



Dual, Low Power, Low Noise, Low Bias Current Precision Rail-to-Rail Output Op Amp

Preliminary Technical Data

AD8622

FEATURES

Very low offset voltage:

50 μ V B-grade maximum

100 μ V A-grade maximum

Low Bias Current: 200 pA

200 μ A supply current

Rail-to-rail output swing

Low input offset drift: 0.8 μ V/ $^{\circ}$ C maximum

Low voltage noise at low power 12 nV/ $\sqrt{\text{Hz}}$

Operating Temperature: -40°C to $+125^{\circ}\text{C}$

± 2.5 V to ± 18 V operation

APPLICATIONS

Portable Precision instrumentation

Process Control Inputs

Laser diode control loops

Strain gage amplifiers

Medical instrumentation

Thermocouple amplifiers

GENERAL DESCRIPTION

The AD8622 is a dual low power (330 μ A max over temperature and supply), precision, rail-to-rail operational amplifiers.

The AD8622 is designed on ADI's iPOLARTM process implementing bias cancellation circuits to guarantee low bias current over temperature. ADI's proprietary iPolar process is an advanced bipolar technology implementing vertical junction isolation with lateral trench isolation, allowing for low noise performance amplifiers in smaller die size at faster speed and lower power. These operational amplifiers offer ultralow offset, drift, and voltage

PIN CONFIGURATIONS



Figure 1. 8-Lead SOIC or MSOP

noise combined with very low input bias currents over the full operating temperature range. Operation is fully specified from ± 5 V to ± 15 V.

With typical offset voltage of only 10 μ V, offset drift of 0.2 μ V/ $^{\circ}$ C, and noise of only TBD μ V p-p (0.1 Hz to 10 Hz), these are perfectly suited for applications where large error sources cannot be tolerated. Many systems can take advantage of the low bias current, low noise, dc precision, and rail-to-rail output swing provided by the devices to maximize SNR and dynamic range for low power operation.

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AD8622 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

$V_S = \pm 5.0\text{ V}$, $V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise specified.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V _{OS}	Grade B Grade A −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		10	50 100	μV μV μV μV
Input Bias Current	I _B	−40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		20	200 300	pA pA
Input Offset Current	I _{OS}	−40°C ≤ T _A ≤ +125°C		10		pA pA
Input Voltage Range			−4		4	V
Common-Mode Rejection Ratio	CMRR	V _{CM} = −3.8 V to +3.8 V −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		120		dB
Open Loop Gain	A _{VO}	R _L = 10 kΩ to ground, V _O = −4.0 V to +4.0 V −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		1000		dB V/mV V/mV V/mV V/mV
		R _L = 2 kΩ to ground, V _O = −4.0 V to +4.0 V −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		500		V/mV V/mV V/mV V/mV
			700	1250		V/mV
						V/mV
						V/mV
						V/mV
						V/mV
						V/mV
Offset Voltage Drift	ΔV _{OS} /ΔT	−40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		0.2 0.2	0.6 0.6	μV/°C μV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V _{OH}	1mA to ground −40°C ≤ T _A ≤ +125°C		4.8		V V
Output Voltage Low	V _{OL}	1mA to ground −40°C ≤ T _A ≤ +125°C		−4.8 −4.91		V V
Short-Circuit Limit	I _{SC}			±20		mA
Output Current	I _O			±10		mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	V _S = ±2.0 V to ±18.0 V −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		120		dB
Supply Current/Amplifier	I _{SY}	V _O = 0 V −40°C ≤ T _A ≤ +85°C −40°C ≤ T _A ≤ +125°C		200		dB μA μA
					330	μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	R _L = 2 kΩ		0.4		V/μs
Gain Bandwidth Product	GBP			600		kHz
NOISE PERFORMANCE						
Voltage Noise	e _{n p-p}	0.1 Hz to 10 Hz		tbd		μV p-p
Voltage Noise Density	e _n	f = 1 kHz		12		nV/√Hz
Current Noise Density	i _n	f = 10 Hz		tbd		pA/√Hz

AD8622 SPECIFICATIONS

$V_S = \pm 15\text{ V}$, $V_{CM} = 0\text{ V}$, $V_O = 0\text{ V}$, $T_A = +25^\circ\text{C}$, unless otherwise specified.

Table 2.

Parameter	Symbol	Conditions	Min	Typ	Max	Units
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	Grade B Grade A $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		10 50 100		μV μV μV
Input Bias Current	I_B	$-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		20 200 300		μV μV μV
Input Offset Current	I_{OS}	$-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		10		μV μV μV
Input Voltage Range			-14.0		14.0	V
Common-Mode Rejection Ratio	CMRR	$V_{CM} = -13.5\text{ V to } 13.5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		120		dB
Open Loop Gain	A_{VO}	$R_L = 2\text{ k}\Omega$ to ground, $V_O = -13.5\text{ V to } 13.5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		3000		dB V/mV V/mV V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	$R_L = 10\text{ k}\Omega$ to ground, $V_O = -13.5\text{ V to } 13.5\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		0.2 0.2	0.6 0.6	V/mV V/mV $\mu\text{V}/^\circ\text{C}$ $\mu\text{V}/^\circ\text{C}$
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	$R_L = 1\text{ mA}$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		14.8		V
Output Voltage Low	V_{OL}	$R_L = 2\text{ k}\Omega$ to ground $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		-14.8		V
Short-Circuit Limit	I_{SC}			± 25		V
Output Current	I_O			± 10		mA mA
POWER SUPPLY						
Power Supply Rejection Ratio	PSRR	$V_S = \pm 2.0\text{ V to } \pm 18.0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		120		dB
Supply Current/Amplifier	I_{SY}	$V_O = 0\text{ V}$ $-40^\circ\text{C} \leq T_A \leq +85^\circ\text{C}$ $-40^\circ\text{C} \leq T_A \leq +125^\circ\text{C}$		210	330	dB μA μA μA
DYNAMIC PERFORMANCE						
Slew Rate	SR	$R_L = 10\text{ k}\Omega$		0.45		V/ μs
Gain Bandwidth Product	GBP			600		kHz
NOISE PERFORMANCE						
Voltage Noise	$e_{n\text{ p-p}}$	0.1 Hz to 10 Hz		tbd		$\mu\text{Vp-p}$
Voltage Noise Density	e_n	$f = 1\text{ kHz}$		12		nV/ $\sqrt{\text{Hz}}$
Current Noise Density	i_n	$f = 10\text{ Hz}$		tbd		pA/ $\sqrt{\text{Hz}}$

ABSOLUTE MAXIMUM RATINGS

Table 3.

Parameter	Rating
Supply Voltage	$\pm 18\text{ V}$
Input Voltage	$\pm V$ supply
Differential Input Voltage	$\pm 0.7\text{ V}$
Output Short-Circuit Duration to GND	Indefinite
Storage Temperature Range	
RM, R Packages	-65°C to $+150^{\circ}\text{C}$
Operating Temperature Range	-40°C to $+125^{\circ}\text{C}$
Junction Temperature Range	
RM, R Packages	-65°C to $+150^{\circ}\text{C}$
Lead Temperature Range (Soldering, 10 sec)	$+300^{\circ}\text{C}$

ESD CAUTION

ESD (electrostatic discharge) sensitive device. Electrostatic charges as high as 4000 V readily accumulate on the human body and test equipment and can discharge without detection. Although this product features proprietary ESD protection circuitry, permanent damage may occur on devices subjected to high energy



Stresses above those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is a stress rating only; 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.

THERMAL RESISTANCE

Table 4. Thermal Resistance

Package Type	θ_{JA}	θ_{JC}	Unit
8-Lead MSOP (RM)	210	45	$^{\circ}\text{C}/\text{W}$
8-Lead SOIC_N (R)	158	43	$^{\circ}\text{C}/\text{W}$

electrostatic discharges. Therefore, proper ESD precautions are recommended to avoid performance degradation or loss of functionality.