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 µV B-grade maximum**
- **100 µV A-grade maximum**

Low Bias Current: 200 pA
200 µA supply current
Rail-to-rail output swing
Low input offset drift: 0.8 µV/°C maximum
Low voltage noise at low power 12 nV/√Hz
Operating Temperature: −40°C to +125°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

PIN CONFIGURATIONS

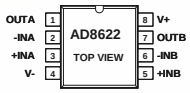

Figure 1. 8-Lead SOIC or MSOP

GENERAL DESCRIPTION

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

The AD8622 is designed on ADI's iPOLAR™ 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 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 µV, offset drift of 0.2 µV/°C, and noise of only TBD µV p-p (0.1 Hz to 10 Hz), these is 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.

Rev. PrA

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AD8622 SPECIFICATIONS

ELECTRICAL SPECIFICATIONS

V_S = ±5.0 V, V_{CM} = 0 V, V_O = 0 V, T_A = +25°C, unless otherwise specified.

Table 1.

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
INPUT CHARACTERISTICS						
Offset Voltage	V_{OS}	Grade B		10	50	µV
		Grade A			100	µV
		−40°C ≤ T_A ≤ +85°C				µV
		−40°C ≤ T_A ≤ +125°C				µV
Input Bias Current	I_B			20	200	pA
		−40°C ≤ T_A ≤ +85°C			300	
		−40°C ≤ T_A ≤ +125°C				pA
Input Offset Current	I_{OS}			10		pA
		−40°C ≤ T_A ≤ +125°C				pA
Input Voltage Range			−4		4	V
Common-Mode Rejection Ratio	CMRR	V_{CM} = −3.8 V to +3.8 V		120		dB
		−40°C ≤ T_A ≤ +85°C				
		−40°C ≤ T_A ≤ +125°C				dB
Open Loop Gain	A_{VO}	R_L = 10 kΩ to ground,		1000		V/mV
		V_O = −4.0 V to +4.0 V				V/mV
		−40°C ≤ T_A ≤ +85°C				V/mV
		−40°C ≤ T_A ≤ +125°C				V/mV
		R_L = 2 kΩ to ground,		500		V/mV
		V_O = −4.0 V to +4.0 V				V/mV
		−40°C ≤ T_A ≤ +85°C				V/mV
		−40°C ≤ T_A ≤ +125°C	700	1250		V/mV
Offset Voltage Drift	$\Delta V_{OS}/\Delta T$	−40°C ≤ T_A ≤ +85°C		0.2	0.6	µV/°C
		−40°C ≤ T_A ≤ +125°C		0.2	0.6	µV/°C
OUTPUT CHARACTERISTICS						
Output Voltage High	V_{OH}	1mA to ground		4.8		V
		−40°C ≤ T_A ≤ +125°C				V
Output Voltage Low	V_{OL}	1mA to ground		−4.8		V
		−40°C ≤ T_A ≤ +125°C		−4.91		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		120		dB
		−40°C ≤ T_A ≤ +85°C				
		−40°C ≤ T_A ≤ +125°C				dB
Supply Current/Amplifier	I_{SY}	V_O = 0 V		200		µA
		−40°C ≤ T_A ≤ +85°C				µA
		−40°C ≤ T_A ≤ +125°C			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 = ±15 V, V_{CM} = 0 V, V_O = 0 V, T_A = +25°C, unless otherwise specified.

Table 2.

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

ABSOLUTE MAXIMUM RATINGS

Table 3.

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

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	°C/W
8-Lead SOIC_N (R)	158	43	°C/W

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