Dual High Speed Low Noise Op Amps

AD8022

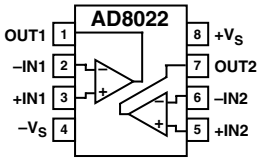
FEATURES

- Low Power Amplifiers Provide Low Noise and Low Distortion, Ideal for xDSL Modem Receiver
- Wide Supply Range: +5 V, ±2.5 V to ±12 V Voltage Supply
- Low Power Consumption
  - 4.0 mA/Amp
- Voltage Feedback
  - Ease of Use
  - Lower Total Noise (Insignificant Input Current Noise Contribution Compared to Current Feedback Amps)
- Low Noise and Distortion
  - 2.5 nV/$\sqrt{Hz}$ Voltage Noise @ 100 kHz
  - 1.2 pA/$\sqrt{Hz}$ Current Noise
  - MTPR < –66 dBc (G = +7)
  - SFDR 110 dB @ 200 kHz
- High Speed
  - 130 MHz Bandwidth (–3 dB), G = +1
  - Settling Time to 0.1%, 68 ns
  - 50 V/μs Slew Rate
- High Output Swing
  - ±10.1 V on ±12 V Supply
- Low Offset Voltage, 1.5 mV Typical

APPLICATIONS

- Receiver for ADSL, VDSL, HDSL, and Proprietary xDSL Systems
- Low Noise Instrumentation Front End
- Ultrasound Preamp
- Active Filters
- 16-Bit ADC Buffer

FUNCTIONAL BLOCK DIAGRAM
SOIC, MSOP



PRODUCT DESCRIPTION

The AD8022 consists of two low noise, high speed, voltage feedback amplifiers. Each amplifier consumes only 4.0 mA of quiescent current yet has only 2.5 nV/$\sqrt{Hz}$ of voltage noise. These dual amplifiers provide wideband, low distortion performance, with high output current optimized for stability when driving capacitive loads. Manufactured on ADI's high voltage generation of XFCB bipolar process, the AD8022 operates on a wide range of supply voltages. The AD8022 is available in both an 8-lead MSOP and an 8-lead SOIC package. Fast overvoltage recovery and wide bandwidth make the AD8022 ideal as the receive channel front end to an ADSL, VDSL or proprietary xDSL transceiver design.

In an xDSL line interface circuit, the AD8022's op amps can be configured as the differential receiver from the line transformer or as independent active filters.

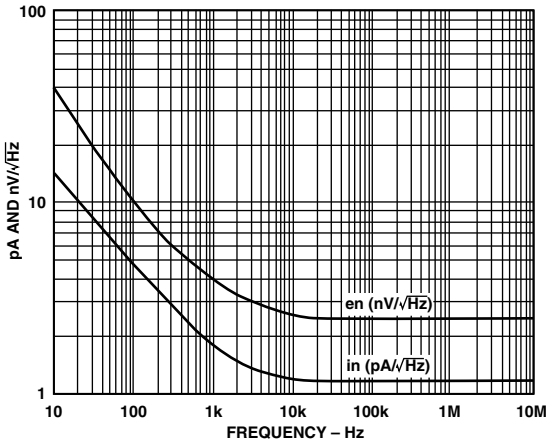


Figure 1. Current and Voltage Noise vs. Frequency

REV. A

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AD8022–SPECIFICATIONS (@ 25°C, V_S = ±12 V, R_L = 500 Ω, G = +1, T_{MIN} = –40°C, T_{MAX} = +85°C, unless otherwise noted.)

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
–3 dB Small Signal Bandwidth	V_{OUT} = 50 mV p-p	110	130		MHz
Bandwidth for 0.1 dB Flatness	V_{OUT} = 50 mV p-p		25		MHz
Large Signal Bandwidth[1]	V_{OUT} = 4 V p-p		4		MHz
Slew Rate	V_{OUT} = 2 V p-p, G = +2	40	50		V/µs
Rise and Fall Time	V_{OUT} = 2 V p-p, G = +2		30		ns
Settling Time 0.1%	V_{OUT} = 2 V p-p		62		ns
Overdrive Recovery Time	V_{OUT} = 150% of Max Output Voltage, G = +2		200		ns
NOISE/DISTORTION PERFORMANCE					
Distortion	V_{OUT} = 2 V p-p				
Second Harmonic	f_C = 1 MHz		–95		dBc
Third Harmonic	f_C = 1 MHz		–100		dBc
Multitone Input Power Ratio[2]	G = +7 Differential				
	26 kHz to 132 kHz		–67.2		dBc
	144 kHz to 1.1 MHz		–66		dBc
Voltage Noise (RTI)	f = 100 kHz		2.5		nV/√Hz
Input Current Noise	f = 100 kHz		1.2		pA/√Hz
DC PERFORMANCE					
Input Offset Voltage			–1.5	±6	mV
	T_{MIN} to T_{MAX}			±7.25	mV
Input Offset Current			±120		nA
Input Bias Current			2.5	5.0	µA
	T_{MIN} to T_{MAX}			±7.5	µA
Open-Loop Gain			72		dB
INPUT CHARACTERISTICS					
Input Resistance (Differential)			20		kΩ
Input Capacitance			0.7		pF
Input Common-Mode Voltage Range			–11.25 to +11.75		V
Common-Mode Rejection Ratio	V_{CM} = ±3 V		98		dB
OUTPUT CHARACTERISTICS					
Output Voltage Swing	R_L = 500 Ω		±10.1		V
	R_L = 2 kΩ		±10.6		V
Linear Output Current	G = +1, R_L = 150, DC Error = 1%		±55		mA
Short Circuit Output Current			100		mA
Capacitive Load Drive	R_S = 0 Ω, <3 dB of Peaking		75		pF
POWER SUPPLY					
Operating Range		+4.5		±13.0	V
Quiescent Current			4.0	5.5	mA/Amp
	T_{MIN} to T_{MAX}			6.1	mA/Amp
Power Supply Rejection Ratio	V_S = ±5 V to ±12 V		80		dB
OPERATING TEMPERATURE RANGE		–40		+85	°C

NOTES

[1]FPBW = Slew Rate/(2 πV_{PEAK}).

[2]Multitone testing performed with 800 mV rms across a 500 Ω load at Points A and B on TPC 20.

Specifications subject to change without notice.

SPECIFICATIONS (@ 25°C, V_S = ±2.5 V, R_L = 500 Ω, G = +1, T_{MIN} = –40°C, T_{MAX} = +85°C, unless otherwise noted.)

Parameter	Conditions	Min	Typ	Max	Unit
DYNAMIC PERFORMANCE					
–3 dB Small Signal Bandwidth	V_{OUT} = 50 mV p-p	100	120		MHz
Bandwidth for 0.1 dB Flatness	V_{OUT} = 50 mV p-p		22		MHz
Large Signal Bandwidth[1]	V_{OUT} = 3 V p-p		4		MHz
Slew Rate	V_{OUT} = 2 V p-p, G = +2	30	42		V/µs
Rise and Fall Time	V_{OUT} = 2 V p-p, G = +2		40		ns
Settling Time 0.1%	V_{OUT} = 2 V p-p		75		ns
Overdrive Recovery Time	V_{OUT} = 150% of Max Output Voltage, G = +2		225		ns
NOISE/DISTORTION PERFORMANCE					
Distortion	V_{OUT} = 2 V p-p				
Second Harmonic	f_C = 1 MHz		–77.5		dBc
Third Harmonic	f_C = 1 MHz		–94		dBc
Multitone Input Power Ratio[2]	G = +7 Differential, V_S = ±6 V				
	26 kHz to 132 kHz		–69		dBc
	144 kHz to 1.1 MHz		–66.7		dBc
Voltage Noise (RTI)	f = 100 kHz		2.3		nV/√Hz
Input Current Noise	f = 100 kHz		1		pA/√Hz
DC PERFORMANCE					
Input Offset Voltage			–0.8	±5.0	mV
	T_{MIN} to T_{MAX}			±6.25	mV
Input Offset Current			±65		nA
Input Bias Current			2.0	5.0	µA
	T_{MIN} to T_{MAX}			7.5	µA
Open-Loop Gain			64		dB
INPUT CHARACTERISTICS					
Input Resistance (Differential)			20		kΩ
Input Capacitance			0.7		pF
Input Common-Mode Voltage Range			–1.83 to +2.0		V
Common-Mode Rejection Ratio	V_{CM} = ±2.5 V V_S = ±5.0 V		98		dB
OUTPUT CHARACTERISTICS					
Output Voltage Swing	R_L = 500 Ω		–1.38 to +1.48		V
Linear Output Current	G = +1, R_L = 100, DC Error = 1%		±32		mA
Short Circuit Output Current			80		mA
Capacitive Load Drive	R_S = 0 Ω, <3 dB of Peaking		75		pF
POWER SUPPLY					
Operating Range		+4.5		±13.0	V
Quiescent Current			3.5	4.25	mA/Amp
	T_{MIN} to T_{MAX}			4.4	mA/Amp
Power Supply Rejection Ratio	ΔV_S = ±1 V		86		dB
OPERATING TEMPERATURE RANGE		–40		+85	°C

NOTES

[1]FPBW = Slew Rate/(2 π V_{PEAK}).

[2]Multitone testing performed with 800 mV rms across a 500 Ω load at Points A and B on TPC 20.

Specifications subject to change without notice.