\sqrt{\text{Hz}}$ typical

Adjustable Gain Bandwidth, Up to 2GHz

High Speed

BW = 220 MHz, SR = 130 V/ms ($G = +2$)

BW = 180 MHz, SR = 500 V/ms ($G = +11$)

Low Power

30mW - 6mA typ for $\pm 2.5\text{V}$ supply

Output Disable Feature

Low Distortion -96dB 2nd, 3rd harmonics @ 1MHz

Low and Temperature Stable DC Offset

5V to 24V Supply Range

Low Price

Small Packaging

Available in SOIC-8 and $\mu\text{SOIC-8}$

APPLICATIONS

Ultra-sound Signal Processing

Instrumentation Pre-amp

Active Filters

Portable Instrumentation

Line Receivers

Precision Instruments

A-to-D Pre-amp and Driver

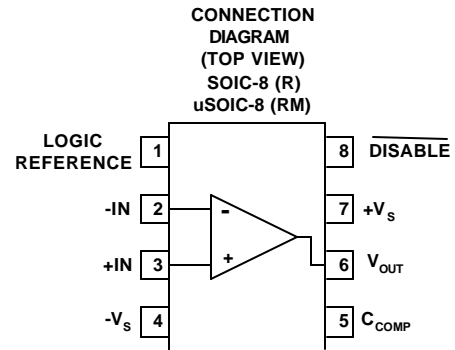
High Gain Circuits

PRODUCT DESCRIPTION

The AD8021 is a very high performance high-speed voltage feedback amplifier, which can be used in 16 bit high-resolution systems. The AD8021 is designed to have the lowest noise (2.1nV/ $\sqrt{\text{Hz}}$ typ and 1.5 pA/ $\sqrt{\text{Hz}}$ typ) at the lowest quiescent supply current (7mA @ $\pm 5\text{V}$ max) available on the market today. The AD8021 operates over a wide range of supply voltages from $\pm 2.5\text{V}$ to $\pm 12\text{V}$, as well as from single +5V supplies, making it ideal for high-speed, low power, instruments. An output disable pin is provided which further reduces supply current to 1.3 mA.

The AD8021 is an easy to use voltage feedback architecture with the flexibility of allowing the user to choose the gain bandwidth product that best suites the application. With a single compensation capacitor the user can select the gain and bandwidth desired up to gain bandwidth products of 2.0 GHz.

The AD8021 is a very well behaved amplifier that settles to 1% in 30ns for a 2V step. The AD8021 has fast overload recovery of 50ns.



The AD8021 is stable over temperature with low input offset voltage and input bias current drift, 0.8 $\mu\text{V}/^\circ\text{C}$ and 2nA/ $^\circ\text{C}$ respectively. The AD8021 is also capable of driving a 75 Ω line with $\pm 3\text{V}$ amplitude video signals.

Not only is the AD8021 technically superior, but it is also priced much less than comparable amps drawing much more quiescent current. The AD8021 is a high-speed general-purpose amplifier, ideal for a wide variety of gain greater than two configurations, and can be used throughout a signal processing chain and in control loops.

The AD8021 is available in both standard 8-pin SOIC and μSOIC packages in the industrial temperature range of -40°C to $+85^\circ\text{C}$.

Model	Operating Temp Range	Package
AD8021AR	-40 to $+85^\circ\text{C}$	8 Lead SOIC
AD8021ARM	-40 to $+85^\circ\text{C}$	8 Lead μSOIC

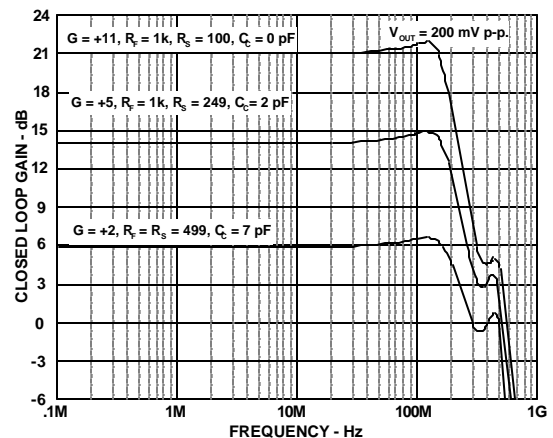


Fig. 1 Small Signal Frequency Response.

PRELIMINARY TECHNICAL DATA

AD8021 - SPECIFICATIONS

(@T_A = +25°C, V_S = ±5V, R_L = 1kΩ, Gain = +2, C_C = 7 pF, unless otherwise noted)

Parameter	Conditions	AD8021AR/ARM			Units
		Min	Typ	Max	
DYNAMIC PERFORMANCE					
-3dB Bandwidth Small Signal	G = +2, C _C = 7 pF, V _O = 0.5Vp-p	TBD	220		MHz
	G = +5, C _C = 2 pF, V _O = 0.2Vp-p	TBD	220		MHz
	G = +11, C _C = 0 pF, V _O = 0.2Vp-p	TBD	180		MHz
Slew Rate, 4V step	G = +2, C _C = 7 pF.	TBD	±200		V/μs
	G = +5, C _C = 2 pF.	TBD	±350		V/μs
	G = +11, C _C = 0 pF.	TBD	±500		V/μs
Settling Time to 0.01%	G = +11, V _O = 2V Step,		21		ns
Overload Recovery (50%)	0V to ±4V step at input, G=+11		50		ns
HARMONIC/NOISE PERFORMANCE					
f = 1 MHz					
HD2	V _O = 2Vp-p.		-96		dBc
HD3	V _O = 2Vp-p.		-102		dBc
f = 5 MHz					
HD2	V _O = 2Vp-p.		-72		dBc
HD3	V _O = 2Vp-p.		-76		dBc
Input Voltage Noise	f = 100 kHz		2.1	2.5	nV/√Hz
Input Current Noise	f = 100 kHz		1.5		pA/√Hz
DC PERFORMANCE					
Input Offset Voltage			0.25	1	mV
Input Offset Voltage Drift	T _{min} - T _{max}		0.8		μV/°C
Input Bias Current	+Input or -Input		7		μA
Input Bias Current Drift			2		nA/°C
Input Offset Current			0.1		±μA
Open Loop gain			80		dB
INPUT CHARACTERISTICS					
Input Resistance			10		MΩ
Input Capacitance			2		pF
Input Common-Mode Voltage Range		-V _S +1.8		+V _S -.5	V
Common-Mode Rejection Ratio	V _{CM} = ±2.5V		-90		dB
OUTPUT CHARACTERISTICS					
Output Voltage Swing	R _L = 1k Ω	±3.25	±3.5		V
Linear Output Current		40	50		mA
Short Circuit Current			100		mA
Capacitive Load Drive for 30% overshoot	V _O = 0.2 V p-p.		40		pF
DISABLE CHARACTERISTICS					
Off Isolation	f = 10 MHz.		TBD		dB
Turn-On Time			40		ns
Turn-Off Time			100		ns
Switching Threshold		TBD	LR	TBD	V
			+1.5 ¹		

Notes:

1. LR = Logic Reference Level

PRELIMINARY TECHNICAL DATA

AD8021

Parameter	Conditions	AD8021AR/ARM			Units
		Min	Typ	Max	
POWER SUPPLY					
Operating Range		±2.5	±5	±12.0	V
Quiescent Current	±2.5V		6		mA
	±5 V		7		
	±12 V		8		
	Powered Down		1.3	TBD	mA
Power Supply Rejection Ratio	±4V to ±6V		-90		dB

Notes:

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS¹

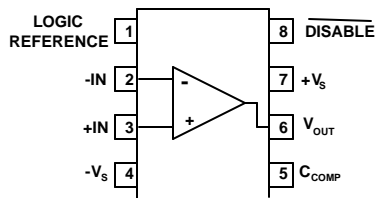
Supply Voltage	TBD V
Power Dissipation	TBD W
Input Voltage	TBD V
Differential Input Voltage	TBD V
Output Short Circuit Duration	
Storage Temperature	
Operating Temperature Range	
Lead Temperature Range	

Notes

¹ 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.

PIN FUNCTION DESCRIPTIONS		
Pin No.	Name	Function
1	Disable Reference	Reference for logic low voltage level. If used, connect to logic negative supply.
2	-IN	Inverting input.
3	+IN	Non-inverting input.
4	-V _S	Negative Supply Voltage.
5	C _{COMP}	Compensation Capacitor (see apps. section for value.)
6	V _{OUT}	Output
7	+V _S	Positive Supply Voltage
8	DISABLE	Disable, active low. Connects to logic disable source. If disable function is not required the pin may be left unconnected for normal operation.

PIN CONFIGURATION



Model	Temperature Range	Package Description	Package Outline	Branding Information
AD8021AR	-40°C to +85°C	8-Lead SOIC	SO-8	
AD8021AR-REEL				
AD8021AR-REEL7				
AD8021ARM	-40°C to +85°C	8-Lead μ SOIC	RM-8	HNA HNA HNA
AD8021ARM-REEL				
AD8021ARM-REEL7				