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Precision Very Low Noise Low Input Bias Current Wide Bandwidth JFET Operational Amplifiers

Preliminary Technical Data AD8610

FEATURES
Low noise: 6nV/ÖHz
Low Offset Voltage: 100■V max.
Low input Bias current 10pA max.
Fast settling: 600ns to 0.01%
Low Distortion
Unity Gain Stable
No Phase Reversal
Dual supply operation: ±5V to ±13V

APPLICATIONS
Photodiode Amplifier
ATE
Instrumentation
Sensors and Controls
Precision filters
High Fidelity Audio

GENERAL DESCRIPTION

The AD8610 is a precision JFET input amplifier featuring very low offset voltage and drift, very low input voltage and current noise, very low input bias current and wide bandwidth. Outputs are stable with capacitive loads of over 500pF in non-inverting unity gain. Output swings to within 1.2V of the supplies even with a 1kohm load, maximizing dynamic range with limited supply voltages.

Applications for these amplifiers include electronic instruments, ATE front-end amplification and integrator circuits, CAT/MRI/Ultrasound medical instrumentation, photodiode amplification, fast precision filters and professional quality audio.

The AD8610 is specified over the extended industrial (-40° to +125°C) temperature range. The AD8610 is available in the 8-lead SOIC and the tiny MSOP8 surface mount packages. MSOP8 packaged devices are available only in Tape-and-Reel.

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ELECTRICAL CHARACTERISTICS (@ V_S= ±5.0V, V_{CM} = 0V, T_A=+25°C unless noted

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage AD8610B	V_{OS}				100	µV
		-40°C < T_A < +125°C			200	µV
Offset Voltage AD8610A	V_{OS}				250	µV
		+25C°< T_A < +125°C			350	µV
		-40°C < T_A < +125°C			850	µV
Input Bias Current	I_B		-10		10	p A
		-40°C < T_A < +85°C	-250		250	p A
		-40°C < T_A < +125°C	-2.5		2.5	nA
Input Offset Current	I_{OS}		-10		10	p A
		-40°C < T_A < +85°C	-75		75	p A
		-40°C < T_A < +125°C	-150		150	p A
Input Voltage Range			-2		3	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = -1.5V to 2.5V	90	95		dB
Large Signal Voltage Gain	A_{VO}	R_L = 1 kΩ , Vo= -3V to 3V	100	200		V/mV
Offset Voltage Drift AD8610B	$\Delta V_{OS}/\Delta T$	-40°C < T_A < +125°C		0.3	1	µV/°C
Offset Voltage Drift AD8610A	$\Delta V_{OS}/\Delta T$	-40°C < T_A < +125°C		0.3	3.5	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 1 kΩ, -40°C < T_A < +125°C	3.8			V
Output Voltage Low	V_{OL}	R_L = 1 kΩ, -40°C < T_A < +125°C			-3.8	V
Output Current	I_{OUT}	$V_{Dropout}$ < 1.2V		±15		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ±5 V to ±13 V	100	110		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			3000	µA
		-40°C <T_A < +125°C			3500	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ	40	50		V/µs
Gain Bandwidth Product	GBP			25		MHz
Settling time	t_S	A_V=+1, 4V step, to 0.01%		350		ns
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		1.2		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		6		nV/√Hz
Current Noise Density	i_n	f = 1 kHz		5		fA/√Hz

ELECTRICAL CHARACTERISTICS (@ V_S= ±13V, V_{CM} = 0V, T_A=+25°C unless noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage AD8610B	V_{OS}				100	µV
		-40°C < T_A < +125°C			200	µV
Offset Voltage AD8610A	V_{OS}				250	µV
		+25°C < T_A < +125°C			350	µV
		-40°C < T_A < +125°C			850	µV
Input Bias Current	I_B		-10		10	pA
	I_B	-40°C < T_A < +85°C	-250		250	pA
	I_B	-40°C < T_A < +125°C	-2.5		2.5	nA
Input Offset Current	I_{OS}		-10		10	pA
	I_{OS}	-40°C < T_A < +85°C	-75		75	pA
	I_{OS}	-40°C < T_A < +125°C	-150		150	pA
Input Voltage Range			-10.5		10.5	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = -10V to 10V	90	110		dB
Large Signal Voltage Gain	A_{VO}	R_L = 1 kΩ , Vo= -10V to 10V	100	200		V/mV
Offset Voltage Drift AD8610B	$\Delta V_{OS}/\Delta T$	-40°C < T_A < +125°C		0.5	1	µV/°C
Offset Voltage Drift AD8610A	$\Delta V_{OS}/\Delta T$	-40°C < T_A < +125°C		0.5	3.5	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	R_L = 1 kΩ, -40°C < T_A < +125°C	-11.75			V
Output Voltage Low	V_{OL}	R_L = 1 kΩ, -40°C < T_A < +125°C			11.75	V
Output Current	I_{OUT}			±15		mA
Short Circuit Current	I_{SC}			±65		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V_S = ±5 V to ±13 V	100	110		dB
Supply Current/Amplifier	I_{SY}	V_O = 0V			3000	µA
		-40°C < T_A < +125°C			4000	µA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R_L =2 kΩ	40	60		V/µs
Gain Bandwidth Product	GBP			25		MHz
Settling time	t_S	A_V=+1, 10V step, to 0.01%		600		ns
NOISE PERFORMANCE						
Voltage Noise	e_n p-p	0.1 Hz to 10 Hz		1.2		µV p-p
Voltage Noise Density	e_n	f = 1 kHz		6		nV/√Hz
Current Noise Density	i_n	f = 1 kHz		5		fA/√Hz

ABSOLUTE MAXIMUM RATINGS [1]

Supply voltage 27.3V
Input Voltage ..... Vs- to Vs+
Differential Input Voltage ..... ±Supply Voltage
Output Short-Circuit Duration ..... Indefinite
Storage Temperature Range
R, RM Package ..... -65°C to +150°C
Operating Temperature Range
AD8610 ..... -40°C to +85°C
Junction Temperature Range
R, RM Package ..... -65°C to +150°C
Lead Temperature Range (Soldering, 60 Sec) ..... +300°C

Package Type	θ_{JA}	θ_{JC}	Units
8-Pin MSOP (RM)	190	44	°C/W
8-Pin SOIC (R)	158	43	°C/W

NOTES

[1] Absolute maximum ratings apply at 25°C, unless otherwise noted.

[2] θ_{JA} is specified for the worst case conditions, i.e., θ_{JA} is specified for device soldered in circuit board for surface mount packages.

ORDERING GUIDE

Model	Temperature Range	Package Description	Package Option
AD8610ARM	-40°C to +125°C	8-Pin MSOP	RM-8
AD8610AR	-40°C to +125°C	8-Pin SOIC	R-8
AD8610BR	-40°C to +125°C	8-Pin SOIC	R-8